TRANSACTIONS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBRIA

Editor:
D GARDNER-MEDWIN
Assistant Editors:
D C NOBLE-ROLLIN
M A PATTERSON

Volume 58

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA
THE HANCOCK MUSEUM
NEWCASTLE UPON TYNE NE2 4PT
1997-1998

ISSN 0144-221X

Printed by Pattinson and Sons, Newcastle upon Tyne

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Trans. nat. Hist. Soc. Northumb. **58**, 1-35 (1997)

ANNUAL REPORT
OF THE
COUNCIL
FOR THE
YEAR ENDED 31 JULY 1997

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA

PRESIDENT

The Viscount Ridley

VICE PRESIDENTS

A H Dickinson
R W T Thorp
M J Hudson
J Alder
Dr G A L Johnson
D F McGuire
D R Shannon
D P Walton
I D Moorhouse
Mrs M A Patterson
Dr A G Lunn
A M Tynan
E Slack

COUNCIL

(1) **Elected by members**:
1994 - K C Patterson
1995 - H H Chambers, A Creedy
1996 - M D Anthony, J S North Lewis

(2) **Nominated by sections:**
Dr D Gardner-Medwin (Chairman of Council, publications), Dr A G Lunn (botany), L Jessop (entomology, retired), Dr G A L Johnson (geology), E Slack (Gosforth Park), H H Chambers (library), Dr C Redfern (ornithology), Professor R B Clark (publications, retired),

(3) **University representatives:**
P S Davis, Dr A J Richards, Dr B J Selman

TRUSTEES

The Viscount Ridley (retired), H H Chambers, A H Dickinson (retired), Dr D Gardner-Medwin, R M Gledson (retired), Dr A G Lunn, I D Moorhouse, J S North Lewis, Mrs M A Patterson, Dr B J Selman, D R Shannon, E Slack, D C Souter (retired), R F Walker (honorary).

HONORARY TREASURER

R E Slack ACA

SECRETARY

D C Noble-Rollin

GENERAL PURPOSES COMMITTEE

P S Davis, Dr D Gardner-Medwin, Dr A G Lunn, R E Slack, J S North Lewis

SOCIETY REPRESENTATIVES

Coquet Island Advisory Management Committee: I D Moorhouse, D C Noble-Rollin

Fontburn Reservoir Wildlife Advisory Group: I S Davidson

Lindisfarne National Nature Reserve:
Advisory Committee: D G Bell
Wildfowl Panel: D C Noble-Rollin

Museum Management Committee: Dr D Gardner-Medwin, D C Noble-Rollin, E Slack, Dr R H Stobbart

STAFF:

Ms P Hammock, Mrs J Jones, Mrs M A Patterson

GOSFORTH PARK NATURE RESERVE

Warden: P Drummond

THE HANCOCK MUSEUM

Senior Curator and Principal Keeper: A Coles
Curator and Senior Keeper: S McLean

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR ENDED 31 JULY 1997

Last autumn, Viscount Ridley generously agreed to be our President and, at our annual meeting in November, he was formally elected. He reminded us then that he has an almost lifelong association with the Society: he remembers as a boy Mr George Temperley (Honorary Secretary 1930-1951) helping him to identify hawfinches at Blagdon; and for many years he had been both a Trustee and a Vice-President. He is an expert on trees and a prominent campaigner for the red squirrel. Lord Ridley has already taken an active interest in our activities and we warmly and gratefully welcome him.

Conservation is one of our new President's great interests, so it seems right to devote a section later in this report to this subject. He is also keen that we and the Northumberland Wildlife Trust should collaborate more closely. Many of us are members of both organisations and there would undoubtedly be much to gain by working together on projects of common interest. Sadly, a first attempt to meet at Blagdon in July failed to materialise; a rather too recherché programme attracted too few members. Lord Ridley has kindly invited us to try again in the spring. The vital part that good survey work plays in wildlife conservation is of interest to both the Society and the Trust. It is crucial to the identification of important sites for conservation and equally so for regular surveillance once the sites have been designated for protection. We hope to develop this theme for the spring meeting. Meanwhile we are delighted that the *Northumberland Red Data Book*, prepared by the Trust, is to be published as an issue of our *Transactions* next year.

One major disappointment this year has been the failure of our application to the National Heritage Lottery Fund to win immediate support for our plans for an extension and other developments at the museum. We have not been rejected, but we have been asked to undertake a full scale conservation audit (fortunately the Fund may provide a grant for this) and we must then reapply in the light of the findings of the audit. At best, this may simply mean a delay of some eighteen months - but it is a great disappointment to all who made such a magnificent effort in producing our first class application last year, particularly Mr Alec Coles who deserves our grateful sympathy. The audit itself will be a modest but real compensation. We look forward to reading and adding to our library a sensitive analysis, from the point of view of an architect and an architectural historian, of the historical, cultural and aesthetic significance of our building and its contents together with recommendations for their conservation, development and social function.

This summer Mr T C Dunn, MBE, one of our finest local naturalists, died. Although he had been a member of this Society only since 1981, he had been an active and much-consulted entomologist for many years and one of our most direct links with the legendary Professor J W Heslop-Harrison and other early members of the Northern Naturalists' Union. Heslop-Harrison was one of the founders the NNU, to which our Society and many others are affiliated, and Tom Dunn was the prime mover of the Union and its activities after the death of 'H-H'. He also edited and often wrote, almost single-handedly, the Union's publication *Vasculum* from 1967 to 1990. But above all, he was a consummate lepidopterist and did more than any other person in living memory to advance the knowledge of local moths and to inspire and teach others to study them. He was essentially a County Durham man, and it is no accident that the area around his home in Chester-le-Street has long been the best documented for butterflies and moths in the whole region. His volumes (written jointly with Dr Jim Parrack) on *The Moths and Butterflies of Northumberland and Durham* (1986 & 1992) are one of the most important recent contributions to the recording of our local fauna.

MEMBERSHIP

The total membership (with the 1996 figure in brackets) on 31 July 1997 was 853 (884). This was made up of 7 (7) honorary members, 41 (42) life members, 514 (529) members who receive *Transactions*, 254 (269) members who do not receive *Transactions*, 25 (28) associate members, 2 (2) schools and 10 (7) complimentary members. Several people make payments

under long-standing bankers' orders ranging from £1 to £12, made when these sums were the current subscription rates, and they are regarded as donors and not members.

The Council reports with much regret the death of Mr T C Dunn (mentioned above) and of three other members, Lady Carr-Ellison (1968), Mrs D Tate (1971) and Mr W D Douglas (1961). The dates in brackets are the years in which they joined the Society.

COUNCIL

At the annual meeting on 29 November, in addition to the election of Viscount Ridley as our President, five new trustees were elected, Mr H H Chambers, Dr D Gardner-Medwin, Dr A G Lunn, Mr J S North Lewis and Dr B Selman. They replace five retiring trustees - Viscount Ridley, Mr A H Dickinson, Mr R M Gledson, Mr D C Souter and Mr R F Walker. We are very grateful to them all for their many years of service as the members who bear the formal responsibility for the proper management of our affairs.

Two members were elected to Council, Mr J S North Lewis, who is on the General Purposes Committee to advise on legal matters, and Mr M D Anthony, who has a wide ranging interest in natural history. Mr H Baird and Dr J M Jones retired from Council by rotation.

PUBLICATIONS

During the year Professor R B Clark, who has been editor of the *Transactions* since 1988, indicated his wish to resign. Accordingly the Publications Committee met on 7 November to discuss the future editing and production of the *Transactions*. It was agreed that Dr Brian Selman would become the editor after his retirement and that Dr David Gardner-Medwin would oversee the editing and production until then. Professor Clark agreed to edit volume 57 part 4, after which Dr Gardner-Medwin will take over. The Council of the Society would like to thank Professor Clark for his years of excellent service as editor and to congratulate him on both the increased size and the high scientific standard of the *Transactions*. His skill in editing and his persistence in achieving accuracy have greatly enhanced the periodical's quality and scope. For a while, the production of issues suffered from competition with the Society's total concentration on its special publication *The Flora of Northumberland*, but Professor Clark enabled us to recover so that we are close to achieving the target of producing two issues every three years. We can be proud of our *Transactions* as a scientific publication covering a wide range of local natural history.

In October volume 57 part 1 was published, with an index to volume 56. The new volume began with papers on a variety of subjects, many with an historical interest. They were as follows: 'George Gibsone and his conches' by L Jessop; 'Foraging distributions of terns and puffins in coastal water off Coquet Island (Northumberland)' by K J Breakwell, M J Denny, S M Evans, D C Noble-Rollin and C P F Redfern; 'Some sources for Thomas Bewick's work on the Chillingham "wild" cattle' by L Jessop and M J Boyd; 'February 1929: an insight into the climatology of Northumbrian cold spells' by D A Wheeler; 'The seaweeds of north-east England: a history of their study' by F G Hardy and G W Scott and finally 'Discussion on paper by Mitchell *et al.* (1994) entitled "The flora and vegetation of Magnesian limestone sea cliffs, County Durham"' by D B Smith, D N Mitchell, A W Davison and J A Cooke.

This publication was followed by the Society's Annual Report and in the spring 'Birds of the Farne Islands in 1996' by J Walton, both issued as parts of the *Transactions*.

STAFF AND MANAGEMENT

The Society relies on both paid staff and volunteers. They look after the membership, produce bulletins and other publications and cope with an endless series of questions from members and the public. Their success depends on a team effort from everyone involved. The following members of staff and volunteers have made it possible for the Society very nearly to keep its head above water during the current year.

Mrs Margaret Patterson continues her invaluable secretarial work and is assistant editor of the *Transactions*. A great deal of her time this year has been spent in the preparation of material for volume 57 part 4 of the *Transactions*, an extremely large issue which is due out shortly, and the Society is also particularly indebted to her for her work on editing 'Birds on the Farne Islands in 1996' and the Annual Report.

Ms Tricia Hammock is responsible for the covenants, bankers' orders and exchange of periodicals with other organisations around the world, and she also puts in numerous hours of voluntary work above her office duties which included the preparation of many of the tables for the current issue of the *Transactions*.

Mrs Joyce Jones continues to be responsibe for the day-to-day finance in the office and helps in general clerical duties.

Mrs Rita Wolland, who retired last year from the office staff, has kindly agreed to return on a voluntary basis to help with the growing work on the returns from the Society's ringing activities. Her expertise in understanding the filing of schedules and recoveries is greatly appreciated.

Miss Barbara Harbottle has also volunteered to help and is working with Rita Wolland on the enormous backlog of resightings and recoveries of ringed Farne Island birds. Barbara is also trying to standardise the entries to assist in the statistical use of the database.

Mrs Joan Holding has continued her voluntary help in preparing the illustrations for the *Transactions*; the current issue has a large number of diagrams, maps and figures that have required a great deal of effort to prepare in the 'house' style. Apart from this Joan has worked many hours preparing illustrations for the bulletin, and undertaken other graphic tasks that have required her special skills.

Mrs Janet Angel continues to assist in analysing the logbooks from Gosforth Park. She comes into the Society's office periodically to collect the information and a month or two later returns with detailed lists of species seen etc.

Mrs Anna Newson has continued to work on upgrading the catalogue of the contents of the *Transactions* from its first publication in 1831, which she has now taken as far as she can. It is hoped that it will become an issue of the *Transactions* for the use of members. She has also updated the file of records of the Chillingham Wild Cattle.

Mrs June Holmes is now occupied mainly in producing the catalogue of the manuscripts and other archival papers held within the museum but she has also helped with enquiries relating to the Hancock manuscripts and Bewick material.

Miss Ann Stephenson has been assisting June Holmes, listing and sorting the archive material in preparation for cataloguing. This work is greatly speeding the process and is appreciated by both the Society's Council and by the museum, who have commissioned June to produce a comprehensive inventory.

Mr and Mrs Hugh Chambers, in addition to their major work in the library, have both assisted the Secretary with organising events and in answering queries from the public, members and the media which would otherwise take up much of the staff's time.

Without the support and help of this dedicated team of volunteers and staff the Society would not be able to undertake so many commitments, and Council would like to thank them all for their contribution throughout the year.

HANCOCK MUSEUM

There is no doubt that the last year has been the most difficult since Tyne & Wear Museums became responsible for the management of the Hancock Museum. It has been an uphill struggle to maintain visitor levels, secure funding and plan for the future. Happily, at the conclusion of the year, it is possible to report positive developments on all three fronts.

A New Management Agreement 30 June 1997 represented the final day of the initial management agreement between the University of Newcastle upon Tyne and Tyne & Wear Museums regarding the management of the Hancock Museum. The University has suffered well-publicised financial restrictions over the current year, and it is for this reason that the renewal of the agreement was brought into question. It was against this background of uncertainty that the management team had to try to plan the year ahead.

The museum's National Heritage Lottery bid was under consideration over this period, attempts were being made to secure major exhibitions, and vacant posts were being frozen throughout Tyne & Wear Museums to accommodate Hancock staff in the event of an agreement not being reached: it was not a happy period.

The situation was finally resolved in December when an agreement was reached. The University's annual contribution was increased, and the terms of the agreement were changed. The initial contract had been for a fixed period of five years: this inevitably led to the last minute negotiations and the uncertainty that flowed from this. The new agreement is for three years, but it is to be rolled forward annually with the result that any difficulties should be ironed out between two and three years before any possible change in funding. Museum and University staff had worked behind the scenes to secure special factor funding from the Higher Education Funding Council for England, and it is almost certain that this enabled the University to fund the improved terms of the agreement.

Lottery Application The good news of the deal with the University was balanced with disappointment over the outcome of the museum's National Heritage Lottery Fund application. The application was welcomed warmly by the Fund's Trustees who were at pains to point out both their recognition of the heritage importance of the museum and its collections and their agreement that development was vital to the well-being of the museum. Unfortunately, the architectural advisors to the trustees expressed reservations about the degree of alteration to the museum building, and therefore the plan is under reconsideration. A renewed application is being prepared to secure the funding necessary to complete a conservation audit of the building.

Visitor figures The temporary exhibitions held over the year are reviewed briefly below, but it is their impact on visitor numbers that must concern the museum. If admission to the Hancock were free we could expect large numbers of visitors, many of them returning on a regular basis. Because the museum must charge, it is immediately placed in a very competitive leisure market - like it or not. Visitors are unlikely to return (and pay again) unless attractions change regularly. Furthermore, they expect value for money. This situation is nowhere better illustrated than with the 'Animal Magic' exhibition: the exhibition was created by our Natural Sciences Department for South Shields Museum (a free admission museum) where it was a resounding success. We brought it to the Hancock where we augmented and expanded it. The result was the poorest visitor figures for at least four years in each of the months of February, March and April. The exhibition then moved on to Sunderland Museum and Art Gallery (another free museum), where it did very well once more.

The decision to stage 'Star Trek: The Exhibition' was driven by the need to attract more visitors. It did not let us down. June and July were more than twice as busy as any June or July before. The interest and publicity generated has put the Hancock firmly back in the public eye, whilst the revenue income is essential to the museum's functioning and continues to support the valuable work on the collections.

Major temporary exhibitions '*Pterosaurs - Rulers of Jurassic Skies*' (closed 31 October 1996) This was an attempt to work with a local company in the production of a 'blockbuster' exhibition. As was mentioned in the last annual report (the exhibition actually opened in the previous year), the relationship was somewhat soured by the poor performance of the animatronics of the exhibition. This was almost certainly responsible for the poor visitor figures recorded over the year.

'*Animal Magic*' (10 February-31 May) This was an exhibition about human attitudes to animals. Whilst it was based on an exhibition at South Shields Museum, it was extensively

augmented with a great deal of additional material, most significantly a series of 'giant' wood sculptures by Mr Gordon Stafford of the Art Studio in Sunderland.

'Star Trek - The Exhibition' (14 June-14 September) This is the official Paramount Pictures exhibition of the TV series and films. It features original TV and film sets, costumes, props and video footage. It has been extremely successful in its first two months and has introduced a new audience to the Hancock. It was the subject of major sponsorship from BT's Community Partnership Programme. The exhibition was opened in a highly entertaining manner by the Chairman of the Museum Management Committee and Pro-Vice-Chancellor, Professor Richard Bailey, with additional remarks from Tony Sarginson of BT.

Other exhibitions *'After Chernobyl'* (9 July-8 September 1996) This exhibition of controversial paintings by Cornelia Hesse-Honegger of insects deformed by mutations, allegedly induced by radiation, attracted a particularly high level of media coverage, especially in the arts press. It is hoped that this will confirm the Hancock's reputation as a suitable venue for smaller arts exhibitions. The exhibition was the subject of a generous grant of £1000 from NEMS's Visual Arts Programme.

'Squirrel Nutkin - The End of the Tale?' (October 18-January 5) This exhibition was timed to coincide with the relaunch of the 'Red Alert' squirrel conservation campaign in the North-East. The Hancock was a particularly appropriate venue given the work of Tyne & Wear Museums in mapping the occurrence of squirrels in the region. The exhibition was hired from Tullie House Museum in Carlisle.

'Bird in the Brush' (November 9-February 8) This exhibition was produced by Mr Les Jessop and featured the pick of ornithological works by living and historic artists in the North-East. Featured artists included Prideaux John Selby, Joseph Crawhall and James Alder. Sadly it also proved to be the last public exhibition of work by Derek Hall before his sudden and tragic death.

'Parrots' (November 12-January 20) Following the decision not to extend the Pterosaurs exhibition, 'Parrots' was booked, on hire from Oldham Museums. Apart from a fine collection of parrots and their relatives, the exhibition marked the long-awaited return to the Hancock of Sparkie Williams, the world-famous talking budgerigar - originally a resident of Forest Hall.

'Ceramics from Ancient Greece' (November 4-April 30) This small exhibition of objects, borrowed from the Laing Art Gallery, was organised by Ms Gillian Mason to support the 'Time Travellers' activities with schools.

'Florilegium Dunelmense' (May 1-June 11) This small exhibition of exquisite paintings represented brand new work from artist David Pearson, commissioned by the Botanic Gardens in Durham, and featuring plants in the Gardens.

New displays *'Earthworks'* The museum's geologists, Mr Steve McLean and Ms Helen Fothergill, are currently preoccupied with the museum's new earth science gallery, 'Earthworks'. Building work is well advanced and it is hoped that the display will be open by Christmas.

'Ugly Bug Zoo' This is the museum's new display, on the first balcony, of live invertebrates. The popularity of this type of display was recognised when a temporary exhibit was installed for the 'Megabugs' exhibition. The new display has been designed by museum Assistant Ms Kirsty Ramshaw.

Touring exhibitions The Hancock's popular exhibition *'Claws!'* successfully toured to the following institutions where it was well received: Gloucester Museum and Art Gallery from 6 July-7 September 1996 and Kelvingrove Museum, Glasgow from 27 September 1996-23 March 1997. Indeed, Glasgow Museums featured heavily in the national press over the year, and every photograph seemed to feature the entrance to the 'Claws!' exhibition! Although it has been in store since the Glasgow showing, a number of venues are booked from spring 1998 until summer 1999.

'*Birds and Flowers of the Castle of Mey*': The museum has organised a small number of exhibition tour venues for James Alder's paintings. The first of these was the Dorman Memorial Museum in Middlesbrough from February-June.

Educational work *'Schools - Time Travellers'*: The level of school visits has been very encouraging and, as ever, this was largely due to the 'Time Travellers' activities. Ancient Egypt is as popular as ever, and a new series of Victorian activities was based on a Victorian naturalist. The success of the year was probably the introduction of the new Ancient Greece activities. These were organised in response to the disappointing visitor figures, and because Ancient Greece is an obligatory study area in the history curriculum. A small display was added, courtesy of a loan from the Laing Art Gallery. Some 4,000 children attended the activities and the response from children and teachers was extremely positive. In addition, craft days and cartoon workshops on the theme of space were organised to coincide with 'Star Trek: The Exhibition'. These attracted over 350 children.

School bookings To cope with the demand of more school visits, and an ever more complex range of school programmes, a new computerised booking system has been installed and is now fully operational.

Family Fun A full programme of Family Fun activities attracted large numbers, as always. The following is a complete list of activities: Saturday 28 September - *Bird of Prey Day* during which a Harris' hawk and a barn owl from the Northumbria Bird of Prey Centre flew live in the museum; Monday 21 October - *Ptero-Storytelling*; Wednesday 23 October - Book Making was one of a range of activities to celebrate '*Older People in Europe Week*'. The latter also included Surfing The Net at 50+, Behind the Scenes tours and a range of special discounts for older visitors; Sunday 10 November - *Snake and Spider day* ; Saturday 30 December - *Snakes and Creepy Crawly Day* - ditto! Saturday 18 January - *Go Greek* to coincide with the Time Travellers exhibition; Saturday 25 January - *Printing Workshop;* Tuesday 18 February - Children's activities plus '*Behind the Scenes*' tours; Wednesday 19 February - *Birds of Prey*; Friday 21 February - *RSPCA Day* to coincide with the Animal Magic exhibition; Saturday 22 - February *Snakes Alive and Creeping Crawlies*; Wednesday 2 April - *Cartoon Capers* with local writer and cartoonist Steve Donald, picking up some of the themes in Animal Magic; Friday 4 April - *Bat-Tastic* with local expert Noel Jackson; Saturday 19 April - *The Art of Taxidermy* - an illustrated talk by Eric Morton; Tuesday 27 May - *Crafty Animals* - a day of making monkey chains, feely frogs and an animal toy tidy; Wednesday 28 May - *Face to Face* - Totem Pole Art computer graphics workshop with Chris Madge; Thursday 3 July - *Making Monsters* an illustrated talk on the art of creating monsters for film and television; Wednesday 23 July - *Starfleet Design* Day involved the creation of a new badge and uniform for the Star Trek crew; Wednesday 30 July - *Art Trek*, making a Star Trek frieze.

Science Alive! 1997 This festival was run in collaboration with the University of Newcastle upon Tyne from 18 to 20 March. Activities were aimed at comprehensive schools, and 192 students attended from across the region. A natural science activity was organised by Hancock staff, entitled 'Quest for the Quadruped', whilst colleagues at Newcastle Discovery Museum organised 'A Troublesome Turbine'.

Access issues Equal access initiatives in the Hancock are coordinated by Ms Gillian Mason, and as part of Tyne & Wear Museum's Access Policy, a general Access Guide to the Hancock is currently in production. This will provide visitors with information on how to access the facilities and collections of the museum. A wheelchair has also been ordered for use by visitors with mobility difficulties. Successful events for visitors with disabilities included a group of students from Delaval Middle School, who visited as part of their annual 'World of Work' week, and two signed teaching sessions on the theme of birds and habitats for children from the Northern Counties School for the Deaf.

Collections management and research It has been another busy year for collections management as we try to bring the storage and environmental conditions in the museum up to scratch. Great progress has been made with the geology collections: the University mineral collection has now been re-stored; a new palaeontology store has been created and fitted-out

in the old video theatre in the bird gallery; and the installation of new cabinets in the existing palaeontology stores has now been completed (the culmination of a seven year programme).

The most notable research and publication event of the year has been the completion of 'A Catalogue of Type, Figured and Cited Fossil Vertebrates in the Hancock Museum', written by Mr A Newman, Mr S McLean and Mr D Hudson. This important volume has been selling world-wide - further evidence of the international importance of the museum's palaeontological collections.

The most important curatorial initiative of the year has been the work on the ethnography collections by Mrs Janet Starkey, a peripatetic ethnography curator appointed by the North of England Museums Service, and her assistant, Ms Lisa Harris. Their work has included re-storage of collections, re-identification of items, rationalisation of documentation and standardisation of terminology. They have also organised remedial conservation of certain items. Mr Les Jessop has devoted a considerable amount of time to the research on this collection and has now identified some seventy specimens attributable to the original collection of the Allan Museum. Mr Jessop has also completed several research articles for publication on the history, origin and survival of the eighteenth century collections relating to Marmaduke Tunstall and the few remaining items from his museum.

Dr Roger Stobbart has carried out significant work on the holdings of bird skins and mounts representing species in the Red Data Book, i.e. those species whose existence is under threat. Work on the geology collections continues to focus on the re-storage of material in recently purchased purpose-built cabinets. Dr Stobbart has also completed his curation of the collections of bird-wing butterflies at both the Hancock and Sunderland Museums. As a result he has prepared a paper on the history and significance of the collections which will appear in the *Transactions* in the near future.

Volunteer curators have been vital to the museum's collections management work as ever, especially in the fields of osteology (Mrs Paddy Cottam) and botany (Mr Ron Cook).

Acquisitions As usual, the greatest number of acquisitions have been carcasses of birds and mammals along with geological and entomological items retained from enquiries. The more formal acquisitions include:

* A collection of cervid bones from Cresswell, Northumberland from Northumberland County Council, Archaeology Section.
* Reptile skulls and four bird skeletons donated by Dr A D Walker.
* A pre-Ecuadorian axe head and two Brazilian knives donated by Mr A H Dickinson.
* *Cervus elaphus* skull and antlers of red deer. Donated by Mr R Cook.
* *Pandion haliaetus* incomplete skeleton of osprey found by Mr E Morton.
* *Capreolus capreolus* roe deer skeleton found by Mr J Steele.
* Selection of minerals from the North Pennine Orefield from Mr F Bell.
* Selection of minerals from the North Pennine Orefield from Mr T F Bridges.
* Selection of minerals from the North Pennine Orefield and rocks from Northumberland from Mr B Young.
* Whale vertebra and sawfish saw from the South Atlantic/Antarctica from Mrs I Barnes.

The Hancock Museum on the World Wide Web The launch of the Hancock's World Wide Web page was announced last year. This year it became fully interactive following an enquiry from Ms Louise Whitts who brought in a photograph of a 'Mystery Object' washed up on a beach in Benbecula. The pictures were published on our Web page and suggestions for the origin of the object have been coming thick and fast ever since, from all over the world. The most likely solution still seems to be a decomposing Greenland or basking shark, but there was very little agreement between our many Internet correspondents! Web address: http://www.ncl.ac.uk/~nhancock.

Awards and Grants

Support of Star Trek - The Exhibition	
* BT Community Partnership Programme	£10,000
Grants towards the new Earthworks Gallery	
(already subject to an ERDF grant of £102,000)	
* Barbour Trust	£10,000
* Burn Charity Trust	£ 1,000
* Sir James Knott Trust	£ 5,000
* North of England Museums Service	£ 2,800
* Pilgrim Trust	£ 5,000
* Charles and Elsie Sykes Trust	£ 500
* Rothley Trust	£ 200
* Garfield Weston Foundation	£ 3,000
North of England Museums Service Grants for Public Programmes	
* After Chernobyl	£ 1,000
* Bird in the Brush Exhibition	£ 1,200
* Marketing and Press Activities	£ 1,000
* Education Activities	£ 1,000
* Greek Time Travellers	£ 1,000
* Ugly Bug Zoo	£ 2,000
North of England Museums Service Grants for Collections Care	
* Restorage	£ 1,000
* Dehumidifier	£ 600
* Security System	£ 1,000

The contributions listed total £47,300 which is a substantial input into the museum's activities. Council would like to express its thanks to all the donors for their generous support.

Staff There have been a number of staffing changes over the year, usually for the right reasons - staff have moved on to pastures new!

We said goodbye to three part-time attendants: Angus Thompson who moved to a full-time position at Arbeia Roman Fort, Susan Davison who moved to the Isle of Arran, and Scott Appleby. We also said goodbye to our long-standing cleaner Lillian Livingston who had faithfully served the museum for many years. We did not quite say goodbye to Kevin Hughes who left to become Information Technology Support Officer for the City of Newcastle upon Tyne, and whose time is now bought back on one day per week by the Hancock Museum.

Our Senior Attendant, Anne Aspery, got married and decided that she would prefer to relinquish her responsibilities and change to part-time working. John Connell was promoted to the position of Senior Attendant.

Gillian Mason has recently been re-graded from her position of Assistant Education Officer to that of Education Officer.

Alec Coles has been promoted to Senior Curator and joins Tyne & Wear Museums' senior management team with special responsibility for the Hancock Museum, Gateshead, Natural Sciences (for which he remains Principal Keeper) and Education. Steve McLean now becomes curator of the Hancock Museum and Senior Keeper of Natural Sciences.

The current staffing complement is as follows:

Alec Coles (Senior Curator and Principal Keeper, Natural Sciences)

Steve McLean (Curator and Senior Keeper Natural Sciences)

Les Jessop (Keeper of Biology) *Based at Sunderland Museum*

Helen Fothergill (Assistant Keeper, Geology) *Based at Sunderland Museum*

Eric Morton (Assistant Keeper, Biology)

Kirsty Ramshaw (Biology Assistant)

Gillian Mason (Education Officer)

Fiona Fenwick (Secretary)

Kevin Hughes (Environmental Recording and Cataloguing Assistant)

John Pratt (Chief Attendant)

John Connell (Senior Attendant)

Sean Dykes (Full-time Attendant)

Anne Aspery (Part-time Attendant)

Gavin Lockey (Part-time Attendant)

Ingrid Solberg (Part-time Attendant)

Freda Rafferty (Cleaner) (absent because of long term sickness)

Volunteers Every year we struggle to find appropriate words to record our thanks to the regular volunteers who assist us in our labours. Whether they be curating collections, carrying out data management or assisting with educational activities, they are simply invaluable and without them the Hancock would achieve only a fraction of what it does. At the time of writing, our volunteers are:

Janet Angel Transcription of George Temperley's diaries

Trevor Bridges Mineralogy curation

Ron Cook Botany/Oology curation

Paddy Cottam Osteology curation

John Durkin Biological recording

Marilyn Elliott Biological recording

Michael Frankis Northumberland bird records

Caroline Gettinby Vertebrate zoology

Lisa Harris Ethnography curation

Clare Huckleby Ethnography curation

George March Geology documentation

Roger Stobbart Entomology curation

June Waites Education

Matthew Wasserman Biological and geological documentation

MUSEUM MANAGEMENT COMMITTEE

This is one of of our most important committees because it forms the crucial link between the Society, which owns the museum, and the University of Newcastle and Tyne & Wear Museums, which manage it. The Council would like to express its thanks to Professor Richard Bailey who chairs the committee with great skill and gives us his warm and energetic support. The committee met on two occasions during the year and discussed the matters that are covered in the museum report.

FINANCE

The surplus for the year is £3,059 compared with a surplus of £5,124 for the year ended 31 July 1996. The principal changes behind this reduction are shown below (with negative amounts in brackets):

	£	£
Increase in salaries, pension contributions and National Insurance	2,956	
Less increase in research funding	(1,963)	993
Increase in net expenditure on *Transactions*		1,604
Increase in expenditure on Gosforth Park Nature Reserve		281
Increase in expenditure on coastal research		292
Decrease in revenue surplus on holidays		1,348
Decrease in investment income		2,728
Less:		
Savings made on printing and stationery		(1,173)
Reduction in depreciation charge		(837)
Reduction in appropriations		(3,000)
		2,236
Less net savings on other headings of income and expenditure		(171)
Overall reduction in surplus (£5,124-3,059)		2,065

The general rise in expenditure and in the range of activities undertaken by the Society will require us to maximise our income if we are to be able to support future development. During the year the Society has increased its research activity with substantial coastal research projects and preparatory work for the future publication of the Northumberland Red Data Book. For this reason coastal research expenditure is now shown as a separate item within the Statement of Financial Activities. The Red Data Book will be included within *Transactions* costs. While Gosforth Park Nature Reserve showed a small increase in revenue expenditure no capital appropriations have been made although a further £1,000 was donated towards the planned rejuvenation of the lake.

In line with revenue forecasts investment income fell during the year to £28,003 from £30,731, largely due to 'one-off' special dividend receipts in the year to 31 July 1996. The investment portfolio continues to be managed by Wise Speke in consultation with the Honorary Treasurer, two of the trustees of the Society and Mr K. Patterson, FCA. During the year all of the Society's quoted investments were transferred into a nominee holding at Wise Speke to eliminate the problems of transferring registered ownership when there is a change in trustees. There were some changes to the portfolio in the year which resulted in the realised gains and losses to the various funds listed below:

	£
General Fund	(1,914)
T B Short Memorial Fund	9,265
Grace Hickling Memorial Fund	5,446

In accordance with the general directions of the Charities Commissioners, the investments held at 31 July 1997 are shown at their market value in the financial statements. The difference between market value and original cost is £235,263 which is shown as an investment revaluation reserve.

Currently the Society has a large cash surplus and this is under review with Wise Speke alongside a review of the overall investment portfolio. As a result of this, additional equity and Treasury Stock investments will be made during the financial year ending 31 July 1998.

The Society is grateful for the continued grant received from Newcastle University and for all other donations received during the year, which together help to maintain current levels of activity.

INDEPENDENT REVIEW

The financial statements to 31 July 1997, independently reviewed by Mr R. Bunter of Price Waterhouse, were approved by Council on 3 October 1997. Council gave its approval for an independent review at its meeting on 18 April 1997.

LIBRARY

During the year the library continued to be run by dedicated voluntary effort. Incoming journals and periodicals were recorded by Mrs Helen Dalrymple who also arranged the binding of these publications. This year more than fifty volumes of serial publications were bound, thus becoming a permanent part of our collection. Dr Alick Walker did essential work in checking and organising the rather complicated Palaeontographical Society Monographs so that the binding of these could restart. Mrs Helen Roscoe helped with the never-ending task of cataloguing our collections. Mr Trevor Hardy worked steadily on his winter task of reviewing the ten thousand geological off-prints from the University that have been entrusted to our care. Mr Richard Slack paid our bills and made sure our budget was not exceeded. The direction of library affairs is controlled by the library committee who meet four times a year; the members have remained unchanged and are Mr Hugh Chambers (chairman), Mrs Paddy Cottam (mammals), Mr Peter Davis (marine biology), Dr David Gardner-Medwin (history of natural history), Mr Les Jessop (entomology), Mr David Noble-Rollin (ornithology), Mrs Joyce Parvin (secretary), Dr Alick Walker (geology) and Dr Trevor Walker (botany). While Mr Les Jessop and Mr Peter Davis find it difficult to attend the meetings they are always available with particularly helpful advice. The Society thanks them all for their efforts.

The library evening on 6 December, again introduced by Mr Les Jessop, was devoted to a viewing of the museum exhibition *Bird in the Brush* to which library material had been contributed. The exhibition covered the range of bird art produced locally from Anglo-Saxon times to the present day and additional items were added from our collections for the evening.

The library has been open every Wednesday during the year for use by members, researchers and students. The library committee members staffed the opening during the hour before each Friday evening meeting.

Two mounts of original Bewick drawings were lent to the Gainsbrough House Museum in Sudbury, Suffolk for an exhibition of Two Hundred Years of Natural History Art, lasting from mid May to the end of June.

This year one hundred and three books, six offprints and eight runs of journals have been added to the library. Forty-seven of the books were donated: these include some notable items, *The Australian Flower paintings of Ferdinand Bauer,* Unwin's *Illustrations of British Mosses* of 1878, *The Orchid Paintings of Franz Bauer* and many more. We must thank for their donations Professor R B Clark, Mr Peter Davis, Dr David Gardner-Medwin, Mr Trevor Hardy, Mr Les Jessop, Mr A Macdonald, Miss H M Oliver, Mrs Margaret Patterson and Dr Alick Walker. Journals were given by Mr Andy Wilson and Mr Hugh Chambers and Mr Les Jessop donated runs of five entomological journals from Mr T C Dunn's collection. The Newcastle Central Library gave us, on permanent loan, twenty volumes of British Museum Catalogues. Other acquisitions included five Government reports on Biodiversity Plans, Volume 3 of *The Moths and Butterflies of Great Britain and Ireland,* seven more parts of *The Handbook for the Identification of British Insects, Museums and the Natural Environment* by Peter Davis, *Plant Breeding Systems* by Dr A J Richards and some very good new bird books. Papers published by members were gratefully received from Dr Chris Redfern, Mr R A Baker and Mr Les Jessop.

CONSERVATION

Our constitution charges us with (among other things) the protection of the local flora and fauna. This objective can be traced back for more than 150 years in our history to the first meeting of the Tyneside Naturalists' Field Club on 25 April 1846 when it was decided that "the Club shall endeavour to discourage the practice of removing rare plants from the localities of which they may be characteristic, and of risking the extermination of rare or interesting

birds by wanton persecution" and that "members be requested to use their influence with landowners and others for the protection of the characteristic birds of the country, and to dispel the prejudices that are leading to their destruction."

In more recent times conservation has become the main purpose of many other local, national and international organisations so we have tended to leave active intervention in such matters to the Northumberland and Durham Wildlife Trusts, the Royal Society for the Protection of Birds, national and European planning legislation, the Environment Agency and English Nature. An exception, of course, is our own reserve at Gosforth Park; in addition, our long association with the Farne Islands and Holy Island and the research projects of our Ringing Group have had important implications for conservation, some of which are described later in this report. But this year we have found ourselves needing to be unusually active in attempting wildlife protection in other areas.

The threat to Gosforth Park, and to many parts of nearby North Tyneside, posed in that borough's Urban Development Plan has caused us some consternation and the problems and our response are mentioned below in the Gosforth Park report. We have also played an active part in the Public Inquiry into the proposals of the Ministry of Defence for major military developments at Otterburn. We decided to do this in February, when we learned that all other nature conservation bodies had withdrawn their objections, because it seemed to us that several potent threats to the wildlife of the Northumberland National Park remained unsolved and unopposed. As many members will know, the Army has contributed greatly to the conservation of the wilderness in upper Redesdale and Coquetdale since it first purchased land there in 1911, and we were dismayed to discover the extent to which that situation was now likely to change. The Society's evidence was presented at the end of July. We concentrated on matters of principle, on the threats posed to ancient woodland, Border mires, upland breeding waders, the black grouse and the red squirrel, and on the likely consequences of greatly increased noise disturbance and of pollution by rocket efflux. The Inquiry is likely to continue at least until the end of October and the recommendations of the Inspector and the subsequent decision of the Secretary of State for the Environment are not likely to be made public until well into 1998.

ACTIVITIES

After the Annual Meeting in November there was a 'workshop' discussion of the role that members could play in research and wildlife surveys in the North-East. The panel of speakers were Mr Alec Coles on botanical recording at the museum; Mr Allen Creedy on biodiversity surveys in Gosforth Park and elsewhere in the City; Dr Martin Luff on entomological surveys; Dr Angus Lunn on botanical themes, including the recording of large trees; Mr Steve McLean on the projected collection of documented rock samples in Northumberland. Plenty of ideas were floated and afterwards there was some constructive exchanging of names and addresses.

Ornithology section The indoor meeting programme began with Dr Steve Percival and Mr Matthew Denny talking about 'The Lindisfarne National Nature Reserve refuge'. They outlined plans to have a no shooting area, allowing the birds more time to feed and hopefully encouraging wigeon, which are declining, to stay longer through the winter. The refuge was due to come into being on 1 September 1997 (see Fig. 3 on page 25). The programme continued with Mr Allen Creedy speaking on 'Newcastle City Biodiversity Plan'. This meeting attracted a rather different audience which included many professional ecologists. They were not disappointed by the clear and well prepared discussion on what biodiversity meant and its implications for the local authorities.

The new year began on 17 January with the Secretary, Mr David Noble-Rollin, giving a talk on 'Winter Bird Watching in Texas' which covered a Christmas visit to many of the best areas of Texas. This was followed by Dr John Day and Mr Mike Hodgson talking about the production of 'The Atlas of Breeding Birds in Northumbria'. The evening proved to be both amusing and informative. The final meeting of the ornithological section listened to Mr Andrew Bielinski talking about 'The Wildlife of Ruaha National Park , Tanzania'. He had spent nearly two years there with the Voluntary Services Overseas (VSO) and he described his encounters with both the wildlife and the people.

The field meeting programme began with a 'Pelagic Cruise' again arranged jointly with the North Northumberland Bird Club. The group had a good evening: the weather was fair and the group soon had views of sooty shearwaters just inland of Inner Farne. Later there were views of Manx shearwaters and skuas. On 28 September the section tried a new half-day outing called 'Coastal Migration' and about twenty members enjoyed an afternoon at Cresswell and Druridge Bay. Although there were few passerines there were good views of ducks and waders including a large number of little stints.

The next outing was to have been to Holy Island on 19 October but unfortunately there were not enough bookings to run a coach and so the outing was cancelled. The two winter field meetings, to Aberlady Bay and south-west Scotland, proved more successful with enough people to warrant using a bus. At Aberlady there was the usual mixture of ducks and grebes. In Galloway the group saw the white-fronted geese well but the most interesting birds were at Murray's Monument where crossbills came out of the woods and took grit from the stonework of the monument. Everyone who had climbed to the monument got excellent views.

The summer programme has continued to cause concern. Two meetings had to be cancelled due to lack of numbers, the Northumberland Coast trip in May and the Bass Rock trip in July. The car trip to the Harthope valley was attended by about sixteen people which was an ideal number for woodland work. Members had excellent views of a male ring ouzel and a buzzard amongst other birds. If this trend of low numbers for bus trips continues then the section must rethink its programme and try to produce meetings that appeal more to members. This trend towards car-orientated meetings has happened in other sections and organisations so perhaps it is time for a change!

Mammal section The evening meetings for the mammal section began with a visit of Richard and Judy Fairburn to talk about the 'Cetacean Project around Mull'. This proved to be a very entertaining evening with a lot of information concerning the surveying of whales and dolphins in the west of Scotland. At the following meeting, Ms Lisa Kerslake updated the Society on the Northumberland Wildlife Trust's survey and conservation work on otters and water voles. It could be said that one was a success story, with increasing otter activity throughout the area, and the other showed the desperate plight of the vole.

The field meetings began on 26 October with Stephan McElwee of the National Trust taking members out to see Atlantic grey seals and also look for sea ducks around the Farnes. The sea was not too kind and this made it difficult to see the ducks; however the seals were visible.

The badger watches brought the usual rewards. Six watches were arranged and some twenty-one people attended. Three to four people plus the leader is about the maximum number that can be accommodated at the site. Those that patiently endured the cold, dampness, midges and cramped conditions were given wonderful views of up to nine badgers (give or take a one) in one evening. Fox cubs, roe deer, tawny owls and bats were seen and heard on various nights. Those lucky enough to see the fox cubs in early evening were alarmed when later, in failing light, two adult badgers appeared to take a fox cub, carrying it across to the main sett area before devouring it. Viewing conditions were poor and in retrospect it may well have been a dead rabbit left at the entrance to the fox earth by the vixen, as no fox cub remains, fur etc. were in evidence next day. Nevertheless, fox cub activity ceased from that time on.

Badgers and their cubs were seen in good numbers and they are obviously flourishing on the reserve. This is borne out by pad marks, dung pits, badger paths and outlying setts. Our thanks must go to Paul Drummond and his family and the voluntary wardens who give much needed protection to the reserve.

A new Northumbria Mammal Group was formed this year at an open meeting held in the museum. We warmly welcome this new organisation which will work closely with our own Mammal Group. The Secretary is Ms Vicky Armitage and the County Mammal Recorder is Ms Lisa Kerslake.

Lichen section We are delighted to welcome this new section, founded by Dr Liz Smith and a small group of enthusiasts who have been meeting each year at her extramural course at the University of Newcastle. The inaugural meeting on 11 October was a special one. Dr Smith

had invited Dr Oliver Gilbert to speak on 'Lichenology in Northumberland' and it is particularly sad that she herself had flu and was unable to be present. Dr Gilbert had spent about fifteen years in Newcastle recording lichens in Northumberland before moving to the University of Sheffield and at the end of that period he wrote the definitive *A Lichen Flora of Northumberland* (1980). His lecture reviewed the remarkable history of the subject: starting in the 18th century with John Wallis, advancing to an astonishing degree by the work of Nathaniel Winch (in about 1800-1830) and then intermittently when James Hardy and the Reverend William Johnson were active until a remarkable effort by Dr Gilbert himself increased the list of species recorded in the county from about three hundred to six hundred. He estimated that perhaps a further two hundred species may still remain undiscovered here. The lecture was enlivened with wit, scholarship, excellent slides of the lichens and many anecdotes of their discovery. At the end he presented the section with a signed copy of his book - a rarity now, being long out of print.

At the second meeting, on 7 March, Dr Smith spoke on 'Lichens, lichens everywhere: a discussion of the adaptability of lichens'. This was a splendid account of the biology and evolution of these remarkable symbiotic organisms with a review of her own work on the evolution of different types of photosynthesis. The section is off to a fine start and we wish it well for the future.

Geology section The summer meeting in September 1996 was with Dr Brian Young of the British Geological Survey (BGS) who took a party of twenty-two around the area north and west of Morpeth to view some of the problems and listen to the interpretation by the BGS of this area's previously little understood geology. The day began at Mootlaw, in a working quarry of the Great Limestone, and in addition to the structural features, which were unique, the party was able to collect from the fossiliferous shales associated with the top of the limestone. Later in the day they visited Rothley and Shaftoe Crags to view the sequence in the Upper Limestone Group where beds in a graben have quite a different lithology caused by sands infilling the down faulted block. The final part of the visit was to Ward's Hill quarry where the Great Limestone is intruded by the Whin Sill which shows clearly in the quarry face.

Though the 12 October meeting was quite late in the month, twenty members met Dr Angus Lunn at Wooler to walk over some of the features left after the Pleistocene Glaciation. He explained how new ideas actually had water flowing uphill under the ice sheet caused by a hydrostatic pressure due to a head of water within the ice mass. This activity had produced a 'glacial overflow channel' along which the group travelled to examine the length and depth of this structure. The party was invited to imagine conditions at that time when the North Sea would be free of sea water and masses of ice were moving from Scotland around the Cheviot massif and conflicting with Norwegian ice. Once Dr Lunn had completed his part of the day, Dr Mick Jones took over with a trip to view the Roddam Dene conglomerate where the sequence of early Carboniferous rocks outcrop in a well-vegetated valley bottom.

There were six lectures during the winter beginning in October with the Pybus Memorial Lecture given by Professor Simon Conway Morris of Cambridge University. He is widely known as a world authority in his field and we were delighted to have him come to lecture to the Society. His talk was entitled 'The crucible of creation: the Burgess Shale and the rise of animals'. He gave a lively account of the origins of life and the special preservation seen in British Columbia and also more recently elsewhere, particularly in Greenland where he had been invited to examine the 'Burgess' fauna. This included an articulated Halkieriid, a sclerite-bearing worm-like creature, which possessed anterior and posterior valves and is likely to have been the prototype for the mollusca. The members present filled the theatre and they were impressed with his knowledge and slide presentation as well as the able way he answered questions at the end.

During November, Dr Tony Johnson, a member of the Society and a popular lecturer at our meetings, spoke on 'The geological evolution of north-east England'. As might be expected his lecture was a clear and concise account of how the area had changed from Palaeozoic times to the present day with some emphasis on the global and plate tectonic position of the North-East. This he used to explain the structural and hence depositional variations which

were encountered. There were many questions put to him at the end and this made for a lively debate.

Dr Dennis Jackson, who had taken some members on a field trip previously, gave the pre-Christmas lecture on 'Petroleum Exploration in the East Irish Sea Basin'. He skilfully explained how the geology of this basin had been revealed by drilling and extrapolation from onshore data. The new techniques employed in drilling allowed much more data to be collected and this with geophysical information showed where thick Permo-Triassic sandstones and mudstones with evaporite beds were emplaced and able to trap hydrocarbons mostly from the Carboniferous. He was able to show how quite a complex technological survey revealed the economic value of the basin. Quite a number of questions followed to prove how well he had stimulated the audience, which numbered over fifty.

The first lecture of the new year, in January, was by Dr Robert J Allison on 'Dynamic desert landscapes: the form and development of drylands'. The word dynamic applied to both the topic and the lecturer who soon had the audience reacting to his questions as he explained how deserts were a changing environment especially with the problem of global warming taking place. He described the changing level of the water table over time and explained how man's influence for better or worse had made its impact.

Professor Martin Bott, who is one of the leaders in geophysical investigation of the earth's crust, lectured in February on 'Rift valleys and their origin'. He reviewed several of the important rift valleys in Africa, Europe and Asia, paying particular attention to Lake Baikal where he had spent some time recently during a symposium at Tashkent. He explained that rifting was related both to plate movement associated with major faults and also to the presence of volcanic activity which often began the process of the rifting. He produced a model to show events and processes through time giving rise to the production of major rifts which were often of a half graben type with complex fault movement and volcanism of varying types. His lecture stimulated a good number of questions which he answered at length.

'Chemical fossils: organic molecules in the geological record' was the title of the next lecture in March by Dr Paul Farrimond from the Organic Geochemical Research Department at the University of Newcastle. This could have been a difficult lecture for most members to understand, but Dr Farrimond took some pains to explain what was meant by a chemical fossil and how they were examined in the laboratory as biological marker compounds in sedimentary rocks. The compound often gave clues as to the type of fossil that had been present in the rock and also about the changes in the rocks over a period of time. The environmental conditions which prevailed when the fossil was first buried could also be determined. This has very important economic significance regarding the environmental history and potential value of a sediment.

The first outdoor meeting, in May 1997, was with Dr David Millward of the British Geological Survey to view the Ordovician volcanics of the western Lake District. This took place on a brilliant summer's day in the Wrynose-Hard Knott Pass area. After a pleasant car journey, ten members met Dr Millward who proceeded without the use of a hammer but with some considerable leg work to examine a wide range of volcanic rocks which outcrop in a complex of fault wedges. His explanations brought clarity to an ancient volcanic Ordovician past using references to present day volcanic activity. The views of this little visited part of the Lake District were striking as we had special views down the Esk Valley and over to the Scafell Range.

Dr Mick Jones, who took a group of four members over the Spittal-Scremerston shore in June, was also blessed with good weather. Despite the small size of the group Dr Jones gave a lively account of the geology of this part of the Carboniferous Limestone succession and there was much debate with Colin Scrutton, who was also in the party, on some of the sedimentary structures and the fossils discovered in the field. Sadly, some members failed to find the party at the rendezvous otherwise the numbers attending would have been greater.

Mr Ken C Patterson, who had originally planned to take the June field day, was re-assigned to the Dunbar-Barns Ness trip in July instead. Unfortunately the visit had to be called off

because there were too few bookings for the joint ornithology and geology field meeting and it is hoped that this may take place on another occasion next year using cars instead of a coach.

Botany section There was a close relationship this year between the winter lecture programme and the summer field trips, with two of the latter following from two of the former. Dr Dave Mitchell's talk in October on 'The flora and vegetation of the Durham Magnesian Limestone sea cliffs' was followed in July by an excursion to Blackhall Rocks. In his lecture he described the plant communities of this rare habitat, relating them to the National Vegetation Classification. They included calcicolous, mesotrophic and maritime grasslands, together with unusual mire, dune slack and fen communities towards the base of the cliffs. In the field we examined these communities, and saw the rare species (including bird's-eye primrose, yellow-wort, brookweed and blunt-flowered rush) which are under threat from cliff erosion and agricultural run-off. Similarly, after Dr Rod Corner had spoken in March about 'What it's like on the other side: the botany of Roxburgh and Selkirk', he led a field trip, also in July, to Alemoor and nearby areas, west of Hawick. Dr Corner is the county recorder for Roxburghshire and Selkirkshire and he described the flora of our neighbouring Border counties and made comparison with the flora of Northumberland. He showed us in the field a number of species lacking from our flora in north-east England, including the sedge *Carex appropinquata* and holy-grass (*Hierochloe odorata*).

Unfortunately it was impractical to relate the two other winter lectures to field trips. Mr Anthony Miller spoke in November on 'Socotra and its remarkable flora'. He is a botanist at the Royal Botanic Garden Edinburgh, specialising on the Arabian Peninsula, and is editor of the *Flora of the Arabian Peninsula and Socotra*. The Indian Ocean island of Socotra is famed for its strange plants including the cucumber tree and dragon's blood tree, and Mr Miller described the unique plants and vegetation of the island. Then in February Professor Howard Griffiths revealed 'What it's like up there: in the tropical rainforest canopy', mainly in Trinidad, and described the trials and tribulations of working in the forest canopy when trying to explore the daily doings of diverse epiphytes and their phorophytes (host plants).

The third summer field trip, in June, was to one of the famous Upper Teesdale localities, Cronkley Fell, led by Dr John Richards. Among many other plants we saw mountain avens, Scottish asphodel, hoary rock-rose, Teesdale violet, hoary whitlow grass, a milkwort (*Polygala amarella*), and shrubby cinquefoil.

Although the early part of the summer was generally wet, all three excursions coincided with fine, sunny days.

Entomology section The speaker at the first meeting of the winter season, on 27 September, was Dr Jim Parrack, who is well known in the area especially for his work on the region's butterflies and moths. His talk discussed some aspects of his insect research in the Kielder area, reflecting on the design of forests and how it affects the invertebrates that use them.

On 24 January Mr Harry Eales, an amateur entomologist with special interests in Lepidoptera and bumblebees, discussed the large heath butterfly. Harry's very extensive surveys of upland sites in Northumberland have uncovered many previously unknown populations of this insect, and resulted in a detailed dataset that will be of long-term value to geneticists as well as conservationists. However, exploring the bogs and trackways of the county has not been without its expenses - and dangers.

The final meeting, on 19 March, was a half-day meeting organised jointly with the Royal Entomological Society of London, when several speakers gave talks on a range of subjects concerned with Lepidoptera. However, like many entomology section meetings, this session was exceptionally badly attended: the speakers actually outnumbered the audience! For some time, the section leader had been despairing of the low level of interest in the entomological meetings of the Society, and this was the final straw. He felt that, unless someone else stepped forward to volunteer as section leader, the entomology section would fold. We have therefore not included any entomology meetings on the programme for next year but would like to invite members interested in this important field to approach the office with suggestions for reviving

the section from what we hope is simply a brief period of hibernation. Meanwhile Mr Les Jessop deserves all praise for the uphill work he did as convenor. The Council is grateful.

GOSFORTH PARK NATURE RESERVE

The main change in the reserve since the last annual report is the replacement of the sluice gate by a more efficient method of controlling water levels. The first sluice was finished in September by Mr Ken Parks, the joiner with the Urban Fringe Area Management Scheme (UFAMS). This was very kindly arranged by Mr Allen Creedy and the work was carried out by people on community service. The wood used, although recommended, warped and it was decided that a second gate was the easiest way to solve the problem. This was put in during the winter and the effect on water levels has been excellent. April was very dry and in previous years this would have had an adverse effect on the subsequent growth of the *Phragmites* but the selected level, just below the main boardwalk, was maintained despite there being virtually no rain. During the summer, which included periods of heavy rain, the levels never became critically high. So, for the first time since 1983, the reserve has had a lake and reedbeds at a reasonable level throughout the breeding season. In August the sluice boards were removed to allow the exposure of areas of mud for waders. We hope to take this idea further in the next year by creating wader scrapes. The Council would like to thank Allen Creedy and UFAMS for all the hard work that they have put in during the year to assist the committee in maintaining and enhancing the reserve.

At the annual meeting when Viscount Ridley became our President he expressed a wish to visit the reserve. Mr Eddie Slack and the Secretary met Lord Ridley in on 17 April and had an enjoyable visit looking at the lake and woodland habitats.

Draft Unitary Development Plan for North Tyneside Just before Christmas North Tyneside Council published their draft Unitary Development Plan (UDP) which covers the whole of North Tyneside and outlines developments and strategies that they wish to implement during the next fifteen years. The Society was not informed directly of the publication but was able to receive the relevant details in time to prepare its objections to the very extensive changes envisaged by the Council in the status of various areas of land. In all the Society submitted seventy-six objections, mainly concerning the preservation of the wildlife corridors and modifications where proposed development contravened the Council's own regulations or the international safeguards for wildlife.

The planned designation of land adjacent to Gosforth Park could have a grave impact on the wildlife corridors that allow the passage of mammals, amphibians and invertebrates in and out of the area. Also many species of birds will need habitat links with the Green Belt in order to move effectively within the area. The most serious problem is the proposed development of the area north of Sandy Lane. This includes rerouting the road and upgrading it to dual carriageway, as well as development of the area for industry. The effect on wildlife, as the plans stand, would be effectively to block the main and designated wildlife corridor between the reserve and the Green Belt. With the other developments to the east and south, the nature reserve and Park are in danger of becoming an island in an urban sprawl.

Like Gosforth Park, the Rising Sun Country Park would lose a great deal of animal access to other wildlife areas within Tyne and Wear and beyond if the proposed plans are not altered to incorporate adequate provision for their movement. It is particularly worrying that many areas are to be designated as 'Enterprise Zones', a move which effectively sidesteps the planning regulations for the preservation of wildlife. This makes it more difficult to ensure that we have sustainable wildlife populations throughout the whole of the area.

Most local conservation bodies have responded to the draft UDP and it is hoped that North Tyneside will look at this as a positive sign that wildlife in an urban environment is of importance to a large number of people, and that it is imperative to meet and discuss the problems so that essential development for increased jobs and the prosperity of the human population can run alongside the requirements of maintaining the present biodiversity of Tyne and Wear. The idea of sustainable growth is a real possibility if the interests of profit and wildlife can be reconciled.

Reserve maintenance In addition to the structural work on the sluice gates mentioned above some reed cutting has been undertaken and also a good deal of work on making a fuller network of boardwalks for the ringers to use when monitoring the bird populations. This was organised by Allen Creedy and UFAMS. The warden, Mr Paul Drummond, undertook to cut willows on the islands in the lake: this was successful in part but he felt that the remaining trees would probably die back with the new water levels.

Vandalism has again caused problems with hides, the feeding station and the ringers' new hut all being targeted. At least twice Paul Drummond has had to replace the wall boards on the feeding station. The lock of the Pearce hide was broken and structural damage caused and the vandals also tried to set it on fire; the ringing hut was vandalised and windows broken. But without the vigilance and skilled wardening of Paul Drummond matters would undoubtedly have been much worse, and Council would like to express our appreciation of the efforts of our excellent warden.

Birds and mammals in the reserve The resident breeding birds are mentioned in the ringing report but this year has apparently been good for water rail, which were heard on a number of occasions, up to three birds calling from different parts of the reed bed. The higher water level may create more suitable habitat for this species. On 7 April a marsh harrier was seen being mobbed by crows and a heron and on the 12th a pair of garganey were seen in the flooded field and later in the reserve. The lake also had up to five ruddy duck present this year. The attempted breeding of a pair of common terns is mentioned under the ringing report.

Fig. 1 Ms Rachel Bowman extracting a bank vole from a Longworth small mammal trap in Gosforth

A number of mammals have been seen during the year. Roe deer have been sighted almost daily throughout the year in numbers of one to ten animals. Also red squirrel have made regular appearances at the feeding station and have been seen by members in other parts of the woods; less frequently foxes have been recorded. During the summer, as part of the biodiversity survey of areas of Newcastle undertaken by the City Planning Department and the Society, small mammal trapping took place in the reserve. Two species were caught: bank vole (24 individuals) and common shrew (3 individuals) over a twenty-four hour period. This was partly a training exercise for Ms Rachel Bowman and Mrs Judith Baker who were to undertake wider studies in other areas of the City. The techniques used were particularly devised to eliminate, where possible, mortality in shrews. The methods, although very hard on the operators, proved successful with all ninety animals (5% of them shrews) being trapped and released without any problems.

RINGING GROUP

The Society's ringing group maintained its activities in the period covered by this report and remains a dynamic and cohesive team, clearly focused on the three key research projects described below. Another important function of the ringing group is to train others to the point where they can be licensed to catch and ring birds unsupervised. Training to be a ringer requires considerable time and commitment and it is gratifying to see the group's trainees progress through the BTO-defined training structure to the point where they can take on the responsibility of supervising the Society's ringing operations. There are seven trainees at present and the Society and ringing group hope to continue to recruit and train some of the

new ringers vital for maintaining the level of research and conservation monitoring in the north-east.

This report summarises the seabird ringing studies carried out on Coquet Island and the Farne Islands in June-July 1997, the constant-effort ringing programme at Gosforth Park (during the period 1 August 1996-31 July 1997), and the coastal migration studies at Newton Pool during the autumn of 1996. All three projects are yielding interesting results, but a great deal remains to be done, particularly with respect to consolidating the seabird studies and analysing the constant-effort data.

The constant-effort data from Gosforth Park continue to be submitted to the BTO and thus contribute to national bird population monitoring. The number of birds ringed at Gosforth Park during the period covered by this report was down very slightly on the previous year (given in brackets) to 656 (681); all the requirements for the constant-effort scheme (number of sessions) were fulfilled, as in previous years, thanks to the dedication and hard work of the team. The birds ringed included 154 (156) sedge warblers and 24 (28) reed warblers, and thus the populations of these species have apparently remained stable. Species of note were two kingfishers, a siskin, a male redstart, and nine house martins. The constant-effort ringing also yields small numbers of controls (captures of birds ringed elsewhere) and recoveries (of dead ringed birds) and we are currently awaiting ringing details of two sedge warblers controlled at Gosforth Park this year. However we now have details on a reed warbler controlled at Gosforth Park on 9 of June 1996 and this was ringed as a first year bird at Leighton Moss, Lancashire, on 15 August 1994. Whether this reed warbler originated from Leighton Moss or was one of our own that evaded nets up here only to get caught while migrating/dispersing, is unknown. However, there is clearly potential for significant interchange of reed warblers between breeding populations in the North, and this is illustrated by one of our reed warblers, ringed as an adult male on 9 July 1995 and controlled on the 23 July the following year at Cleveland, 52km south. In a remarkable coincidence, two Gosforth Park sedge warblers ringed on the same day, 21 July 1996, were also controlled on the same day eighteen days later but 308km apart: one at South Milton Ley, Devon, and the other at Icklesham, Sussex.

Fig . 2 Ringing group at Newton Pool, processing birds.

The numbers of birds ringed at Newton Pool in autumn 1996 more than doubled from the previous year to 318 (129). The increase was partly accounted for by the fifty-three meadow pipits caught with the help of a tape lure, but the numbers of most species also increased: for example, 10 (3) song thrushes, 7 (3) redwings, 24 (7) sedge warblers, 8 (4) blackcaps and 52 (10) blue tits were ringed. In addition, there was a greater range of species ringed (27 compared with 22 the year before) and new species added were icterine warbler and stonechat. The icterine warbler generated some excitement, but another particularly memorable bird was a commoner species, an adult sedge warbler caught on 15 September. This had massive fat

deposits covering its breast and abdomen and, weighing in at 16.0g, was 150% of normal body weight for sedge warblers. Such large deposits of fat in migratory passerines are laid down in preparation for long flights, and it is likely that this individual would have made most of its journey to Africa in a few long-distance flights rather than a series of short flights with refuelling.

Only one bird was controlled at Newton Pool this year, a reed bunting caught on 20 October which had been ringed twenty-three days earlier on Fair Isle, 448km due north. Four Newton-Pool birds were reported as controlled or recovered elsewhere: a great tit, ringed on 20 October, 1996 was recovered dead in Alnwick (13km away) in early January this year; a sedge warbler ringed as a first-year bird on 28 July 1994 was controlled at Icklesham, Sussex on 27 August 1996; a sedge warbler ringed at Newton Pool on 8 September 1996 and trapped again there on the 22nd September was controlled at Dungeness Bird Observatory on 10 October 1996, a distance travelled of 537km over eighteen days. This bird weighed 10.5g when trapped at Newton Pool, but had increased in weight to 12g at Dungeness, presumably in preparation for onward migration to Africa. Finally, a sedge warbler ringed as a juvenile at Newton Pool on 8 September 1996 and retrapped on the 15th, was controlled by us at Gosforth Park on 25 May 1997!

Permission was granted by the Farne Islands Local Management Committee of the National Trust for the Society to continue its ringing study on the Farnes for this year. The studies on the Farnes and Coquet Island both had mixed success. On Coquet, a population of arctic tern chicks of known age was ringed in the lighthouse garden with the help of the Warden, Durham University PhD student James Robinson, and 515 Sandwich terns were ringed in the main Sandwich tern colony. On Inner Farne, we ringed 147 Sandwich terns, including the hybrid chick of the lesser crested tern, 'Elsie', and set up two study areas for mark-recapture estimation of arctic tern chick mortality. Subsequent work was severely disrupted by a period of wet and stormy weather which prevented access to all islands. Consequently, we could not establish effective mark-recapture study plots on Brownsman, and could not take the growth measurements needed for our arctic tern study on Coquet. This period of bad weather caused significant mortality of kittiwakes and puffins, and the ringing data showed that the terns also did badly, at least on Coquet Island where there was a Sandwich tern chick mortality of 34%. Arctic terns in the lighthouse garden study plot did not fare much better and we recorded a mortality of 22% based on the recovery of chicks ringed before the bad weather. These mortality figures are minimum estimates because we cannot account for chicks that may have been removed by predators or scavengers. Some growth data were obtained immediately before and after the bad weather, from both Coquet and the Farnes, and we are currently analysing these data to see if they differ markedly from previous years or if there are differences between the Farnes and Coquet Island. Seabird ringing totals for this year were: eider (adult female) 33, shag 67, kittiwake 302, Sandwich tern 662, common tern 70, arctic tern 728, roseate tern (Inner Farne) 4, fulmar 13 and black-headed gull 167. The fulmar total of thirteen represents all the chicks found on Coquet Island and is down considerably on the forty ringed last year, presumably an effect of the bad weather at the end of June.

One reason for maintaining a seabird ringing programme in the north-east is to allow us to monitor survival and the causes of mortality. Sixteen of the 1,292 Sandwich terns ringed on Coquet and the Farne Islands last year have now been recovered, fourteen of them (1% of the total ringed) on the West African Coast (Ghana, Morocco, Senegal, Liberia and Gambia) and, of these, eleven were recorded as 'intentionally taken'. Children are known to account for four of these birds. Clearly, the capture of Sandwich terns in that part of the world is still a serious conservation problem that needs to be addressed urgently.

Population monitoring is an essential aspect of conservation, and cannot be achieved effectively without ringing. Through its seabird and constant effort programmes, and systematic ringing at Newton Pool, the Society is making an important contribution to conservation at a national and local level, and is helping to maintain an adequate pool of skilled ringers which is essential for the continued effectiveness of ringing as a research and conservation tool. The Society is grateful to Northumbrian Water for their continued support of the seabird research; without the boat *Sea Spray* generously provided by Northumbrian

Water we would not be able to carry out monitoring work on the Farnes or Coquet Island. We are also grateful to Mr James Robinson for his help with the tern project and to Mr John Walton and the wardens on the Farne Islands for their cooperation and help during our visits to the islands. The Society is grateful to the Farne Islands Local Management Committee for granting permission for the study to continue for a further year, the Coquet Island Management Committee for allowing access to Coquet Island, and Mr Mike Freeman of the National Trust for his support of ringing at Newton Pool. Once again we would like to thank Major Carr-Ellison for the use of his beach chalet at Newton. As the weather deteriorates in the autumn this amenity becomes greatly appreciated by the ringing group. The marine environment and its birds are an important part of life in the North-East and the Society hopes that the Farne Islands committee will continue to support the seabird ringing studies as an integral part of their monitoring programmes.

THE FONTBURN RESERVOIR WILDLIFE ADVISORY GROUP

There were no meetings of this group during the year.

COQUET ISLAND MANAGEMENT ADVISORY COMMITTEE

The Committee's visit to the island had to be cancelled due to bad weather but the Committee met once during the year. The main issue discussed was that the wardens would be students working on their projects through Durham University rather than full time wardens employed by the Royal Society for the Protection of Birds. One of the students had been in residence on the island last year and so lent continuity to the wardening work.

The other issue was that with the increasing amount of research being carried out it is becoming apparent that some control and liaison between projects is desirable. Consequently, a sub-committee was formed to bring together everyone doing work on Coquet Island and to make sure that efforts were not being duplicated.

LINDISFARNE NATIONAL NATURE RESERVE

Lindisfarne Wildfowl Panel The panel had a number of meetings during the year which culminated in the decision to recommend that the southern part of Fenham Flats should become a non-shooting refuge within the Nature Reserve. This arrangement will be for an experimental period of three years. If wigeon numbers increase and the area is of benefit to the other important wintering wildfowl and waders, then it will become permanent. However, if the wigeon continue to decline then the refuge area will return to being shot over. The map shows the proposed area (fig. 3)

Lindisfarne Advisory Committee The Advisory Committee looks at wider issues affecting the reserve and the Holy Island area, although this year much of its effort has been in securing agreement for the refuge. But the committee also discussed the continuing problem of bait-digging. Although activity has continued to decrease in Budle Bay, there has been an increase at Holy Island where people have been digging on the Pilgrims' Way and many are not back-filling, thus creating greater damage to the substrate. Spartina control has been successful with the continued and more extensive use of a rotavator, which was on trial during the previous season. Financial assistance from a Wildfowl Habitat Trust grant has greatly helped the work and some trampling and back-pack spraying was also carried out. English Nature was very pleased with the results and their Northumbria Team has written an article to be published in 'ENACT' magazine. Other issues discussed were the draft Holy Island Management Plan, rabbit fencing on the island, water sport activity in Budle Bay, County Council improvements in interpretive panels and work on the causeway car park. The committee also held a site meeting to allow members of both the Wildfowl Panel and the Advisory Committee to look at some of the problems and the work in hand.

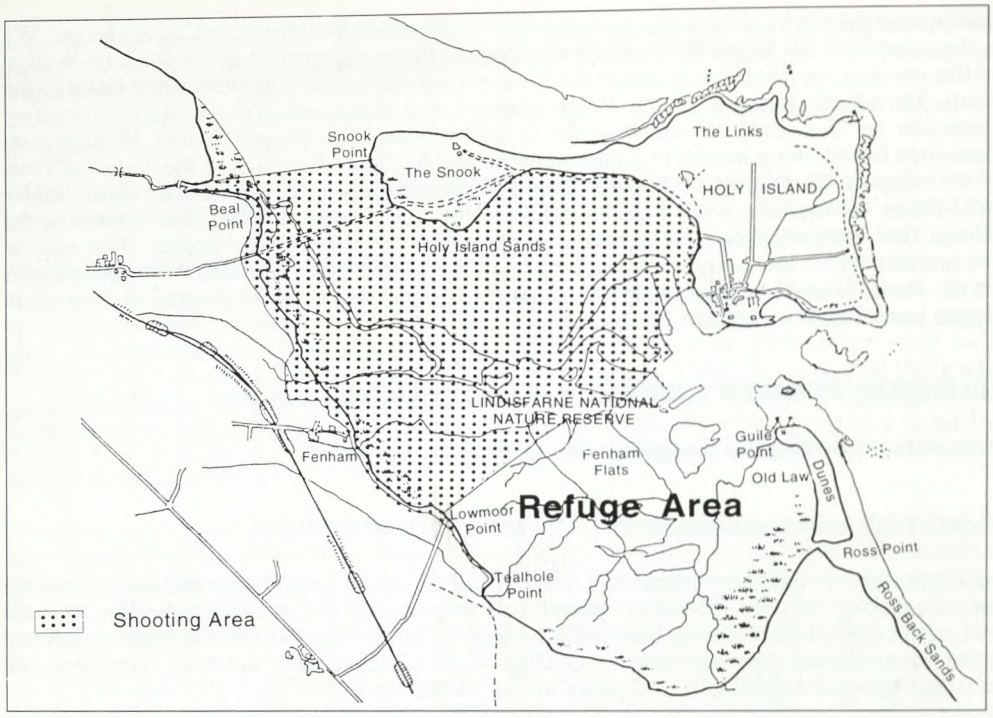

Fig. 3 Lindisfarne National Nature Reserve shooting and refuge areas.

A FINAL PARAGRAPH

Many people have been involved in writing this report - Hugh Chambers, Alec Coles, Les Jessop, Angus Lunn, David Noble-Rollin, Ken C Patterson, Chris Redfern, Richard Slack and Bob Wilkin. David and Margaret Patterson have edited it. I am grateful to them all for their contributions and to the members of Council who have scutinised and improved the text. They have all expressed the Council's thanks to the very many people, staff and volunteers, who make our Society function in the exciting, enterprising and friendly way that it does. They have of course not mentioned themselves and I should like to do so on behalf of the Council, for they are at the heart of the Society's activities. Richard Slack's task as Honorary Treasurer has been particularly arduous and we are very grateful to him. We also congratulate Alec Coles on his well deserved promotion to the post of Senior Curator in Tyne & Wear Museums, and Mr Steve McLean on becoming Senior Keeper of Natural Sciences.

David Noble-Rollin deserves a particular word of thanks for his many and herculean contributions to the running of the Society. Few of us realise how many activities he personally organises - the programme of lectures and the running of the office are only a start; he is a section organiser, and an expert desk-top publisher (typesetting all our publications); he answers innumerable questions from the public (often needing some research to do so), plays a major part in our research projects, manages Northumbrian Water's boat on our behalf (pure hard work and frustration, no joy of course!), finds and organises our wonderful team of volunteers, represents us on many committees and sits on all of our own, and writes endless letters and reports. He suffers in fact from being the person who knows everything and everyone. We are very grateful.

DAVID GARDNER-MEDWIN

Chairman of Council

FINANCIAL STATEMENTS

31 JULY 1997

THE NATURAL HISTORY

STATEMENT OF FINANCIAL ACTIVITIES

1996			
£		£	£
27,119	SALARIES, PENSION CONTRIBUTIONS AND NATIONAL INSURANCE (Note 10)		30,075
4,168	PRINTING AND STATIONERY		2,995
2,153	POSTAGE AND TELEPHONE		2,410
1,947	INSURANCE		1,794
720	REPAIRS AND RENEWALS		182
351	GENERAL EXPENSES		966
5	LICENCE FEE		5
400	INDEPENDENT REVIEW		425
790	SUBSCRIPTIONS TO SOCIETIES		884
1,561	LECTURE AND FIELD MEETING EXPENSES		1828
	TRANSACTIONS		
3,169	Expenditure	5,541	
1,710	Less: Proceeds of sale	2,478	
1,459			3,063
2,520	LIBRARY		2,496
1,753	GOSFORTH PARK NATURE RESERVE		2,034
1,266	COASTAL RESEARCH (Note 11)		1,558
3,034	DEPRECIATION		2,197
	APPROPRIATIONS		
3,000	Gosforth Park Nature Reserve Restoration Fund		—
5,124	EXCESS OF INCOME OVER EXPENDITURE FOR THE YEAR		3,059
£57,370			£55,971

SOCIETY OF NORTHUMBRIA

FOR THE YEAR ENDED 31 JULY 1997

1996			
£		£	£
	SUBSCRIPTIONS		
15,754	Annual subscriptions	15,915	
240	Add: Transfer from Life Members' Fund	240	
15,994			16,155
857	DONATIONS		931
179	ARCHIVE CATALOGUE RESEARCH FUNDING		2,142
7,600	UNIVERSITY OF NEWCASTLE UPON TYNE		7,825
1,348	SURPLUS ON HOLIDAY FIELD TRIP		—
30,731	INVESTMENT INCOME (GROSS)		28,003
661	SALES OF *FLORA OF NORTHUMBERLAND*		915
£57,370			£55,971

THE NATURAL HISTORY

BALANCE SHEET

1996			
£		£	£
	GENERAL FUND		
	Balance at 1 August 1996	107,043	
	Add: Excess of income over expenditure for the year (Note 4)	3,059	
107,043	Less deficit on sale of investments	1,914	108,188
2,599	LIFE MEMBERS' FUND (Note 5)		2,359
	EXPENDABLE ENDOWMENTS		
	T B Short Memorial Fund (Note 6)		
	Balance at 1 August 1996	105,269	
105,269	Add: Surplus on sale of investments	9,265	114,534
	Grace Hickling Memorial Fund (Note 6)		
	Balance at 1 August 1996	79,632	
79,632	Add: Surplus on sale of investments	5,446	85,078
176,992	INVESTMENT REVALUATION RESERVE (Note 7)		235,263
	DESIGNATED CAPITAL FUNDS		
3,000	**Provision for deferred repairs**		3,000
18,500	**Gosforth Park Nature Reserve Restoration Fund** (Note 8)		19,500
£493,035			£567,922

Approved by Council on 3 October 1997

D GARDNER-MEDWIN – Chairman and Trustee

R E SLACK – Honorary Treasurer

SOCIETY OF NORTHUMBRIA

31 JULY 1997

1996			
£		£	£
	FIXED ASSETS		
	Freehold property (Note 2)		
	Hancock Museum		Not valued
	Lake Lodge		
3,899	Cost	3,899	
5,300	Electrical installation	5,300	
9,199		9,199	
6,782	Less: Depreciation	6,860	
2,417			2,339
	Hides, equipment, office furniture and computers (Note 3)		
19,605	Cost 1 August 1996	25,243	
5,638	Additions	—	
25,243		25,243	
18,113	Less: Depreciation	20,232	
7,130			5,011
	Investments in trustee securities, at market value (Note 7)		
	Quoted		
152,557	Narrow range	140,587	
125,376	Wide range	155,523	
100,746	Special range	124,933	
	Unquoted		
	Charities Official Investment Fund		
70,479	9,750 shares	86,628	
449,158			507,671
	CURRENT ASSETS		
2,911	**Income tax recoverable, accrued income and payments in advance**		2,705
	Cash at bank		
29,719	Charities deposit fund	31,446	
9,513	Deposit account	5,204	
4,521	Current account	27,511	
43,753			64,161
	CURRENT LIABILITIES		
(12,334)	**Creditors, accrued charges and subscriptions received in advance**		(13,965)
£493,035			£567,922

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA

RECONCILIATION OF FUNDS FOR THE YEAR ENDED 31 JULY 1997

1996		
£		£
5,124	Excess of income over expenditure for the year	3,059
7,354	Net investment gains (realised and unrealised)	71,068
10,500	Change in capital funds	1,000
(240)	Change in life members' fund	(240)
22,738	Net movement in funds	74,887
470,297	Net funds brought forward	493,035
£493,035	Net funds carried forward	£567,922

STATEMENT OF TRUSTEES' RESPONSIBILITIES

The Trust deed, the Charities Act 1993 and the Charities (Accounts and Reports) Regulations 1995 require the trustees to prepare accounts for each financial year. In preparing these accounts, the trustees are encouraged to follow the recommendations outlined in Statement of Recommended Practice No. 2 - Accounting by Charities (issued by the Accounting Standards Board in 1995).

The trustees consider that in preparing these accounts, they have used appropriate accounting policies, consistently applied and supported by reasonable and prudent judgements and estimates.

The trustees are responsible for keeping proper accounting records to enable them to ensure that the accounts comply with the Charities Act 1993. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

ACCOUNTING POLICIES AND NOTES

1. **Basis of accounting**

   The accounts have been prepared under the historical cost convention as modified by the revaluation of investments.

2. **Freehold property including Library and Collections**

   (a) No value was attributed to the Hancock Museum at the date of its completion in 1884. The building is leased to the University of Newcastle upon Tyne which is normally responsible for all repairs and improvements.

   (b) (i) The cost of Lake Lodge, less donations and grants received, of £3,899 is depreciated at 2% per annum.

   (ii) The cost of installing mains electricity, less donations received, of £5,300 has been fully depreciated.

3. **Hides, equipment, office furniture and computers**

   The cost of the hides, equipment and office furniture is depreciated at 10% per annum and computers at 20% per annum.

4. **Income and expenditure account**

   All of the charity's revenue income received is unrestricted and is applied by the trustees to meet general expenditure. Any excess of income over expenditure for the year is arrived at after making any appropriations to special funds for the purpose of setting aside temporary surpluses of income to meet future expenditure.

5. **Life members' fund**

   Amounts received in payment of life subscriptions are taken to the life members' fund and are released to income and expenditure account over a period of 20 years in equal annual instalments.

6. **T B Short and Grace Hickling Memorial Funds**

   The funds from these legacies are invested in accordance with the Trustee Investment Acts and are subject only to expenditure for special projects.

7. Investments are shown on the Balance Sheet at their market value. The difference between market value and cost is shown as an Investment Revaluation Reserve.

8. **Gosforth Park Nature Reserve Restoration Fund**

	1997	1996
General restoration	£11,000	£11,000
Sir James and Lady Steel donation for lake rejuvenation	£8,500	£7,500
	£19,500	£18,500

9. Payments made to trustees comprised salary costs £1,807 (1996 £2,047), travelling expenses £112 (1996 £127) and reimbursement for entertaining speakers after lectures £147 (1996 £209), library books £43 (1996 £nil) and office sundry expenses £68 (1996 £50). The payments made related to three trustees (1996; four trustees).

10. **Employees' Remuneration**

Total remuneration (excluding employer's contributions) for the year was £27,996 (1996 £25,131). The average number of paid staff for the year was one full time and four part time employees.

11. Coastal Research comprises boat costs and ringing expenses for Farne Islands and Coquet Island research.

12. The Society is a registered charity, official number 526770.

Independent Examiner's Report to the Trustees of The Natural History Society of Northumbria

I report on the accounts of the Trust for the year ended 31 July 1997, which are set out on pages 28 to 34

Respective responsibilities of trustees and examiner

As the charity's trustees you are responsible for the preparation of the accounts; you consider that the audit requirement of section 43 (2) of the Charities Act 1993 (the Act) does not apply. It is my responsibility to state, on the basis of procedures specified in the General Directions given by the Charity Commissioners under section 43 (7) (b) of the Act, whether particular matters have come to my attention.

Basis of independent examiner's report

My examination was carried out in accordance with the General Directions given by the Charity Commissioners. An examination includes a review of the accounting records kept by the charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts, and seeking explanations from you as trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit, and consequently I do not express an audit opinion on the view given by the accounts.

Independent examiner's statement

In connection with my examination, no matter has come to my attention:

(1) which gives me reasonable cause to believe that in any material respect the requirements

- to keep accounting records in accordance with section 41 of the Act; and
- to prepare accounts which accord with the accounting records and to comply with the accounting requirements of the Act

have not been met; or

(2) to which, in my opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

R. BUNTER
PRICE WATERHOUSE
89 Sandyford Road
Newcastle upon Tyne
NE99 1PL

3 October 1997

RED DATA BOOK FOR NORTHUMBERLAND

Edited by LISA KERSLAKE

A joint publication of the Northumberland Wildlife Trust and the Natural History Society of Northumbria

TRANSACTIONS

OF THE NATURAL HISTORY SOCIETY

OF NORTHUMBRIA

VOLUME 58 PART 2

1998

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA
THE HANCOCK MUSEUM
NEWCASTLE UPON TYNE NE2 4PT

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Front cover: red squirrel photographed by Allan G Potts FRPS

ISSN 0144-221X

Printed by Pattinson and Sons, Newcastle upon Tyne.

FOREWORD

The Viscount Ridley

I am honoured to commend this book, both as an example of partnership between the Northumberland Wildlife Trust and the Natural History Society of Northumbria, two local organisations with which I have long been associated, and as an important practical step towards conserving Northumberland's wild plants and animals.

Without knowing which plants and animals occur in our county, and their status, we are of course unable adequately to conserve them, so that the information contained in this *Red Data Book* will allow local authorities, statutory agencies and voluntary nature conservation organisations to plan their conservation activities in a much more structured way than hitherto. But apart from this practical use, the contents will inform and entertain everyone who is interested in the wildlife of Northumberland.

The compilers of the *Red Data Book* readily acknowledge many gaps in coverage, but the information is published as the best currently available – and the fact that so much is available is a tribute to the many field naturalists, both present-day and former, who have worked so painstakingly in Northumberland. The county is the largest for which a Red Data Book has been published.

We all owe a particular debt of gratitude to Lisa Kerslake, Conservation Manager of the Northumberland Wildlife Trust, who undertook the laborious task of compiling this book, and to David Gardner-Medwin for his meticulous editing on behalf of the Natural History Society.

Ridley

Patron, Northumberland Wildlife Trust

President, Natural History Society of Northumbria

CONTENTS

1 Invertebrate Site Register

ILLUSTRATIONS

Acknowledgements

Thanks are due to the Natural History Society of Northumbria, English Nature and Northumberland County Council's North Pennines Project for financial support.

I would like to thank all the authors, who gave their time and expertise willingly. Many people made comments on the various drafts and gave assistance in other ways; in particular Andy Adams and other Environment Agency staff, Ian Armstrong, Alec Coles, Terry Coult, the staff of English Nature, David Feige, David Gardner-Medwin, Les Jessop, Angus Lunn, Peter Lurz, Dave Mitchell, David Noble-Rollin, Margaret Patterson, Steve Rushton, Rebecca Sinton, George Swan and Gordon Woodruffe.

Thanks to Allan Potts and Hewett Ellis, who kindly donated photographs; to Joan Holding for the drawings; and to Anne Wilson and Heather Weatherill, who compiled the index and gazetteer.

Finally, I owe a particular debt of gratitude to all my friends and colleagues at Northumberland Wildlife Trust who supported me during the long process of compilation, particularly Simon Dickson, Duncan Hutt, Jane Speak, David Stewart and Kim Woolhead.

Lisa Kerslake

Contributors

Dr Gordon Beakes is a Lecturer in the Department of Biological and Nutritional Sciences at the University of Newcastle upon Tyne. He has a longstanding interest in the fungi of Northumberland.

Harry Eales has pursued various different careers, including time in the police force and RAF. He has collected and recorded insects in Northumberland and Durham since the 1950s, has supplied records for various local and national atlases and has produced a number of papers and reports. His main study interests are butterflies (particularly the large heath), dragonflies and bumble bees.

Dr Judy Foster-Smith has spent much of her life on the Northumberland coast. She studied zoology at the University of Newcastle upon Tyne and has had a long involvement with marine conservation in Northumberland. Judy is a freelance marine biologist and teaches part-time in the Department of Marine Sciences and Coastal Management at the University of Newcastle upon Tyne, based at the Dove Marine Laboratory. She is married with two sons.

Bryan Galloway is a founder member of the Northumberland and Tyneside Bird Club and an active bird ringer with the BTO. He was a member of the Northumberland Bird Breeding Atlas committee between 1987 and 1995 and co-authored the annual reports *Birds in Northumbria* from 1970 to 1978 and the book *Northumberland's Birds* (1978-83). His particular interests are monitoring breeding populations of raptors, monitoring pied flycatcher nesting in boxes and monitoring breeding species on the Otterburn Ranges.

Oliver Gilbert worked on the lichens of the county in 1955-70 while he was on the staff of the Botany Department of the University of Newcastle upon Tyne. He produced the *Lichen Flora of Northumberland* in 1980. He is a past President of the British Lichen Society and has published widely in all branches of botany. His present post is in the Landscape Department at the University of Sheffield.

Dr Gavin Hardy read botany at the University of Newcastle upon Tyne. Following this he carried out research for a PhD on marine algae and has continued his researches in this field for the past twenty years, concentrating particularly on the marine algal flora of north-east England and south-east Scotland. He is currently coordinator of the national Marine Algal Mapping Scheme which is run by the British Phycological Society, and is based at the Department of Marine Sciences and Coastal Management at the University of Newcastle upon Tyne.

Lisa Kerslake has an honours degree in ecology and an MSc in landscape ecology. She began her career with the Nature Conservancy Council in North Yorkshire and Sussex, carrying out mainly botanical and habitat survey and SSSI notification work. She then spent six years as an ecologist and team leader with Nottinghamshire County Council and became Conservation Manager with Northumberland Wildlife Trust in January 1995. Lisa is a founder member of the Institute of Ecology and Environmental Management, a member of council of the British Association of Nature Conservationists and of the Natural History Society of Northumbria, and is the mammal recorder for Northumberland.

Dr Martin Luff has an honours degree in zoology and studied the ecology of beetles in grass tussocks for his PhD. He has lectured at Imperial College and worked as a Scientific Officer for the ARC Unit of Insect Physiology in Newcastle. Since 1968 he has worked as a lecturer, and latterly a senior lecturer, in the Agricultural Departments of the University of Newcastle upon Tyne. Since taking early retirement in 1997 he has undertaken research and part-time lecturing. He has worked on the ecology, biology and larval taxonomy of beetles, especially ground beetles, for over thirty years and is currently interested in the use of beetle distribution and habitat in environmental assessment.

Dr Angus Lunn is Chairman of the Conservation Committee of the Northumberland Wildlife Trust. Until early retirement he was Head of the Adult Education Programme at the Centre for Continuing Education, University of Newcastle upon Tyne, where he continues to lecture part-time. He serves on the Conservation Professional and Technical Advisory Group of the Wildlife Trusts nationally, and is Chairman of the Council for National Parks.

Dr Dave Mitchell has worked as a local government ecologist in the south-east of Northumberland for over ten years. His particular interests include urban nature conservation, biodiversity issues, vegetation classification and terrestrial plant ecology. He has developed a special 'soft spot' for the region's bryophytes and believes that they are important indicators of the health of our local environment.

David Noble-Rollin has been the Secretary of The Natural History Society of Northumbria since 1988. He has been involved in publishing the *Flora of Northumberland* and the Society's *Transactions*. Before this he was a freelance ornithologist and photographer, working particularly in adult education and leading ornithological groups to many parts of the world.

Dr Jim Parrack has had a long involvement with the study and recording of moths and butterflies in Northumberland as well as being a keen ornithologist. He co-authored *The moths and butterflies of Northumberland and Durham* with the late Tom Dunn and has travelled widely, often accompanying tours as an ornithological guide. Jim retired from teaching in 1982 and now runs a small ecological consultancy, advising Forest Enterprise, the National Park and others on invertebrate and ornithological matters.

Dr Anne Pickering was born in Hexham and has an honours degree in botany from Manchester University. She worked as a botanist in Scotland and as a horticulturalist in Newcastle, carried out contract survey work for the Nature Conservancy Council and spent a year in Tyne & Wear Planning Department, before obtaining an MSc at Bath. Anne is presently the supervisor of Moor Bank Garden for the University of Newcastle upon Tyne, where she obtained her PhD in 1992. She is a founder member of the Institute of Ecology and Environmental Management and is active in a number of conservation organisations in the North East.

Dr John Richards trained at the University of Durham, where he obtained a BSc and PhD, the latter in the genetics of dandelions. John subsequently became a demonstrator at the

University of Oxford and came to Newcastle in 1970 where he is a reader in botany in the Department of Agriculture and Environmental Science. He has been involved in conservation work with the Northumberland Wildlife Trust for nearly thirty years.

Dr Nick Rossiter obtained his BSc and PhD in chemistry at Hull and is now a lecturer in computing science at the University of Newcastle upon Tyne. He was regional representative for Northumberland for the British Trust for Ornithology from 1984 to 1990 and one of the coordinators and editors for the Northumberland Bird Breeding Atlas from 1988 to 1993. He has been county bird recorder since 1990. Personal research interests include studying upland birds and determining and understanding historical bird distribution.

Dr Liz Smith is a research associate at the University of Newcastle upon Tyne, carrying out research into the ecophysiology of lichens and bryophytes and lecturing at continuing education and professional short courses. Prior to this she worked in the field of conservation management for English Nature, the Northumberland Wildlife Trust and West Sussex County Council.

Gordon Simpson qualified as a forester in 1957, and completed a geology degree in 1977 and an honours degree in ecology in 1981. He has had a long interest in wildlife, starting with birds, mammals and wild flowers and developing his interest in forest insects, mosses and fungi from the 1960s onwards. He was awarded an MBE in 1988 for conservation work in Forestry Commission woods and continues to give advice and undertake survey work for the Forestry Authority some five years after retiring.

Rebecca Sinton has a BSc in ecology and an MSc from Newcastle University. She has worked as a Conservation Officer for the RSPB since 1992, formerly in the south-east region and, since 1995, in the north-east region, based in Newcastle and covering Northumberland, Durham, Tyne & Wear and Cleveland.

Tony Tynan is a Yorkshireman. He took a degree in natural sciences and geology at the University of Reading, and then worked at the Maidstone Museum and the National Museum of Wales in Cardiff, before coming to Newcastle as Curator of the Hancock Museum (1958-92). In 1962 he helped to found the Northumberland and Durham Naturalists' Trust, becoming its Honorary Secretary and later that of its successor, the Northumberland Wildlife Trust.

Marsh harrier, drawing by Joan Holding

INTRODUCTION

L J Kerslake

A number of British national Red Data Books have been produced, notably for birds, plants and insects; these have become a well-established conservation tool in Britain. In recent years local Red Data Books have begun to appear, usually based on counties. These serve to translate the information in national RDBs into a local context and also to indicate the need for conservation measures for those species which may not be nationally rare or threatened but nevertheless are deserving of help in a local area. The latter are part of local biodiversity and contribute to local character.

The need for a *Red Data Book for Northumberland* was highlighted by the publication in 1995 of *Biodiversity: the UK Steering Group Report.* This arose from the Biodiversity Convention to which the UK Government agreed at the Rio Earth Summit in 1992 and the Government's *Biodiversity: the UK Action Plan*, published in 1994. The recommendations of the Steering Group Report were endorsed by the UK Government in May 1996. It lists species and habitats of national conservation concern for which action plans should be prepared. The information contained within the Report can be used to guide the local action needed to conserve our most threatened species and habitats, and it is intended that the Northumberland *Red Data Book* will play a vital role in informing the local Biodiversity Action Planning process with respect to the species identified in the Report as well as those of more local conservation concern.

The aims of the Northumberland Red Data Book are:

to list species of conservation concern in Northumberland;

to indicate species for which local Action Plans should be prepared, to be implemented by Northumberland Wildlife Trust and its partners;

to provide information for input into local Biodiversity Action Plans and other nature conservation initiatives;

to identify those areas where information is inadequate or absent and to suggest priorities for research.

Geographical coverage

The Northumberland RDB covers the County of Northumberland, the City of Newcastle upon Tyne and the Metropolitan Borough of North Tyneside; that is the Watsonian vice counties 67 and 68. No attempt has been made to present data separately for each administrative area.

Method of compilation

Local experts for particular groups of taxa were identified and asked to prepare a list of Red Data species for the county. Where an appropriate expert was not available, a list was compiled by the editor using existing documented information. For some groups however there is no existing information so the *Red Data Book* does not cover all taxa (see 'Priorities for research' below).

Sources of reference for species selection included, where relevant, the national Red Data Books, distribution atlases, such as *The Atlas of Breeding Birds in Northumbria* (Day *et al.* 1995), the *Flora of Northumberland* (Swan 1993), the *Invertebrate Site Register* (Ball 1987) and the *UK Steering Group Report* (1995).

There has been no attempt to list 'red habitats' as part of the process. Unlike most English counties, much of Northumberland has no Phase 1 Survey coverage so data relating to different habitats are limited. However on pages 66-69 an attempt is made to identify the habitat types which, in a UK context, are particularly well represented in Northumberland.

Criteria for the selection of species vary between groups of taxa and an explanation of the criteria used is given at the beginning of each chapter. Nevertheless, in general terms each species had to qualify under one or more of the following categories in order to be included:

nationally rare and present in the county;
locally rare (ie falling below a defined threshold);
important populations present in the county;
severe decline, either national or local;
endemic to the county or to Britain.

Species Action Plans

Some species included in the RDB will benefit from the production of a Species Action Plan (SAP) to aid their conservation. In some cases, notably for birds, it is likely that action for particular habitats will aid the conservation of a number of different species. Where it is considered that either a Species or Habitat Action Plan should be prepared, this has been stated at the end of the relevant species account.

Criteria for the selection of species for SAPs vary between groups but in most cases involve some combination of degree of threat to the species, importance of the species, and whether it is possible or practical to take any action. Where a species is listed on the *UK Steering Group Report* short or middle list, it has automatically been selected for a SAP. The two exceptions to this rule are species which are believed to be extinct in the county and pelagic species (such as cetaceans, the basking shark and the sturgeon) over which authorities in Northumberland have no control. In all, Action Plans have been proposed for fourteen mammals, forty-one birds, a newt, two fishes, a mollusc, nine insects, forty-eight vascular plants, three bryophytes, three lichens and a fungus.

How to use the Red Data Book

The *Red Data Book* has been compiled with a separate chapter for each group of species. Each chapter begins with a short introduction and a description both of the **criteria** used to select species for inclusion and of any additional information on their **conservation status**. A complete list of all the **codes** used for selection criteria and conservation status is given on pages 49-51 and summarised on the fold-out leaf of the back cover.

Because criteria for selection vary between groups, it is important to check the chapter introductions for information about which criteria were used for each group. Any given species might qualify on more than one criterion, and an attribute used as a criterion for one group might be used only as information about conservation status for another group, and vice versa.

In each chapter, species are listed in the appropriate standard order for the particular group. This is usually taxonomic, with certain exceptions: the lichens are, according to convention, listed in alphabetical order; and the few marine invertebrates are listed in a separate chapter at the end of the taxonomic sequence of fauna. Species accounts vary but always include **codes** to indicate criteria for selection (bold type, first line) and, where relevant, other conservation status (ordinary type, second line).

Where the relevant information is available, species which have become extinct in the county since 1945 are either listed at the end of each chapter (Lepidoptera, vascular plants) or are clearly indicated in the text.

Information gaps and the need for further research

One of the aims of the *Red Data Book* is to identify areas where information is inadequate or absent and to suggest priorities for research. The need for further research is apparent in many of the individual species accounts and will not be dealt with here. However, gaps in data are not always identified in the main text and are covered below.

Most deficiencies in the data relate to invertebrate and lower plant groups although, with the possible exception of birds and vascular plants, our knowledge of nearly all groups of taxa in Northumberland is limited and the lists given in the *Red Data Book* should not be considered definitive. The following groups are not included in the *Red Data Book* as there is no information available for Northumberland:

Insects: Thysanura (bristletails)
Diplura (two-pronged bristletails)
Protura (proturans)
Collembola (springtails)
Dictyoptera (cockroaches)
Dermaptera (earwigs)
Psocoptera (psocids)
Thysanoptera (thrips)
Siphonaptera (fleas)

Centipedes

Millipedes

Algae (except marine algae)

For the following invertebrate groups, no local expert could be identified and data were extracted by the editor, largely from the Invertebrate Site Register - ISR (Ball 1987), but with additional records from individuals whose help is acknowledged in the relevant chapters. The ISR, though valuable, is inevitably not always up to date and is patchy in the quality of the information it contains. The resulting lists clearly reveal the need for more survey data.

Molluscs

Annelids

Insects: Coleoptera (beetles, except ground beetles, Carabidae)
Diptera (true flies except hoverflies, Syrphidae)
Ephemeroptera (mayflies)
Plecoptera (stoneflies)
Orthoptera (grasshoppers and crickets)
Hemiptera (bugs)
Neuroptera (lacewings)
Mecoptera (scorpion flies)
Trichoptera (caddis flies)
Hymenoptera (bees, wasps & ants, except bumblebees, Apidae)

Crustaceans

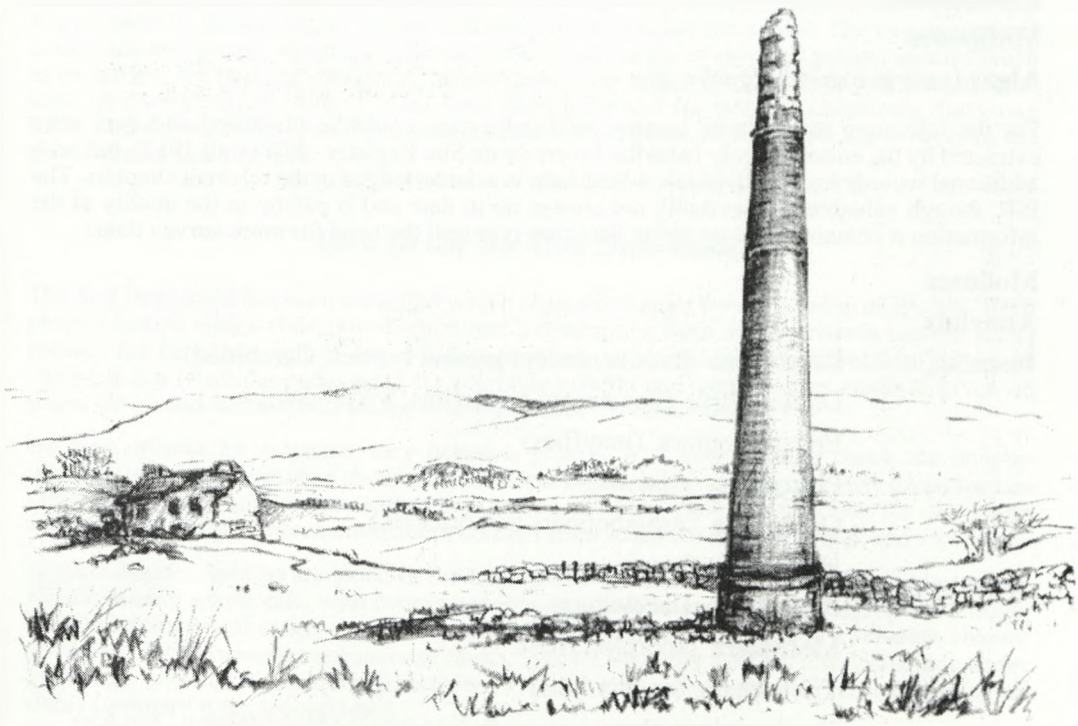
Arachnids

North Pennines Project

The production of the *Red Data Book* has been supported by Northumberland County Council's North Pennines Project.

The North Pennines are an Area of Outstanding Natural Beauty. The project was established in 1996 by the County Council with support from the Countryside Commission. It aims to focus the Council's work on implementing the North Pennines Management Plan, which includes recommendations on nature conservation, including the conservation of rare species. The Project works with farmers and landowners to maintain the present level of biodiversity and to aid the recovery of rare and endangered species.

Those species for which Species Action Plans have been proposed and which are characteristic of the North Pennines will be targeted for particular action there. 'North Pennines target species' are identified in the text; they include five mammals, seventeen birds and ten vascular plants.



Northern Pennines, drawing by Joan Holding

KEY TO SELECTION CRITERIA AND CONSERVATION STATUS

The following codes are used to indicate the **criteria** by which a species was selected for inclusion in the *Red Data Book* (RDB) and the current **conservation status** of the species (protection under UK statutes or European directives, guidelines etc).

In some cases a particular status has been used as a selection criterion. To distinguish between status and criterion, those codes representing selection criteria appear in bold type in the main text.

Criteria specific to particular groups are indicated below in brackets; further information is given in the chapter introductions where appropriate. Not all the criteria listed were used to select species in every taxonomic group; the reader should refer to individual chapters for a list of the criteria used and for precise definitions of these.

The lists are ordered alphabetically for ease of reference.

Selection criteria and national and international conservation status

Amb Listed on national amber list for birds (RSPB 1996)

B Protected under European Birds Directive (EEC 1979)

BTOh On the BTO (1997) High Alert list (birds)

BTOm On the BTO (1997) Medium Alert list (birds)

D Rapid or historical national decline (birds, vascular plants)

Birds:
50% decline in national population or range in 25 years (red listed species – RSPB 1996) which are confirmed breeders or which regularly occur in Northumberland

Plants:
25% decline in population or range nationally in the last 25 years (*UK Steering Group Report* 1995)

End Endemic to UK (plants)

Eur Important European population (mammals)

G Globally threatened (birds, plants) *UK Steering Group Report*

H Protected under European Habitats and Species Directive (EEC 1992)

Ii Internationally important (birds, plants, lichens)

Birds:
5% of global/flyway breeding or wintering population

Vascular plants:
25% of global population in UK (excluding endemics)

Lichens:
Atlantic species, threatened in the EU

L On the long list, but not on the short or middle list, of the *UK Steering Group Report*

Loc Species of local distribution in the UK (invertebrates)

M On the middle list of the *UK Steering Group Report*

North At northern limit of distribution (seaweeds)

Pop Important national population (birds, Lepidoptera, vascular plants)

Birds:
10% of breeding or wintering national population

Plants:
nationally important (from Perring and Walters 1983)

pRDB Species provisionally to be included in national RDB updates

R Nationally rare (occurring in 15 or fewer 10km squares)

Rare Rare species (invertebrates)

Terrestrial and fresh water invertebrates:
recorded from fewer than 30 10km squares

Marine invertebrates:
recorded from 8 or fewer 10km squares containing sea

RDB Listed in the relevant national RDB (birds, invertebrates, vascular plants, lichens)

RDBk Listed in national RDB: category not defined (invertebrates)

RDB1 Listed in national RDB: endangered (invertebrates)

RDB2 Listed in national RDB: vulnerable (invertebrates)

RDB3 Listed in national RDB: rare (invertebrates)

Reg Species regarded as notable in the region in which they occur (invertebrates)

S On the short list of the *UK Steering Group Report*

Sc Nationally scarce (occurs in 16-100 10km squares)

Scarce Scarce species (invertebrates, seaweeds)

Terrestrial and fresh water invertebrates:
species recorded from 30-100 10km squares

Marine invertebrates:
species recorded from 55 or fewer 10km squares which contain sea

Seaweeds:
nationally scarce species

South At southern limit of national distribution (seaweeds)

U Species distribution unknown (invertebrates)

W Protected under the 1981 *Wildlife and Countryside Act*

Wp Partial protection under the 1981 *Wildlife and Countryside Act*

Northumberland selection criteria and status

ND Local decline (birds, Lepidoptera)

Birds:
50% or greater decline in breeding range between 1967-72 and 1988-92 (Day *et al.* 1995) OR
50% or greater decline in population over last 25 years OR
evidence of very long term decline in numbers or range

Lepidoptera:
evidence of a sustained decline in numbers or range

Nend Endemic to Northumberland (seaweeds)

NL Localised populations in Northumberland (birds, Lepidoptera)

Birds:
50% of county breeding or wintering population at 5 sites or fewer in Northumberland

Lepidoptera:
evidence indicating presence at 5 sites or fewer in Northumberland

NM Maintained populations in Northumberland (birds)
Amber list species (RSPB 1996) which have declined nationally but maintained their populations in Northumberland

NP Prospective species in Northumberland (mammals, birds)
Species not currently breeding in the county but with a high priority for re-establishment in Northumberland

NR Rare in Northumberland (but may be common elsewhere)

Mammals:
nationally common but locally uncommon

Birds:
fewer than 100 breeding pairs in Northumberland

Dragonflies:
fewer than 10 sites in Northumberland

Butterflies and moths:
fewer than 10 records in Northumberland

Ground beetles:
fewer than 5 localities in Northumberland

Other invertebrates:
fewer than 10 records in Northumberland

Vascular plants:
occurring in 8 or fewer 5km squares in Northumberland (Swan 1993)

Seaweeds:
occurring in two localities or fewer in Northumberland

Synonymy

The present work uses the standard abbreviations RDB1 to RDB5 and RDBk throughout, in the same sense as they are used in the Invertebrate Site Register.

For **Notable Species** the ISR codes Na, Nb and Nr are replaced by the following terms, already defined above: Na becomes **Rare**; Nb **Scarce**; and Nr **Reg**

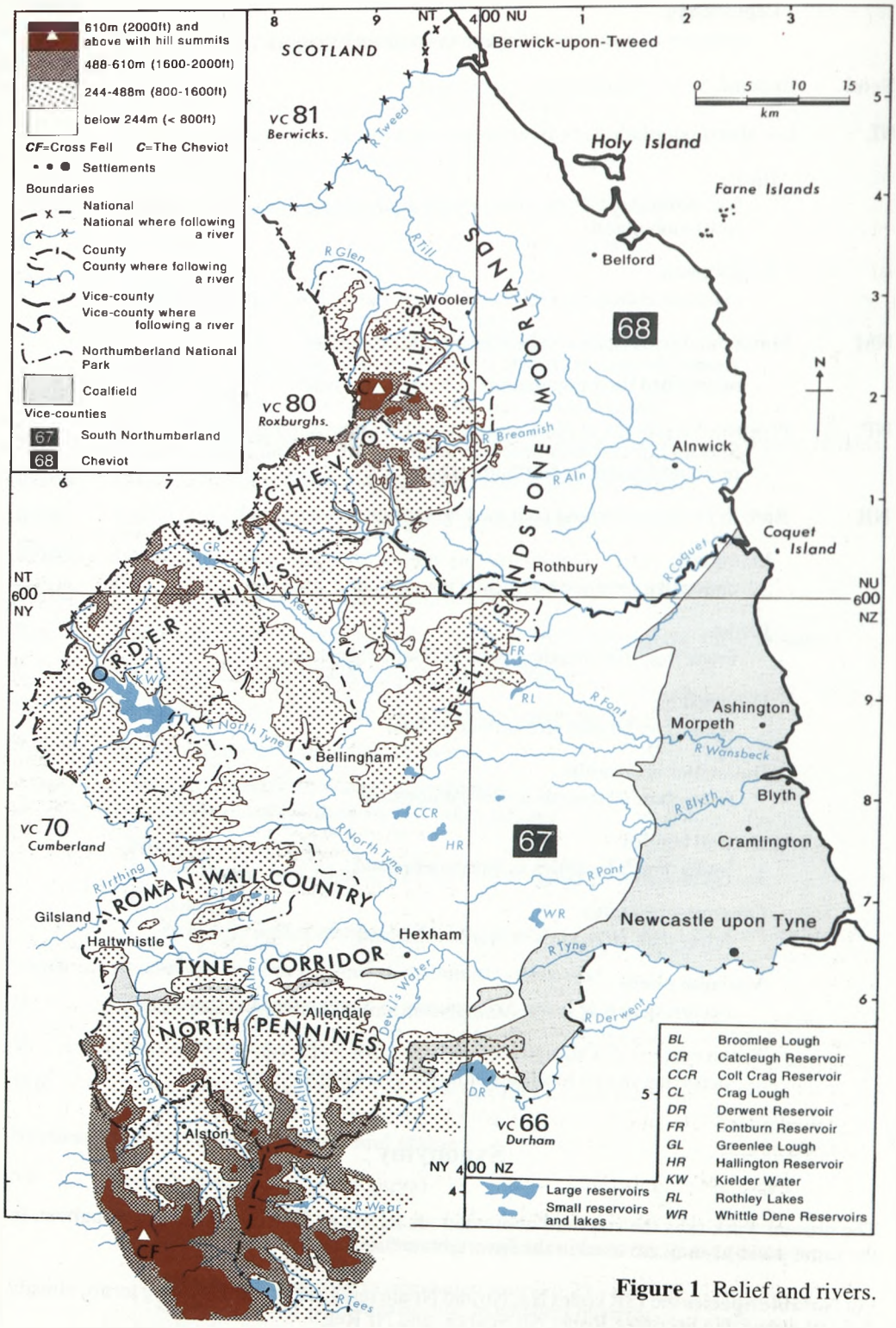


Figure 1 Relief and rivers.

DESCRIPTION OF THE COUNTY

A G Lunn

Topography

Northumberland comprises lowland in the east and upland in the west, although several dales penetrate the western hills and, in the north-east, upland ridges of modest altitude run parallel to the coast. Upland, lying above the 250m contour, occupies about forty percent of Northumberland. This altitude also very approximately coincides with the boundary between the intensively-managed, improved farmland below and extensively-farmed moorland above. The uplands are themselves divided into units of differing geological and topographic character, approximately separated by the main dales. These uplands are (Figure 1):

(1) The **Cheviot Hills**. The Cheviot, at 815m above sea level (asl), is the highest summit in Northumberland.

(2) The **Fell Sandstone moorlands** of the centre and north-east of the county, including Simonside (429m) and Tosson (440m). Other named stretches of Fell Sandstone moorland include the Kyloe hills, Bewick Moor, Rimside Moor and the Harbottle hills.

(3) The hills on both sides of upper Redesdale and of upper North Tynedale, referred to as the **Border Hills**; large areas of this part of Northumberland have been afforested with conifers since the 1920s. The higher individual hills, tabular in form, include Carter Fell (579m), Peel Fell (602m), Deadwater Fell (569m) and Glendhu Hill (514m).

(4) The west-east ridges, separated by linear depressions, which occupy the **Roman Wall country** between the River Irthing in the west and the lower River North Tyne in the east; this area is also much afforested.

(5) South of the Tyne Corridor, the Northumberland part of the **North Pennines**. (The Tyne Corridor – or Tyne Gap – is the west-east valley which connects the Cumbrian lowlands with those of Northumberland.) The North Pennines consist of an upland plateau, tilted downwards towards the east, and dissected by dales; the highest hills in the Northumberland part are on the southern and south-western county boundary and include Killhope Law (673m), Grey Nag (656m) and Tom Smith's Stone (631m).

The Northumberland National Park comprises the greater part of the first four upland units.

Within the eastern lowlands, the most significant division is between the industrialised, densely-populated **south-east** (the coalfield triangle of Amble-Riding Mill-Tynemouth) and the very much larger **rural area to the north**. The **coastline** is a distinctive environment.

The major rivers are the Tweed and the Tyne, partly forming the northern and southern boundaries of Northumberland. The lower Tyne is now tidal as far upstream as Heddon-on-the-Wall, 25km from Tynemouth, and becomes increasingly saline coastwards from that point.

Northumberland falls into five of English Nature's **natural areas**. These are, using English Nature's numbering:

1 North Northumberland Coastal Plain (the lowlands north of the coalfield)

2 Border Uplands (the uplands north of the Tyne Corridor)

4 North Pennines

5 Northumbria Coal Measures

98 Northumberland Coast.

Natural areas each possess common geological and ecological characteristics and are defined on a practical scale for planning the conservation of species, habitats and landscape features.

Geology

The Cheviot Hills consist of igneous rocks – mainly granite and volcanics – of Devonian age. Younger sedimentary rocks, of Carboniferous age, partly cover the volcanics and so form the sub-drift surface of almost all of the rest of Northumberland. The Carboniferous sedimentary rocks dip generally away from the Cheviots, towards the east, south-east and south, such that successively younger strata crop out further away from the Cheviots (Figure 2).

The Cheviot igneous massif is the eroded remnant of a volcano, intruded by granite and traversed by dykes. The central granite stock forms The Cheviot itself, Hedgehope Hill (714m) and adjacent hills – the highest ground in the county. Soils on the granite, or on drift derived from it, are sandy and base-deficient, and typically podzolic (see page 60). The surrounding lower hills of the Cheviots – among the more prominent being Yeavering Bell, Newton Tors, Cushat Law, Windy Gyle and Thirl Moor – are volcanic. They consist mainly of sequences of andesite lavas but include also some rhyolite lavas and pyroclasts (varying from coarse agglomerates to fine ashes). In areas of lower rainfall the soils derived from the andesite lavas are relatively base-rich, some notably so. However, the higher, flatter hills in the Cheviots, both granite and volcanics, have blanket bog on their summits.

The granitic magma intrusion caused thermal metamorphism of the adjacent volcanics, and a toughened lava (meta-lava) crops out, in an aureole about 1km wide, around the granite. This toughened rock is responsible, *inter alia*, for the crags, otherwise scarce in the Cheviots, of The Bizzle and Hen Hole – two corries on the northern side of The Cheviot whose high altitude, rock ledges and basic soils provide the nearest approach in Northumberland to the type of montane habitat which supports a basophilous alpine and/or arctic flora.

The Carboniferous sedimentary rocks consist of a sequence of limestones, mudstones and shales, siltstones and sandstones, and coals. They are classified locally into informal groups according to the relative importance of these rock types in each group. In order of decreasing age these consist of: Cementstone Group (cementstones are muddy limestones); Fell Sandstone Group; Scremerston Coal Group; Lower Limestone Group; Middle Limestone Group; Millstone Grit (subsuming the Upper Limestone Group and including the Longhoughton Grits); and Lower and Middle Coal Measures.

North of the Tyne Corridor each group crops out as a broad arc, encircling the Cheviots, to the east, south-east and south. Important topographically is the Fell Sandstone Group, consisting of thick beds of resistant, quartzose sandstones. These form a prominent ridge, single or multiple, separated from the Cheviots by the lower ground of the Cementstone Group, mainly shales. On the sandy, podzolic soils of the sandstones, heather *Calluna* dominated moorland occupies large areas.

Within Northumberland, limestones in the Scremerston Coal and Limestone groups are subordinate to shales and sandstones, being thin and with restricted outcrops. Nevertheless, these groups provide a broad zone in the Roman Wall country and from there north-eastwards through the centre of the county, within which occur linear patches of calcareous soil and also calcareous springs and flushes. The Great Limestone, at the base of the Upper Limestone Group, is the thickest limestone (up to 20m) and has the most extensive outcrops; it is also the one which has been by far the most extensively quarried.

In the south-east of the county, the thick, productive, coal seams of the Lower and Middle Coal Measures were the basis of the industry and urbanisation. Important associated habitats include the many subsidence wetlands and, formerly, the ballast hills on the banks of the Tyne and on the coast, where collier vessels unloaded their ballast of chalk with flints or beach gravels. The Coal Measures also crop out, and were worked, in a string of small outliers in the Tyne Corridor, in the west of the county.

The combination of alternating resistant and weak strata, dipping outward from the Cheviots, is responsible for the striking cuesta topography of much of Northumberland north of the Tyne Corridor. A cuesta is an asymmetric ridge formed by the edge of a tilted, resistant rock stratum, comprising a scarp slope and a dip slope. The cuesta scarps face generally towards the Cheviots. The sandstones of the Fell Sandstone Group, either collectively or individually, form major cuestas – the single or multiple ridge described above. The Roman Wall country also has classic cuesta terrain.

To the **south of the Tyne Corridor**, in the North Pennines or Alston block, the Carboniferous sedimentary strata are horizontal or only gently-dipping over a wide area, and the topography is therefore of the plateau-benchland-dale type. Wide plateaux, typically developed on Millstone Grit sandstones, are dissected by dales whose lower slopes and floors are in the underlying Limestone groups. The sides of the dales are in many areas markedly benched, owing to the sequential outcropping of resistant sandstones and limestones – which form the benches – and weak shales. The plateaux in the higher and wetter west, on either side of the upper South Tyne, have developed blanket bog, while those in the lower and drier east support *Calluna* heaths or acidic grasslands on podzolic soils and surface-water gleys (see page 60).

The Alston Block lies within the **Northern Pennine Orefield**, and was a major producer of lead, mainly from galena ore, and zinc, from sphalerite and secondary ores. Cadmium and copper are also present, in low but ecologically significant concentrations. Fluorite, baryte and witherite have also been mined on a considerable scale. The landscape of the upper dales is dominated by evidence of former mining activity, and many new habitats were created. Most notable are those with soils contaminated by heavy metals – lead, zinc, cadmium or copper – which are toxic to plants when present above certain critical concentrations. These soils occur in two main contexts.

The first is that of the mines themselves – their spoil and dressing floors – and of the smelt mills and transport routes. Because the majority of productive oreshoots occur in the Great (and other) limestones, many mine dumps, whether or not they are toxic, are calcareous. The second context is river alluvium which – incorporating particles containing heavy metals, derived from the mine workings – was deposited on floodplains and channel beds. Metalliferous alluvium is a highly distinctive soil of the South Tyne/Tyne river system, and is found far beyond the Orefield. A unique heavy-metal resistant 'metallophyte' flora occurs on these toxic soils, most abundantly on the river alluvium, and characteristically on low gravel terraces.

Not so far mentioned is the **Great Whin Sill**. This is a somewhat complex sheet of intruded igneous rock, up to 70m or so thick but commonly somewhat less, with associated dykes. The 'normal' rock of the sill is quartz-dolerite, which in chemical composition is similar to basalt. The Whin Sill is a very late Carboniferous-age concordant intrusion into the Carboniferous sedimentary rocks; in much of Northumberland it occurs within the Limestone groups, although in the north, in the Kyloe hills, it is intrusive into the Fell Sandstone Group. As a concordant intrusion it forms a most striking cuesta sweeping across the county north of the Tyne Corridor. In west Northumberland, Hadrian's Wall was built on its crest, above the north-facing crags. It meets the coast at Cullernose Point, forms the Farne Islands – each island a piece of cuesta – and then the whin heights in the Bamburgh-Spindlestone area. The Heugh, a low rocky hill on Holy Island, is a portion of one of the associated dykes.

The Whin Sill provides some of the most distinctive Northumberland plant habitats. Because of the hardness of the rock, its dip slopes have developed only shallow soils, drought-prone but base-rich; these support grassland with many bare patches, including plates of exposed rock. On the scarp slopes of the cuesta are base-rich crag and block scree. The Sill's long coastal outcrops are, in addition, subject to maritime influences, reflected in their flora.

The local name for quartz-dolerite is whinstone, and botanists are accustomed to using 'whin' as an adjective, for example in 'whin grassland' and 'whin flora'.

Northumberland has 100km of **coastline** (not counting the islands). As the Carboniferous sedimentary strata and the Whin Sill sequentially intersect the coast, in their broad arcs around

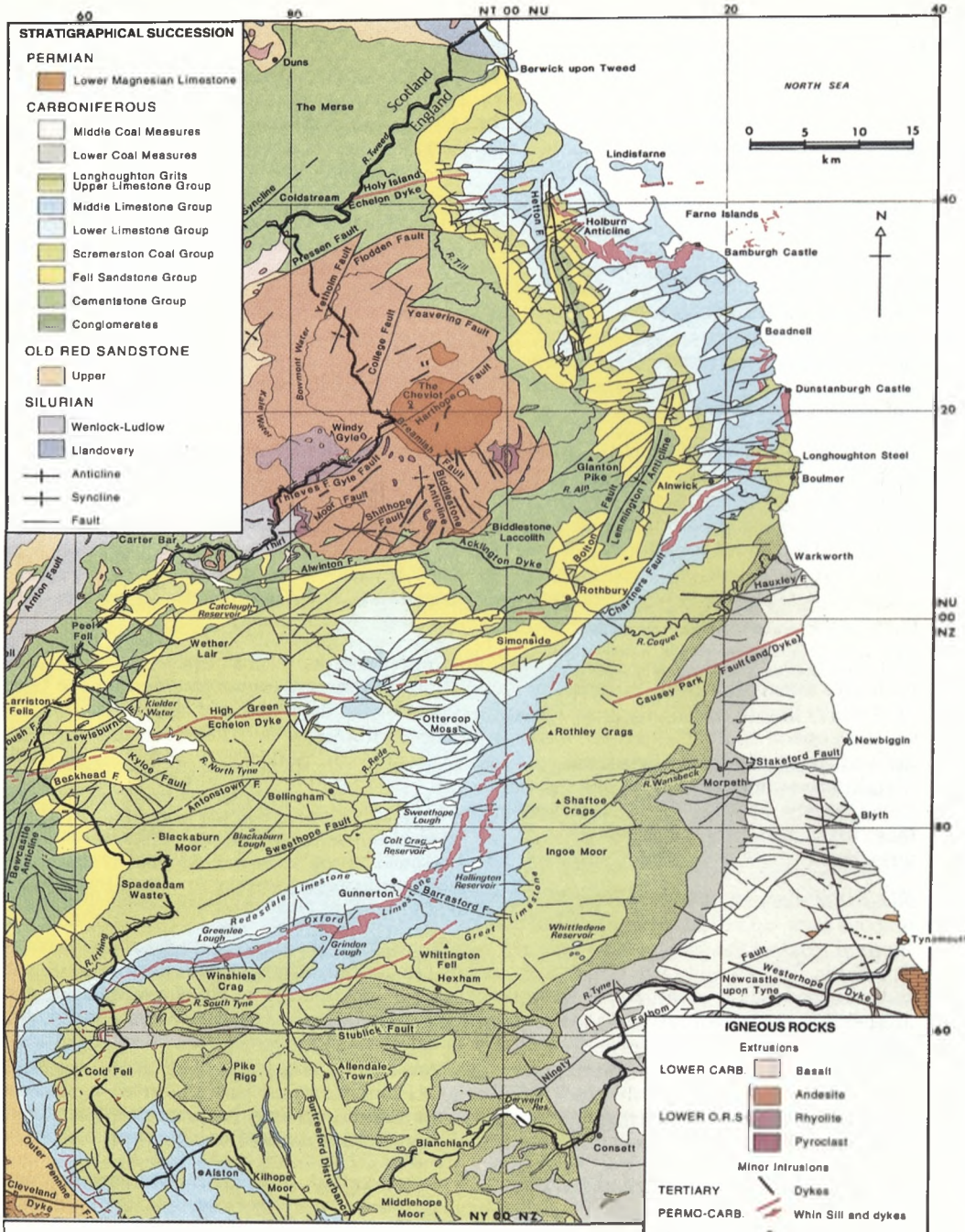


Figure 2 **Solid Geology** This section of the *Geological map of North East England, with the Scottish Borders and Lake District*, was published by the University of Newcastle in 1977, and extended and reprinted in 1982. The map is based on a compilation carried out by K R Crossley, with later additions by G A L Johnson and D A Robson.

The cartography is by C Cochrane, adapted by J Lunn for inclusion in *The Flora of Northumberland*. The rock groups are extensively covered, especially in the lowlands, by Quaternary drift. The key refers only to the area within the Northumberland boundary.

the Cheviots, they make a sequence of cliffed headlands, bays and reefs. Thick sandstones form the main headlands. Between Cullernose Point and Budle Bay the Whin Sill intermittently forms the coastline, and for long stretches its east-facing dip slope shelves gently into the sea. Weaker rocks have been eroded to form bays; glacial drift backs the longer bays (Seaton Sluice-Blyth, Druridge, Warkworth-Alnmouth, Beadnell), and shales are responsible for the smaller bays characteristic of the north Northumberland coast. At the back of the long bays are fine sand-dune systems ('links'), but the most extensive dune systems are on prograding coasts at Ross Links, The Snook on Holy Island, and Goswick. Dune sands are prevailingly calcareous owing to the shell fragments they contain. Depressions among the dunes are 'slacks' and in cases where their floors are below the seasonal water-table they support a rich calcareous slack flora.

Tidal estuaries and partly-enclosed bays have sand- and mud-flats ('slakes') and salt-marsh. These are particularly extensive in Budle Bay and in the strait between Holy Island and the mainland.

During the **Quaternary** sub-era (occupying approximately the last two million years), Northumberland, like the rest of Britain, experienced a long sequence of alternately cold and temperate climatic stages. Some of the cold stages brought ice sheets to Northumberland, and on other occasions there may have been valley and corrie glaciers in the Cheviots. The most recent cold stage, ending at *ca* 10,000 yr BP (years before the present), is known as the Devensian, and it was in the Late Devensian (*ca* 26,000-10,000 yr BP), that a major ice sheet last developed in northern Britain. It is likely that at the glacial maximum Northumberland was completely buried under glacier ice so that all life was extinguished. The present biota must therefore have re-immigrated into the area following the melting and retreat of the ice sheet, which in this area probably took place between *ca* 16,000 and *ca* 13,000 yr BP.

In the lowlands, the dales and on the lower slopes of the hills, the bedrock described earlier is extensively covered by Quaternary drift and most soils in these areas have developed in drift. Particularly widespread is glacial **till** (boulder clay) deposited by the Late Devensian ice sheet. The till is in the form of a slightly undulating sheet in much of lowland east Northumberland, but is ice-moulded into stream-lined drumlins (hills up to *ca* 20m high and up to *ca* 1km long) in the lower Tweed area, on the western flanks of the mid-North Tyne valley and in the Tyne Corridor. Tills are predominantly clayey, fine silty or fine loamy (with stones), being derived from the thick, erodible Carboniferous mudstones and shales. Locally, however, they are derived from sandstones and are sandy. They were the parent materials for most of the heavy surface-water gley soils, with impeded drainage, which occur in such a large part of Northumberland.

In rather localised areas of the county, **sands and gravels**, overlying till, were deposited by water in an ice-contact environment during ice sheet melt. These sands and gravels are commonly in the form of low irregular hills, and they carry freely-draining soils. The main areas of such ice-contact meltwater sands and gravels are between Cornhill on Tweed and Etal; between Wooler and Powburn (the Wooperton area); between Spindlestone Heughs and Fallodon (the so-called Bradford kame complex); and in the Tyne Corridor between Gilsland and Corbridge.

In the Milfield plain (north of Wooler), in parts of south-east Northumberland and elsewhere, laminated glacio-lacustrine **clays and silts** were deposited in lakes dammed by the retreating ice sheet. These lake sediments form flat ground and, where they are still at the surface, they develop notably poorly-drained soils (pelo-stagnogleys). The lake which formerly occupied Milfield plain also received a large glacio-lacustrine delta composed of sand and gravel, the surface of which now forms the wide, level terrace occupying the western half of the plain.

In the Roman Wall country especially, the ice sheets eroded numerous basins in the floors of the linear depressions marking the outcrops of shales between the cuestas. The basins subsequently contained shallow meres, most of which, however, have become filled by post-glacial peat. They are now the sites of raised and blanket mires, prime Northumberland habitats. However, the deeper meres have survived as the loughs of the Roman Wall country, and these are the main natural lakes of the county.

In general, glacial processes disrupted the drainage network. Not only were erosional depressions formed, but in the lowlands numerous shallow hollows occurred in the irregular Late Devensian till surface, as well as deeper kettle holes and dead-ice hollows amongst the ice-contact sands and gravels. The result was a complex of meres, ponds, swamps, fens, carrs, raised mires and marshes. Most of these lowland wetlands have been reclaimed by drainage schemes, or by piecemeal drainage, but some survive, in whole or in part, amidst intensive farming. Two sites which are referred to frequently in the *Red Data Book* are Newham Fen ('Embleton's Bog'), and Prestwick Carr. The former is the only eutrophic fen of any size in Northumberland, while Prestwick Carr, being within a few miles of Newcastle, was extremely well-known to nineteenth century naturalists. It is now largely drained and under pasture, but before drainage included a mere, open fen, carr and a raised bog. Fragments of all of these habitats except the mere survive.

Glacial meltwaters, together with post-glacial rivers and streams, eroded steep-sided valleys through till and into the underlying Carboniferous sedimentary rocks. The narrower valleys are locally known as **denes** (or deans), and frequently contain ancient semi-natural woodland. Most of the denes have valley walls which include sandstone outcrops, and the sequences of strata which they cut through, and associated springs and seepages, provide a notable variety of habitat. The denes include many of the most magnificent of Northumberland's numerous bluebell woods. In the uplands similar valleys are 'cleughs'.

During and since the retreat of the ice sheet, watercourses have laid down **alluvial deposits** on their floodplains and channel beds; the main rivers – the Tweed and the Tyne – are bordered by wide alluvial tracts. In the case of these rivers the alluvium includes wide gravel terraces, 5-10m above normal river level. The wide beds of the upland reaches of the present rivers and larger streams are commonly composed of cobble-gravels, and, except at times of flood, are partly exposed.

Climate

Northumberland is the northernmost county of England, mainly north of 55°N latitude. Its northern location makes it the coldest part of England in summer, when isotherms trend west-east, and its eastern location makes it one of the coldest parts in winter, when isotherms trend north-south.

July mean sea-level temperatures on land are about 14.5-15.°C, with summer sea-surface temperatures offshore about 13°C. In January, sea-level temperatures on land are about 3.0-3.5°C and winter sea-surface temperatures about 5.5°C. Temperatures decrease with increasing altitude at a lapse rate of *ca* 0.6°C per 100m, indicating that July mean temperatures at 600m asl should be *ca* 11°C and at 750m asl *ca* 10°C; these are values near to those generally accepted as being at the critical threshold for survival and growth of the hardiest trees. In the vicinity of the coast winter temperatures are 1-2°C higher than inland, and summer temperatures lower, owing to the moderating effect of the sea.

Within Northumberland, July sea-level temperatures are about 0.5°C lower in the far north than the far south, and some direct or indirect effect of temperature no doubt explains both the failure of some southern species to reach the county and the attainment of others, within Northumberland, of their northern limit in Britain. Conversely, a lesser number of species reach southern limits in the county.

Figure 3 shows the average annual precipitation. Lowland Northumberland is very dry, owing to a rain-shadow effect of the uplands further south-west and west, from which directions come the main moisture-bearing winds. The driest area is the mouth of the Tweed with as little as 610mm (24"), and most of the coastal plain and of lowland north Northumberland receive less than 700mm. However precipitation increases within the county both westwards and with altitude, and moderately heavy precipitation falls on the western uplands. The wettest areas are in the North Pennines – on the main watershed between the Tyne and the Eden drainage – with, in places, more than 1525mm (60"). The Border Hills, from Carter Bar south-westwards

to the head of the Irthing, receive more than 1270mm, and the hills of these two areas have the most extensive blanket bogs. Local climate is highly sensitive to altitude.

On average, rainfall in the summer half-year is similar to that in the winter half-year. July and August are the wettest months, and March and April the driest.

Snowfall is normally brought to Northumberland with northerly and easterly polar air masses, and the orographic effect causes the Cheviots and the eastern slopes of the North Pennines to experience the heaviest falls (usually between December and March), and the deepest and longest lying snow. On the coast, there are fewer than ten days on average when snow lies (Holy Island very seldom has lying snow), Kielder has thirty-three days and there are considerably more days than this with snow lying on the summits (more than a hundred days on The Cheviot). The North East is the region of most frequent snow fall in England and Wales.

A particularly bleak feature of the climate of the north-east coast of England in late spring and early summer, particularly in May and June, is the persistent presence of haar or sea-fret. This is either very low stratus cloud or fog, accompanied by low temperatures and intermittent drizzle, brought in on easterly winds chilled to saturation by the cold North Sea; the haar penetrates varying distances inland, and is partly responsible for lowland Northumberland's low mean summer temperatures.

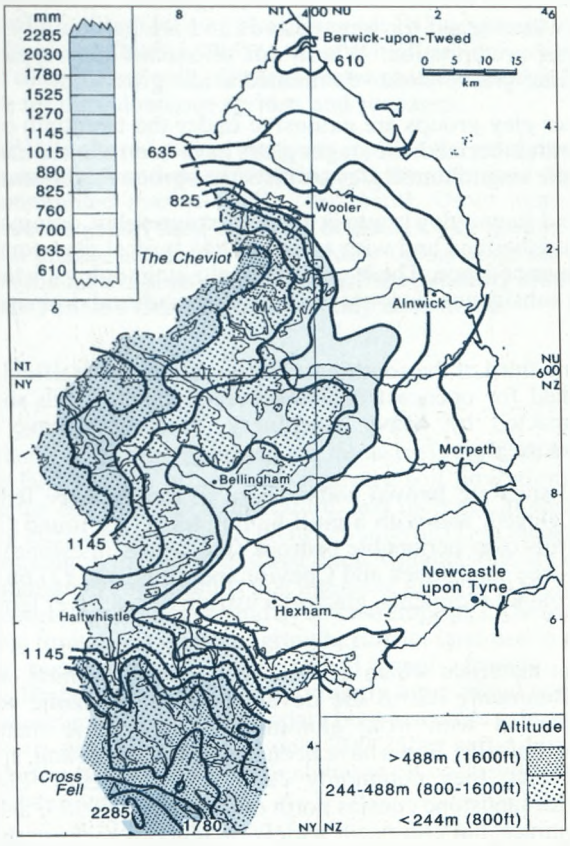


Figure 3 Rainfall, average annual precipitation (mm) (after Northumbrian River Authority, 1973; by kind permission of the Environment Agency, North East Region, Northumbria Area).

It remains to be seen what the effect will be on plant and animal distributions of the predicted global warming caused by the discharge of greenhouse gases into the atmosphere. This *Red Data Book* will at least be a benchmark for monitoring future changes.

Soils

A very large part of lowland Northumberland, and extensive areas in the uplands, are occupied by **surface-water gley soils** with impeded drainage caused by a slowly-permeable subsoil. (Gley soils are characterised by the reduction of ferric compounds in waterlogged conditions.) The distribution of such soils reflects the widespread occurrence of clayey, fine loamy or fine silty soil parent materials, mainly tills and glacio-lacustrine clays and silts.

The surface-water gley soils include **stagnogleys**, with a mineral topsoil, and **stagnohumic gleys** (peaty gleys), with a peaty topsoil 10-40cm thick. Stagnogley soils underlie most of the agricultural land of lowland Northumberland as well as marginal land on either side of the moorland edge, where rushes, especially compact rush *Juncus conglomeratus* and soft-rush *J. effusus*, are conspicuous. The drying-out of surface soils, brought about by the gradual creation since the eighteenth century of an artificial underground drainage system, may have been one of the most significant influences on the lowland flora and fauna since forest clearance, in an environment dominated by stagnogleys. The drains fed into an efficient open ditch network, and the ditches themselves were a new habitat.

Stagnohumic gleys are waterlogged for long periods and are particularly widespread in the uplands with their higher precipitation. Where not afforested they typically carry purple moor-grass *Molinia*- or mat-grass *Nardus*-dominated acidic grassland.

Both of the surface-water gley groups are extensive under the twentieth century coniferous forests of the west of Northumberland; the stagnogleys have been planted mainly with Norway spruce *Picea abies* and the stagnohumic gleys with Sitka spruce *P. sitchensis*.

A subgroup of the lowland stagnogley group is the **pelo-stagnogley**, dominant in the coalfield area of south-east Northumberland and with a higher than typical clay content and therefore an even greater drainage impedance. These coalfield pelo-stagnogleys, when combined with widespread coal-mining subsidence, account for severe agricultural drainage problems in this area.

Since the 1940s about one-third of the south-east Northumberland coalfield area has been, or is currently being, worked for opencast coal. The restored, clay-rich soils (often former pelo-stagnogleys), compacted by heavy machinery, commonly have severe drainage impedance and are immature gleys.

The other main lowland soils are **brown soils**. These generally more fertile soils, neither podzolised nor strongly gleyed, and with a mull humus form, are found (1) on the coarser textured tills, or on thin tills over permeable bedrock (including limestone), or on the flanks of drumlins; (2) on drift-free sandstones and Cheviot andesites; and (3) on water-laid sands and gravels such as ice-contact sediments, glacio-lacustrine deltas, river terraces and modern river alluvium.

In the uplands, on parent materials which are relatively freely-draining (with a high sand content), leaching has commonly led to the development of **podzolic soils**. These have subsurface horizons enriched with iron, aluminium and organic matter, translocated downwards through the soil profile. Bases have been leached from the soil, so that podzols are acidic and nutrient-deficient; they commonly carry *Calluna* heath. Podzolic soils are particularly associated with sandstone cuestas north of the Tyne Corridor and with sandstone plateaux in the North Pennines, but also occur widely on igneous rocks in the Cheviot Hills.

The other extensive soil types in the uplands are **peat soils.** These are principally the soils of the ombrogenous blanket and raised mires, with ombrotrophic vegetation, developed in cool, humid climates. They occur on the higher, western plateaux of the North Pennines, in the

Roman Wall country and Border Hills, and on the higher Cheviot plateaux and summits. The soils of these ombrotrophic mires are very acidic and infertile; they commonly have a very high water-table. The oligotrophic peat carries bog (or 'moss') vegetation.

Peat depths in the blanket bogs of the plateaux and summits are characteristically 1-2m. These bogs are widely dominated by a mixture of *Calluna* and hare's-tail cottongrass *Eriophorum vaginatum*. However the mires in west Northumberland (in the Roman Wall country and lower parts of the Border Hills), occurring mainly at altitudes between 180m and 300m asl, commonly have much deeper peat lenses, with depths of 7-8m or more. They include a few raised mires with the classic cupola shape, but a much larger number of mires which have nearly flat surfaces and which partly fill in the linear depressions between adjacent cuestas, by which they are over-topped. These inter-cuesta mires range from a few topogenous valley mires, with large areas of minerotrophic vegetation (poor-fen), to ombrotrophic mires (bogs) constrained by their inter-cuesta setting. The latter may be considered either as raised or as blanket bogs. There are scores of such mires in this area and in addition ten or so larger mires where adjacent mire units have overtopped cuestas and coalesced.

The deep ombrotrophic mires, where undamaged, have a permanently very high water-table and support a more or less continuous carpet of *Sphagnum* moss; they are *Sphagnum* bogs.

In addition to the widespread soil types just described, there are more restricted areas of other soils which, however, are of considerable importance for a number of species in the *Red Data Book*. Throughout the uplands, there occur larger or smaller soligenous mires (loosely, 'flushes'), with peat soils of varying depth; however flushes occurring on mineral soils are part of the same 'spring fen' habitat complex. They are fed by springs varying chemically from highly calcareous (some producing tufa) to those which are only slightly less base-deficient and acidic than the surrounding soils. Ground-water passing through limestone or calcareous shale is responsible for the calcareous springs and seepages.

Immature soils over little altered parent materials include the **rendzina** group: thin calcareous soils on limestone, and the **sand-pararendzinas** of the stabilized dune systems (calcareous owing to their comminuted marine shell component). Other immature soils are **rankers** (shallow non-calcareous soils): they occur on broken, rocky ground in the sandstone areas, high on the Cheviot granite and rather more widely on scree on the steepest of the Cheviot andesite slopes. The distinctive soils of the Whin Sill are similarly immature. The metalliferous soils of the Northern Pennine Orefield have already been noted.

Land use

Although the lowlands of Northumberland are intensively farmed, a very modest increase in the altitude of the land surface brings with it severe soil limitations on agriculture. This is primarily because the fall in mean temperature, and increase in precipitation, with altitude, cause substantially increased leaching (and hence infertility) in the coarser-textured soils and increased water-logging in the finer-textured ones. Upland soils are often also shallow or on steep slopes. An additional constraint is that intensive grazing in such wet areas would lead to poaching (the development of bare ground by stock trampling). These soil limitations, together with direct climatic limitations on plant growth, restrict land use in the uplands to extensive livestock rearing systems based on moorland rough grazing, or to forestry. Upland Northumberland (the dales excepted) is accordingly a moorland and forest environment. As noted earlier, the moorland edge – the boundary between more or less intensive, and extensive, farming systems – is typically found at only 200-250m asl. Additionally, there is a broad transitional zone below it of livestock farming based on enclosed grassland, much of which is still under rigg-and-furrow.

It should be noted that 'moorland' is used to mean simply uncultivated, substantially unenclosed, treeless upland with semi-natural vegetation. Most is used for grazing by hill sheep or hill cattle, or is managed as grouse moor (a limited area is not in productive use). The natural tree-line, which in Northumberland is located at about 600-750m asl, separates sub-montane

from montane vegetation. Most moorland is in the sub-montane zone and includes a variety of grasslands, heathlands (dominated by dwarf-shrubs, mainly *Calluna vulgaris*) and mires.

Within the lowlands there is a continuum from predominantly arable farming (although including substantial areas of grass leys) in the lower and drier east, to predominantly grassland towards the hills in the west.

The ecological and agricultural differences between the upland, moorland environment, characterized by a cool, wet climate and by nutrient-deficient, acidic, often peaty soils, and the more benign environment of the lowlands, determine the distribution of many species.

Habitats

Uplands

In the uplands of Northumberland extensive conifer plantations, established mainly by the Forestry Commission since 1926, now cover somewhat over 500km^2 of former moorland, about 10% of the area of the county and 25% of that of the uplands. Most of the planting has been in the Border hills and the Roman Wall country, but substantial plantations have also been established on the Fell Sandstone moorlands and smaller ones in the Cheviot Hills. The continuous forest area in the west of the county, popularly known as Kielder Forest, is by far the largest in England and Wales. The predominant species are Sitka and Norway spruces.

There has been relatively little afforestation in the North Pennines, owing to the substantial area of common land there, and to the high altitude of the moorland edge – normally well over 300m asl. This high moorland edge is a consequence of eighteenth and nineteenth century reclamation of the sides of the dales by land-hungry lead-miner smallholders, and it leaves the moorlands above it with a climate unsuitable for good timber yields.

Much of the remainder of the 40% of the county lying above the 250m asl contour is moorland; this includes the greater part of the Ministry of Defence's Otterburn Training Area, 23,500ha bounded approximately by the upper Rede, upper Coquet and Scottish border. The distribution within the moorland areas of the various mainly submontane vegetation types, on the basis of dominant and abundant species, is given in the map *Vegetation of Northumberland* (Lunn, 1976). Most of the vegetation is acidophilous. There are extensive areas of *Agrostis-Festuca* grassland (dominated by bent grasses *Agrostis* spp. and/or sheep's-fescue *Festuca ovina*); *Pteridium* communities (dominated by bracken *P. aquilinum*); *Nardus* grassland (dominated by *N. stricta*) and other types of acidic grassland; and *Calluna-Eriophorum vaginatum* bog. The *Agrostis-Festuca* grassland and *Pteridium* communities occur on brown soils, the drier stagnogleys, and some rankers; the *Nardus* grassland on a range of podzolic and surface-water gley soils; and the *Calluna-Eriophorum vaginatum* bog mainly on blanket peat. What is, however, distinctive about the Northumberland moorlands is the combination of extensive *Molinia* grassland (dominated by *M. caerulea*), extensive upland *Calluna* heath and the considerable number of surviving *Sphagnum* bogs. The *Molinia* grassland and *Sphagnum* bogs characteristically occur together in a mosaic in the cuesta terrain of the Roman Wall country, the former on stagnohumic gleys on till on the dip slopes and the latter in inter-cuesta settings. However, vast areas of former *Molinia* grassland in the Roman Wall country and Border Hills have been afforested, leaving the surviving bogs as openings within spruce plantations.

The west Northumberland bogs collectively support a high proportion of the English population of the large heath butterfly *Coenonympha tullia*.

The *Calluna* heaths are characteristic of podzolic soils in four main areas of the county: granite and andesite lava plateaux and hill slopes in the Cheviots; Fell Sandstone and other sandstone cuesta dip slopes in the centre and east of the moorland area; the slopes of the tabular sandstone hills in the Border Hills (below the blanket bogs of the summits); and on Millstone Grit plateaux in the eastern part of the North Pennines. Much of the heather is managed as grouse moor, although it usually also carries hill sheep. The higher-altitude *Calluna* heaths contain a

substantial admixture of bilberry *Vaccinium myrtillus*, and, on wetter podzols, *Calluna* heaths grade into wet heaths with an admixture of cross-leaved heath *Erica tetralix*.

The majority of flushes within the moorland areas are acidic, and floristically relatively species-poor, but the calcareous flushes are notably species-rich and occur especially in the Ottercops area, in part of the Otterburn Training Area and on the upland fringe south-east of Simonside. *Molinia-Myrica* (bog-myrtle) acidic soligenous mires are a characteristic feature amidst the *Calluna* heaths on the sandstones of upper Coquetdale.

Another upland habitat is limestone grassland, occupying limited areas on rendzinas and related soils in the North Pennines and in the broad zone north of the Tyne Corridor described on page 54. There are also crags, developed in all of the hard-rock lithologies. Most of the metalliferous habitats on mine spoil and river alluvium occur in the North Pennine dales.

Above the natural tree-line are limited areas of montane vegetation. These occur in the North Pennines and Cheviots, and in the latter case include the basophilous communities containing an alpine and/or arctic flora of The Bizzle and Hen Hole.

The hill farms depend on their inbye (improved) grasslands for richer grazing and for winter keep, traditionally as hay but now also as silage. As was the case elsewhere in northern England, many traditionally managed meadows were botanically very rich, and they also supported breeding populations of corncrake and yellow wagtail. Most of these old upland hay meadows (a type of neutral grassland) have been completely altered by heavy applications of nitrogen fertilisers or by year-round grazing, if they have not been destroyed by ploughing and reseeding, and only a handful survive under traditional management. The corncrake has been lost as a breeding species and the yellow wagtail has declined. The best surviving old meadows, in the North Pennine dales, North Tynedale, Redesdale and upper Coquetdale, still support up to thirty species of vascular plant per m^2 (Haffey n.d. but *ca* 1984), and up to 120 species in a field. There are related tall herb communities, particularly along the banks of the North Tyne.

Finally, in the uplands there are limited areas of ancient semi-natural woodland, characteristically on the steep slopes by rivers and burns, dominated variously by oak or birch, but with some alder woods on gentler slopes with impeded drainage. However, only 0.8% of the Northumberland National Park (for example) carries broadleaved semi-natural woodland, not all of which is ancient (that is, dating from before 1600 AD).

Lowlands

The lowland landscape of rural Northumberland, with farm steadings, field patterns and plantations dating largely from the eighteenth and first half of the nineteenth centuries, is characteristically one of large- and medium-sized estates with tenanted farms. Agriculture has long been undertaken on a large scale and is, in its own terms, efficient. Most of the once-numerous wet habitats, associated with the stagnogleys and lowland wetlands, have been lost through drainage. In the most highly-farmed areas – on Tweedside, in Glendale (the lowlands around the Rivers Glen and Till), on the till plain between Berwick and Alnwick, and in the mid-Tyne valley – there is little room for scraps of semi-natural habitat amongst the estate plantations and hedged fields.

Hedges typically date from between 1700 and 1820 (S M Linsley, pers. comm.). There has been comparatively little modern removal of hedges, owing to the initially large size of the fields and the important place of livestock in farming systems. There are some older hedges, for example in Hexhamshire (Richards 1979).

Landed estates have contributed to habitat diversity through the creation of ornamental ponds and lakes: virtually all standing water-bodies in lowland Northumberland are directly or indirectly man-made. Estates also created game-cover, arboreta, parks and gardens. Sycamore *Acer pseudoplatanus*, a naturalised hortal, was widely used in estate improvement and was also, because of its wind-stability, introduced as shelter-planting around upland farmsteads, where it remains characteristic. It is now, as elsewhere in Britain, invasive in deciduous woodlands.

A consequence of the dominance of large landed estates in Northumberland is that private woodland has been a significant element of land use, so that the lowlands (as well as the uplands) are relatively well-wooded. Fifteen percent of the area of the administrative county carries woodland or forest (a figure which is substantially above the eight percent woodland cover for the UK as a whole); and about one-third of this is in the lowlands. Ancient woodland (defined as dating from before 1600 AD and occupying sites greater than 2ha) is also found mainly in the lowlands; it accounts for only 0.96% of the area of Northumberland. Ancient woodland occupies 2.01% of Tyne & Wear, but much of the woodland there is south of the River Tyne, and thus not in Northumberland (Nature Conservancy Council 1987a, 1988). Furthermore, because part of the area of ancient woodland has been replanted, only about 0.6% of the county carries ancient semi-natural woodland, compared with 1.4% for Britain as a whole (Peterken 1993). Much of it occurs in denes, or on the steep banks of rivers such as the Blyth, Wansbeck and Coquet.

Overall 88% of Northumberland's woodland (upland and lowland) is 'mainly coniferous' (Swan, 1993 p88). Assuming that the 12% of non-coniferous woodland occurs mainly in the lowlands, some two-thirds of the area of the lowland woods is coniferous and one-third broadleaved. The ancient semi-natural woods account for, again, about one-third of the latter. However, this calculation is based upon the assumption that the area of ancient semi-natural woodland in sites of less than 2ha is not significant.

Most of the outcrops of the Whin Sill with its distinctive vegetation and flora (page 55) occur in the lowlands or on the upland fringe. Twelve vascular plant species are confined, in Northumberland, to the Whin Sill (Swan 1993).

Lowland fens and other wetland habitats were noted on page 58.

Both agriculture and industry have exploited the mineral resources of Northumberland, in addition to coal and the North Pennine ores. Limestone, sandstone, quartz-dolerite (whinstone), Cheviot igneous rocks, ironstone, clay (from till, but especially from glacio-lacustrine clays – for bricks, roofing tiles and field drains), sand, gravel and peat were all quarried or dug at the surface. There remain a number of active hard-rock quarries and sand and gravel workings. These past and present activities have created a variety of pond, quarry-face and spoil habitats which, in intensively farmed areas, are some of the few semi-natural habitats available. Indeed, as agricultural reclamation has reduced the number and size of natural lowland wetland habitats, coal mining subsidence (mainly in the south-east), quarrying activities and landed estate improvements have created others.

Coalfield

In the south-east Northumberland coalfield (including the Tyneside conurbation), many habitats are a result of centuries of coal mining and of industrial and urban land use. They include the one hundred or so mining subsidence ponds and innumerable other subsidence wetlands, colliery spoil (now rapidly dwindling in extent owing to reclamation schemes), mineral railways (mainly disused), docks and the active and former opencast coal sites. The ballast hills have almost completely disappeared. Industry and housing provide a further series of habitats, and waste ground occurs as disused railways, old allotments, and abandoned factory sites, shipyards and docks.

One of the subsidence ponds, Cresswell Pond, is accessible by the sea and its brackish water is responsible for marginal salt-marsh.

Opencast coal workings have been restored in part as nature reserves, which feature deliberately-created ponds and other wetlands; reserves include those at Low Hauxley, Druridge Pool and, very recently, East Chevington. Apparently particularly associated with the subsidence ponds and other ponds left by mineral working is the great crested newt *Triturus cristatus*. This is possibly in part because the ponds are close enough together to allow population interchange and also because of the absence of predatory fish in recently-formed ponds.

Workable coal is not confined to the south-east Northumberland coalfield. Thick seams were formerly mined in the string of small outliers of the Coal Measures in the Tyne Corridor – in the Haltwhistle-Lambley area and elsewhere. Among the resulting habitats is an extensive subsidence wetland at Coanwood. Additionally, coal seams in both the Scremerston Coal Group and the Limestone groups were worked widely in rural Northumberland.

Although most of the larger colliery spoil heaps have gone, the long, chalk spoil heap from the former ICI fertiliser and explosive works at Low Prudhoe survives. It was turved during the Second World War to make it less conspicuous as a marker for German bombers, and the resulting chalk grassland is analogous to chalk downland as regards flora and fauna.

Many, although not all, of the surviving lowland fragments of floristically-rich old neutral grassland are in the coalfield area of south-east Northumberland (elsewhere they have largely been ploughed out). This is, at least in part, a result of the less intensive agricultural systems which characterised this area owing to management problems associated with subsidence and with the network of coal-roads, lanes and wagonways which criss-crossed and fragmented farmland. In this area, too, the prevalent pelo-stagnogleys have resisted leaching, thus maintaining their base-status and the fact that south-east Northumberland is the warmest and one of the driest parts of the county would also minimise leaching. A number of plant species at or near the northern limits of their geographical ranges in Britain occur in these relict clay pastures.

River systems, lakes and reservoirs

Of Northumberland's main rivers, the Coquet is notable as a near-natural system from its headwater streams to its lowland reaches, but all of the larger rivers, including the Tyne, sustain healthy breeding populations of Atlantic salmon *Salmo salar*. The white-clawed crayfish *Austropotamobius pallipes*, characteristic of clean stony waters, is present in the Wansbeck and Aln systems, and the fresh water pearl mussel *Margaritifera margaritifera*, still found in the North Tyne/Rede system, is also associated with near-natural rivers. The lampern *Lampetra fluviatilis*, brook lamprey *L. planeri* and marine lamprey *Petromyzon marinus* are all characteristic of high-quality river systems; all occur in the Coquet and at least one of these species occurs in most of the main rivers.

The wide cobble-gravel beds of the upland reaches of the rivers and larger streams locally support rich ruderal and ephemeral floras rooted in the fine sediments between the stones. These floras, however, vary from one river system to another. The Pennine rivers not only have metallophytes (most abundant, however, on the low terraces), but also a suite of calcicoles – a consequence of a significant limestone component in the gravels – and occasional montane species whose propagules have been washed down from the head of the South Tyne in Cumbria. In contrast, the North Tyne channel gravels and river banks are neither metalliferous, nor (except very locally) calcareous, nor are they replenished with montane propagules. It is not surprising that the flora of this river is both different from and less rich than that of the South Tyne and its tributaries. Nevertheless, the Rivers North Tyne and Rede support on their channel alluvium most of the known British population of the fugitive ruderal northern spike-rush *Eleocharis austriaca*, a national Red Data Book species. The upper Coquet and other Cheviot rivers contain a high proportion of igneous material in their alluvium, which is therefore relatively base-rich and supports a more basophilous flora.

Very few fragments of natural floodplain habitat survive along the main rivers, owing mainly to reclamation for agriculture, although in recent years the Northumberland Wildlife Trust's otter recovery project has successfully encouraged riparian owners to restore scrub and wetland alongside north Northumberland rivers.

There are few natural lakes in Northumberland, the largest being the eutrophic loughs of the Roman Wall country, with hard waters dominated by calcium bicarbonate (derived from the local limestones). They contrast with small dystrophic lakes on non-calcareous bedrocks and amidst peaty soils, such as Coldmartin, Blackaburn and Whitfield Loughs (Sutcliffe 1972).

Large water-supply reservoirs date from the last hundred years. Catcleugh reservoir in upper Redesdale, completed in 1905, is the oldest and most mature; the Derwent reservoir, on the upper Derwent (and half in County Durham), is more recent (1966); and most recent is the immense Kielder Water in upper North Tynedale (1982), set within Kielder Forest. There is also a system of smaller reservoirs, many of them on the upland fringe, of which the Whittle Dene complex dates back to 1848. Catcleugh has low concentrations of dissolved salts and a pH near neutral, whilst Colt Crag reservoir has moderately hard water.

Coastlands

The main habitats along Northumberland's 100km of coastline were described on pages 55-57. They are remarkably diverse and include extensive sand-dune systems, many with dune slacks (not otherwise well-developed on the east coast of England), tidal estuaries and partly-enclosed bays with sand- and mud-flats ('slakes'), and salt-marsh. Lindisfarne National Nature Reserve is of major importance for its dune/slack systems and its tidal slakes. The latter have rich infaunal communities and support an exceptionally diverse assemblage of wintering waterfowl. Additionally the slakes have the largest intertidal beds of narrow-leaved eelgrass *Zostera angustifolia* and dwarf eelgrass *Z. noltii* on the east coast of England (JNCC 1997). The Farne Islands and Coquet Island are also of major importance, for breeding seabirds and breeding grey seal *Halichoerus grypus*. The mainland cliffs, too, support seabird colonies as well as halophyte plants, and sloping seabanks with associated flushes sustain a distinctive vegetation.

The dune systems, mainly calcareous, are geographically isolated from other systems by cliffed coasts in Berwickshire and in County Durham and they support a distinctive flora. They include a variety of embryonic shifting dunes and of fixed (grey) dunes. Bloody crane's-bill *Geranium sanguineum* is particularly prominent on the latter.

The sandy foreshores and wave-cut rock platforms and reefs, washed by relatively unpolluted waters from the northern North Atlantic, support a rich littoral biota. In particular the subtidal and littoral reefs of the north Northumberland coast (with Berwickshire) are the most diverse known on the British North Sea coast, and the Farne Islands are the only rocky islands with extensive reefs in the entire North Sea. Several reef species reach their southern limits in these cold waters (JNCC 1997).

Northumberland's key habitats

Northumberland possesses about a hundred Sites of Special Scientific Interest (SSSIs). Six Northumberland sites or composite sites are being put forward as Special Areas of Conservation (SACs) and four have been selected as Special Protection Areas (SPAs), as components of the *Natura 2000* network of European protected areas.

We may analyse Northumberland's habitats according to:

(i) their representation in the *Biodiversity: the UK Action Plan* (1994) list of key habitats, and

(ii) their selection as SPAs and candidate SACs.

Table 1 lists the twenty-three out of thirty-eight key habitats in *The UK Steering Group Report* (1995) which occur in Northumberland (where only trivial examples occur they are omitted). It notes: (i) whether they are a priority habitat type in Annex I of the *EU Habitats Directive* (EEC 1992), where there is equivalence of nomenclature; (ii) the quality of the habitat type in Northumberland; (iii) the area of the habitat type in Northumberland (having regard to its characteristic pattern of site occupation); and (iv) the proportion of the national area of the habitat type which occurs in Northumberland. For (ii), (iii) and (iv) a subjective score of one (low) to three (high) stars is allotted.

Tables 2 and 3 are lists of the SPAs and candidate SACs in Northumberland. SPAs are classified for the conservation of bird species listed in Annex I of the *Birds Directive* (EEC 1979) and for regularly occurring migratory species; the species are noted against the name of

the SPA. Similarly for candidate SACs, the habitat types (from the *Habitats Directive*, Annex I) for which the SACs were selected are noted, and also any additional habitat types from Annex I which they contain. The *Habitats Directive* also requires designation of SACs to protect species of Community interest (listed in Annex II), and these are noted where relevant.

Table 1

UK Steering Group Report Key Habitats

Habitat type	*'Priority'*	*Quality*	*Area*	*Proportion*
Ancient and/or species-rich hedges	-	*	*	*
Blanket bog	yes[1]	***	***	**
Cereal field margins	-	*	*	*
Coastal saltmarsh	-	**	*	*
Coastal sand dune	yes[2]	***	***	**
Estuaries	-	*	*	*
Eutrophic standing waters	-	*	*	*
Fens[3]	yes (in part[4])	**	**	*
Lowland calcareous grassland[5]	-	***	***	***
Lowland hay meadow[6]	-	**	*	*
Lowland wood pastures and parklands	-	*	*	*
Maritime cliff and slope	-	***	**	*
Native pinewood[7]	-	*	*	*
Raised bog	yes[8]	***	***	**
Reedbeds[9]	-	*	*	*
Saline lagoons[10]	yes	*	*	*
Seagrass beds[11]	-	***	**	**
Upland calcareous grassland	-	*	*	*
Upland hay meadow	-	**	*	*
Upland heathland	-	***	***	**
Upland mixed ash woodland	yes[12]	*	*	*
Upland oakwood	-	*	*	*
Wet woodlands	yes	**	**	*

Notes

1 Only active blanket bog is a priority habitat type; the higher-altitude and more extensive of the series of ombrotrophic mires in west Northumberland and elsewhere are blanket bogs.

2 'Fixed dunes with herbaceous vegetaton (grey dunes)' are a priority habitat type.

3 Interpreted to include the more basic flushes.

4 'Petrifying springs with tufa formation' are a priority habitat type.

5 Interpreted (perhaps perversely) as including grassland on immature soils on the Whin Sill (there are also patches of limestone grassland, especially near the coast).

6 Interpreted to include lightly grazed old neutral pastures.

7 The fragment of pine woodland at William's Cleugh, on Kielderhead Moor, and a few other fragments, may be native (Swan 1993).

8 Only active raised bog is a priority habitat type; some of the individual mires which occur at lower altitude within the series of ombrotrophic mires in west Northumberland are taken to be raised bogs.

9 Reedbeds are not currently extensive in Northumberland but a very large one is being created at East Chevington.

10 The most important example is Cresswell Pond.

11 Seagrass = eelgrass *Zostera* spp.

12 If '*Tilio-Acerion* ravine forests' encompasses local ravine ashwoods, as is suggested in JNCC (1997).

Table 2

Special Protection Areas[1]

Lindisfarne

Whooper swan†, greylag and light-bellied brent geese, shelduck, wigeon, eider, long-tailed duck, common scoter, red-breasted merganser, ringed plover, golden plover†, grey plover, sanderling, dunlin, bar-tailed godwit, redshank, roseate† and little† terns.

Holburn Lake and Moss[2]

Greylag goose.

Farne Islands[3]

Cormorant, shag, eider, lesser black-backed gull, kittiwake, Sandwich†, roseate†, common† and arctic† terns, guillemot, puffin.

Coquet Island[3]

Eider, black-headed gull, Sandwich†, roseate† and common† terns, puffin

† Listed in Annex I of the *Birds Directive*

1 Proposed SPAs are moorlands in the North Pennines, and additional sections of the Northumberland coast.

2 An ombrotrophic raised mire in the north-east of the county.

3 For the Farne Islands and Coquet Island, species for which the sites have important UK populations are listed.

Table 3

Candidate Special Areas of Conservation

Tyne and Allen River Gravels

calaminarian grasslands[1]

Newham Fen

alkaline fens

Border Mires, Kielder - Butterburn[2]

*active blanket bog

also present: *active raised bog, alkaline fens, dry heaths, Northern Atlantic wet heaths with *Erica tetralix*.

North Pennine Dales Meadows[3]

mountain hay meadows (British types with *Geranium sylvaticum*)

Berwickshire and North Northumberland Coast[4]

reefs, mudflats and sandflats not covered by seawater at low tide, submerged or partly submerged sea caves, grey seal *Halichoerus grypus*.

North Northumberland Dunes

embryonic shifting dunes, *fixed dunes with herbaceous vegetation (grey dunes), dunes with *Salix arenaria*[5], humid dune slacks, petalwort *Petalophyllum ralfsii*.

* Priority habitat types

1 Heavy-metal contaminated grasslands

2 A composite site, partly in Cumbria, extending from Spadeadam to upper Redesdale; it includes many individual mires, some very extensive

3 Only a small part is in Northumberland; several individual fields

4 Partly in Berwickshire

5 *Salix arenaria* = *S. repens* subsp. *arenaria*.

It is clear from both approaches that Northumberland's coastal habitats (including the near-offshore) and its mires are of particular international and national importance. The species entries in this *Red Data Book* provide the evidence that a remarkable range of biota is associated with these habitats. Of the local habitat types which are not spotlighted by either of these approaches, perhaps the subsidence ponds on the coalfield are the most important.

Red squirrel, by Allan Potts

MAMMALS

L J Kerslake and J L Foster-Smith (marine species)

More than forty species of mammal (excluding cetaceans) are regularly recorded in Northumberland of which twenty-eight (approximately 65%) are represented on the red data list below. However, some of the listed species, although believed to be of national conservation concern, may be stable or even thriving in Northumberland.

Mammal recording in the county has been intermittent and generally uncoordinated. No systematic account has been published since that of Mennell and Perkins (1864) in which the authors admitted imperfections. Many local naturalists take a general interest in mammals but records are not always passed on for systematic collation. Consequently information on the status and distribution of mammals in the county is correspondingly patchy. An important exception is the grey seal colony on the Farne Islands which has been thoroughly documented (Selby 1841; Hickling 1962; Thompson and Hickling 1973; Hawkey 1991), particularly by Goddard in the 1920s-1940s, by Hickling in the 1940s-1986, and by Hawkey in the 1970s-1990s as recorded in a series of papers (from 1955-91) in these *Transactions*. A few other species accounts have been published: on bats (Bolam 1924); badger (Cowen 1955); red squirrel (Temperley 1953); roe deer (Tegner 1955; Cowen, Ridley and Tegner 1965); and Chillingham wild (ie. park) cattle (Bilton 1957). For some species, such as otter and red squirrel, regular surveys have been carried out and we can be fairly confident about their current status. Others, such as water vole and pine marten, have only recently begun to attract serious attention and, although information about them is beginning to emerge, it remains limited. The exact status of most of the species listed is unclear.

In 1997 a Mammal Group was formed for Northumbria and a mammal recorder enlisted; so we have reason to hope that there will be an improvement in the amount and quality of information available in the future.

Mammals have been selected for inclusion according to the following criteria:

Eur	Important European population (as stated by Harris *et al.* 1995)
H	Listed on Annex 2 or 4 of the EU *Habitats Directive* (EEC 1992)
L	Listed on *UK Steering Group Report* long list (1995)
M	Listed on *UK Steering Group* middle list
NP	Prospective breeding species in Northumberland
NR	Rare in Northumberland (but may be common elsewhere)
S	Listed on *UK Steering Group* short list
W	Protected under Schedule 5 of *Wildlife and Countryside Act* 1981
Wp	Partial protection under Schedule 5 of *Wildife and Countryside Act* 1981

In addition, the code 'RDB' is used to indicate where a species is listed in the mammal *Red Data Book* (Morris 1993).

The criteria for proposing the preparation of a Species Action Plan are: threat to the species; importance of the species (in terms of its status as indicated); and practicality, i.e. whether it is possible to take any effective action. Certain mammals, for example brown hare, might benefit from the generic habitat action plans to be prepared for various bird species.

Species Action Plans have not been suggested for any of the marine mammals because it is not thought that there is yet sufficient information on which to base a decision about which species would benefit from the preparation of SAPs.

Species		Criteria/status
Hedgehog	*Erinaceus europaeus*	**L** RDB

Habitat: mainly woodlands, gardens.

The *UK Steering Group Report* (1995) indicated that the number of hedgehogs is believed to be declining but more research is needed to establish whether this is the case. Frequent road kills, habitat change and effects of pesticides may be causes of decline. It is possible to obtain advice from the British Hedgehog Preservation Society to assist hedgehogs which have been injured or are too undernourished to survive the winter unaided.

Well distributed throughout the county including the Cheviots to 300m above sea level.

Common shrew	*Sorex araneus*	**L** RDB

Habitat: woodlands, hedgerows, dunes, rough grasslands and moorland to 600m above sea level.

The *UK Steering Group Report* indicated that the population is believed to be declining but more research is needed to establish whether this is the case. Harris *et al.* (1995) suggest that declines may be due to habitat loss and increased use of insecticides but that this could be offset by the provision of agricultural set-aside land.

Pygmy shrew	*Sorex minutus*	**L** RDB

Habitat: woodlands, hedgerows, dunes, rough grasslands and moorland to 600m above sea level.

As for the previous species, the *UK Steering Group Report* indicated that the population is believed to be declining but more research is needed to establish whether this is the case. Again, Harris *et al.* (1995) suggest that declines may be due to habitat loss and increased use of insecticides but that this may be offset by providing more set-aside land.

Water shrew	*Neomys fodiens*	**L** RDB

Habitat: waterside vegetation, especially small shallow streams and ditches.

The *UK Steering Group Report* indicated that the population is believed to be declining but more research is needed to establish whether this is the case. The reasons for any decline are unknown; possibly habitat destruction (Harris *et al.* 1995).

There have been few records (about twelve) in the county, but the species is probably under-recorded.

Bats (all species)	*Chiroptera*	RDB

Habitat and distribution varies depending on species.

Seven species are recorded as breeding:

Whiskered	*Myotis mystacinus*	**L W**
Brandt's	*Myotis brandtii*	**L W**
Natterer's	*Myotis nattereri*	**L W**

Daubenton's	*Myotis daubentonii*	**L W**
Noctule	*Nyctalus noctula*	**L W**
Pipistrelle	*Pipistrellus pipistrellus*	**S W**
Brown long-eared	*Plecotus auritus*	**L W**

In addition, **Leisler's bat** *Nyctalus leisleri* (**L W**) has been recorded once in the county.

All bats and their roosts are protected and advice can be obtained from English Nature. Most species are believed to be declining and further research is needed. The Northumberland Bat Group is currently preparing a report of recorded roosts.

SPECIES ACTION PLANS REQUIRED.

Brown hare,
by Allan Potts

Brown hare *Lepus europaeus* **Eur S**
RDB

Habitat: mixed farmland, especially where small fields and old hedges persist, and marginal land in the uplands. The species is found up to 600m above sea level in summer, overlapping the mountain hare's former altitudinal range.

The *UK Steering Group Report* (1995) indicates that the species has suffered a severe decline in Britain of 25-49% over the last twenty-five years, possibly due to agricultural change. The British population is important in a European context (Harris *et al.* 1995).

Still fairly common in the county; a frequent road casualty.

The brown hare is a wide ranging species, so it is not possible to protect it by site designation.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Mountain hare *Lepus timidus* **L**
RDB

Habitat: higher uplands, where it generally replaces the brown hare, although in Northumberland their ranges have overlapped.

It may be susceptible to climatic variability, which would enhance the vulnerability of small populations (Harris *et al.* 1995).

It was formerly present, certainly until the mid 1980s, in the Harthope Valley. There have been recent unconfirmed sightings. More research is required.

Red squirrel *Sciurus vulgaris* **S W**
RDB

Habitat: woodlands, including conifer plantations.

Largely displaced by the introduced grey squirrel *S. carolinensis* over most of England but still widespread in Northumberland. It is adapted to coniferous habitats so areas such as Kielder are likely to become its remaining strongholds.

Grey squirrels have recently begun to colonise the county from both the north and the south. There is a need to control greys and to encourage reds by appropriate tree planting and by supplementary feeding at critical sites and at times of natural food shortage.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Water vole *Arvicola terrestris* **S**
RDB

Habitat: waterways and wetlands with good vegetation cover.

Largely restricted to the banks of streams, ditches and rivers. It depends on good vegetation cover for food and for protection from predators, particularly mink.

The combination of high mink predation and loss of habitat have caused a 70% decline nationally in the last twenty-five years.

Recent surveys have confirmed that it has disappeared from many previous sites in the county. It is being considered for protection under a review of the *Wildlife and Countryside Act* (1981).

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Harvest mouse *Micromys minutus* **NR**

Habitat: lowland areas with tall vegetation, including reeds, arable crops, grassland and hedgerows.

One old record for the county; rediscovered in 1996 near Causey Park.

SPECIES ACTION PLAN REQUIRED.

Common dormouse *Muscardinus avellanarius* **H S W**
RDB

Habitat: deciduous woodland with good shrub layer, especially hazel *Corylus avellana.*

Important in a European context, the British population of this species has suffered a 25-49% decline in the last twenty-five years. The main cause probably lies in changes in woodland management. Northumberland has the most northerly population of dormice in Great Britain.

SPECIES ACTION PLAN REQUIRED.

Pine marten *Martes martes* **L W**
RDB

Habitat: undisturbed upland areas with scattered woodland; forest edges.

Scotland is the main stronghold of the pine marten. It is currently expanding its range and is occasionally seen in Northumberland, where suitable habitat is relatively abundant.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Stoat *Mustela erminea* **L**

Habitat: various, including woodland, moorland and grassland.

The *UK Steering Group Report* indicated that the stoat is believed to be declining nationally but there is no evidence of this locally – more research is needed. Stoats are often trapped in keepered areas and are frequently seen as road casualties. They may be affected by reductions in the numbers of farmland birds and possibly by secondary poisoning when they consume rodents contaminated by pesticides.

Weasel *Mustela nivalis* **L**

Habitat: various, including woodland, moorland and grassland.

The *UK Steering Group Report* indicated a 25-49% decline in the numbers and range of weasels in Great Britain over the last twenty-five years but there is no evidence of a local decline. They are often trapped in keepered areas and are frequently seen as road casualties. Weasels, like stoats, may be affected by scarcity of prey or by secondary poisoning.

Polecat *Mustela putorius* **L NP Wp**
RDB

Habitat: various, including woodland, farmland and coasts; often makes use of farm buildings.

Listed in the *UK Steering Group Report* as having an unfavourable conservation status in Europe.

The polecat suffered a severe decline in Britain in the 19th century, remaining common only in parts of Wales. The population is now expanding and there are established colonies in Cumbria. There have been recent unconfirmed records of road casualties in Durham and Northumberland and the polecat may recolonise the county in the near future.

Badger *Meles meles* **L**
RDB

Habitat: woodland and hedgerows but setts are found in widely varying habitats, including treeless habitat up to 600m above sea level in the Cheviots.

Research by Harris *et al.* (1995) indicates that in many areas numbers are stable; this will not be confirmed until the National Badger Survey is completed.

Widely distributed and relatively common throughout the county, and frequently seen as a road casualty; there is no evidence of local decline.

Otter *Lutra lutra* **H S W RDB**

Habitat: varied, but especially undisturbed rivers and wetlands with good water quality, suitable riparian habitat and adequate prey availability; also coasts, though generally not in Northumberland.

A species of international concern which suffered a serious population decline in the 1950s-1960s; now recovering in many places, including Northumberland.

The county distribution is centred on the Rivers Till, Coquet, Wansbeck and Tyne although it is expanding into other river systems, including the Blyth.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Common seal *Phoca vitulina* **H L**

Habitat: marine/coastal, feeding at sea but hauling out on rocky shores and intertidal muds and sands to rest and breed.

A species of European conservation concern, listed on Annex II of the *EU Habitats Directive* as being of Community interest.

A small colony breeds on Lindisfarne. Not infrequently seen in the Aln and Coquet estuaries.

Grey seal *Halichoerus grypus* **Eur H L**

Habitat: coastal, hauling out onto rocky shores and offshore islands.

The population in UK waters is of international importance, being 50-74% of the world population. The species is threatened by a variety of fishery interests. It is listed in Annex II of the *EU Habitats Directive* as being of Community interest.

There is a breeding population of approximately 4000 individuals on the Farne Islands, the most important breeding site in England. This population represents 95% of the European Union population and 50% of the world population. Small groups also haul out on reefs at Newton-by-the-Sea and on Coquet Island. The local population is believed to be stable.

Red deer *Cervus elaphus* **L**

Habitat: mainly upland woods and moorland.

The species is increasing in the UK where the population is of international importance, being 25-49% of the world population.

Infrequent records in the county may represent escapes from deer farms or casual immigrants from Cumbrian populations.

Fallow deer *Dama dama* **L**

Habitat: mainly lowland woods.

An introduced species, believed to be declining internationally, but more research is needed. It is increasing in the UK. There are herds in some local estates, including Chillingham.

Roe deer *Capreolus capreolus* **L**

Habitat: mainly woodland.

Increasing in the UK; believed to be declining internationally but more research is needed.

Locally very abundant, especially in conifer forests; consequently it is culled in some areas. Seen at up to 600m above sea level in the Cheviots.

Park cattle *Bos taurus* **Ii**

Habitat: extensive parkland including woodland and moorland.

Of Britain's park cattle, only the Chillingham herd has been kept pure. The cattle are remarkably homozygous and show no affinity with any other breed. They are white with partly red ears and are horned. Skeletally they resemble mediaeval British cattle. The herd's origins are unknown. It may be directly derived from native *Bos primigenius*, but is more likely to be a feral domestic breed, mediaeval or earlier; perhaps white mutants were walled in as a curiosity or for hunting. It is one of the very few herds of cattle in the world that is completely feral, with a natural sex ratio and age distribution. They are found in Chillingham Park, where they were enclosed by the thirteenth century; in April 1997 there were twenty males and twenty-six females. The herd is managed by the Chillingham Wild Cattle Association Ltd and is backed by a reserve herd in Morayshire, established from the Chillingham herd in 1972. (Information from Harris *et al.* 1995 and the reports of the Association.)

Feral goat *Capra hircus* **Eur**

Habitat: moorlands.

An introduced but long established species; Great Britain has an important European population, comprising approximately half the ancient feral caprines in Europe (Harris *et al.* 1995).

Present above Kielder Forest and in the Cheviots, particularly at Kielderhead, Coquet Head and the College Valley.

MARINE MAMMALS OCCURRING OFF THE NORTHUMBERLAND COAST

Fin whale	*Balaenoptera physalus*	**H L W**
Minke whale	*B. acutorostrata*	**H L W**
Sperm whale	*Physeter catodon*	**H M W**
White whale	*Delphinapterus leucas*	**H L W**
Northern bottle-nosed whale	*Hyperoodon ampullatus*	**H L W**
Sowerby's beaked whale	*Mesoplodon bidens*	**H L W**
Common porpoise	*Phocoena phocoena*	**H S W**
Common dolphin	*Delphinus delphis*	**H L W**
Bottle-nosed dolphin	*Tursiops truncatus*	**H M W**
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	**H L W**
White-beaked dolphin	*L. albirostris*	**H L W**
False killer whale	*Pseudorca crassidens*	**H L W**
Killer whale	*Orcinus orca*	**H L W**
Long-finned pilot whale	*Globicephala melas*	**H L W**

BIRDS

B Galloway, L J Kerslake, A G Lunn, D C Noble-Rollin, B N Rossiter, R Sinton

Bird recording in Northumberland has a long history. The first complete account by Selby (1831) was followed by those of Hancock (1874), Bolam (1912, 1932) and, most recently, Galloway and Meek (1978-1983). Before Selby's work a number of key species had been described by Wallis (1769) and some yet earlier records were reviewed by Gardner-Medwin (1985). It is certain that the county's records for birds are more comprehensive than for any other group. The Northumberland and Tyneside Bird Club has had more than thirty years of involvement in ornithological surveys in the area and the British Trust for Ornithology, Natural History Society of Northumbria and RSPB are also active.

During a survey of breeding birds in Northumberland in 1988 to 1993, some 165 bird species were recorded, of which 149 were confirmed as breeding (Day *et al.* 1995). Sixty-eight species of breeding birds are included below, representing approximately 46% of the total breeding bird species in the county. Many more species winter in Northumberland, or migrate through the county, and fourteen of these are included below because they have important wintering populations or are prospective breeding species.

Proposed Species Action Plans are given a priority rating of 1 or 2. Priority 1 Plans will be prepared within a year of publication of the RDB and Priority 2 Plans within two years.

Some groups of species would benefit from the improvement of particular habitats, for example reedbeds, wet grasslands, moorlands and open water. It is therefore intended to prepare generic plans for these habitats to benefit the relevant bird species. These Habitat Action Plans are referred to in the relevant species accounts.

Birds were selected for inclusion according to the criteria listed below. The list of criteria is divided into two sections: species which appear on the national Red List (*Birds of Conservation Concern*, RSPB 1996, which effectively replaced the listing in the *1990 Red Data Birds in Britain*,) and other species occurring in Northumberland.

UK red listed species occurring in Northumberland

D **Rapid or historical decline**

Only includes species occurring regularly in Northumberland

Only includes confirmed breeders

G **Globally threatened**

All other species occurring in Northumberland

Ii **International importance**

5% of global/flyway breeding or wintering population occurs in Northumberland

ND **Locally declining species**

50% or greater decline in breeding range between 1967-72 and 1988-92 (Day *et al.* 1995)

50% or greater decline in population over last 25 years

Evidence of very long term decline in numbers or range

NL **Localised species**

More than 50% of the Northumberland breeding or wintering population occurs at five sites or fewer

NM **Maintained populations**

National Amber species (RSPB 1996) or species on the BTO lists (1997) which have declined nationally but which have maintained their populations in Northumberland (included only in the annex on pages 94-95)

NP **Prospective species**

Species not currently present or not currently breeding but which are a high priority for (re)establishment.

NR **Rare species**

Fewer than 100 breeding pairs in Northumberland

Pop **National importance**

10% or more of the national breeding or wintering population occurs in Northumberland

Key to national conservation status of birds

Amb	Listed on national Amber list (RSPB 1996)
B	Listed on Annex 1 of the *Birds Directive* (EEC 1979)
BTOh	On the BTO high alert list (BTO 1997)
BTOm	On the BTO medium alert list (BTO 1997)
L	Listed on the *UK Steering Group Report* long list 1995
M	Listed on *UK Steering Group Report* middle list
RDB	Listed on national Red List (RSPB 1996)
S	Listed on *UK Steering Group Report* short list
W	Protected under Schedule 1 of *Wildlife and Countryside Act* 1981
Wp	Partial protection under Schedule 1 of *Wildlife and Countryside Act* 1981

Species **Criteria/status**

Little grebe *Tachybaptus ruficollis* **NR**

Habitat: small ponds and lakes with suitable water quality, stable water levels and open water areas but with a fringe of diverse vegetation to build nests and to hide young. Feeds on small fish, tadpoles and aquatic invertebrates.

Rare breeding species. Its main strongholds are small waterbodies in south-east Northumberland. The escaped American mink *Mustela vison* can be a significant predator.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Great crested grebe *Podiceps cristatus* **NR**

Habitat: similar to the above but prefers larger water areas.

Rare breeding species. Virtually absent from the north of the county, largely found in mining subsidence ponds and reservoirs. Nests and young are vulnerable to predation.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Red-necked grebe *Podiceps grisegena* **NP**
Amb L

Habitat: shallow well-vegetated lakes and ponds.

Regular passage and winter visitor that sometimes remains into summer, but there has been no evidence of breeding.

Black-necked grebe *Podiceps nigricollis* **NL NR Pop**
Amb L W

Habitat: shallow lakes with good growth of aquatic vegetation, perhaps especially amphibious bistort *Persicaria amphibia*. Sometimes associated with black-headed gull colonies.

Established in Northumberland as a regular but rare and localised breeding species only since 1977. Now breeding in nationally significant numbers in the county. Has recently become the target of egg collectors.

SPECIES ACTION PLAN REQUIRED: PRIORITY 1.

Shag *Phalacrocorax aristotelis* **NL**
Amb L

Habitat: coastal cliffs, islands.

The most significant colony is on the Farne Islands, where regular breeding commenced as recently as 1931; by 1994 there were almost 2000 pairs.

The population can suffer from breeding failure if there is stormy weather in the nesting season.

Bittern *Botaurus stellaris* **D NP**
B RDB S W

Habitat: large reedbeds.

The UK population has suffered a long-term decline, mainly due to loss of habitat.

A regular visitor, mainly in winter; it last bred in 1956, in Gosforth Park. The creation of new and extended reedbeds would assist recolonisation. The aim is to encourage birds to overwinter and then to stay to breed.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

Greylag goose *Anser anser* **NR**
Amb L

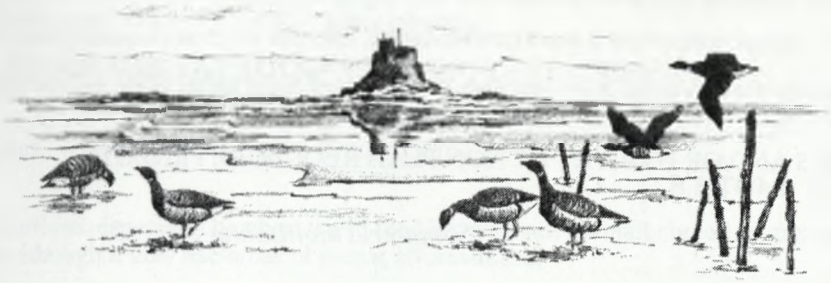
Habitat: eutrophic open water with nearby land suitable for grazing.

Well established wintering population; rare localised breeding has occurred since 1974, as a feral breeding population has moved north in Britain.

Brent goose *Branta bernicla hrota* **Ii NL Pop**
(Pale-bellied race) Amb L

Habitat: winters on intertidal mudflats with adequate growths of eel-grass *Zostera* spp. and certain marine algae.

Found mainly at Lindisfarne. Until the late 19th century *Branta b. hrota* dominated the population there but was then replaced by smaller numbers of the dark-bellied race for more than fifty years; it has increased again in numbers since persecution at Spitzbergen ceased in about the 1950s. The wintering palearctic population of the *hrota* race has been partially



Brent geese at Holy Island, by Joan Holding

displaced from Denmark, perhaps by disturbance. Almost the entire Spitsbergen and Franz Josef Land populations of this race now spend part of the winter at Lindisfarne. In 1997 an experimental 'refuge', where shooting is banned for two seasons, was established over part of Fenham Flats at Lindisfarne. At risk from excessive disturbance or from failure of the *Zostera*.

Wigeon *Anas penelope* **NL NR**
Amb L

Habitat: wetlands, it breeds especially in moorland areas. Prefers open water with grassy edges to provide food for the young.

Abundant winter visitor; rare and localised breeding is concentrated in two main areas in the county; more potential sites, in the form of moorland ponds, need to be created.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Gadwall *Anas strepera* **NL NR**
Amb L

Habitat: inland lakes though also seen on waters near the coast.

Rare and localised as a breeding species, but increasing.

Garganey *Anas querquedula* **NR**
Amb L W

Habitat: shallow lakes and pools in marshland or wet meadows.

Occurs in most springs on ponds in south-east Northumberland, especially in the Druridge Bay area; breeding has occasionally been recorded since 1965, but may be difficult to confirm.

Shoveler *Anas clypeata* **NR**
Amb L

Habitat: shallow mining subsidence ponds and marshy areas, like that of little grebe.

Rare breeding species, but has shown a steady increase in recent years.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Pochard *Aythya ferina* **NR**
Amb L

Habitat: deeper water with a good benthic fauna, like that of great crested grebe.

A common winter visitor. Rare breeding has occurred since about 1890, except from 1945 to around 1965.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Eider *Somateria mollissima* **NL**
Amb L

Habitat: coasts and islands.

Breeding on the Farne Islands was documented in the 7th century. The Farnes and Coquet Island remain the main breeding sites with some mainland coastal sites. Human disturbance and ground predators will limit the latter.

Goldeneye *Bucephala clangula* **NP**
Amb L Wp

Habitat: inland lakes and rivers. Normally nests in holes in trees.

A regular winter visitor, staying late into the spring, but it does not breed. Nest boxes have been erected where birds linger, on inaccessible parts of the Tyne and Rede, but without success; more could be erected on other rivers.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Red-breasted merganser *Mergus serrator* **NL NR**
L

Habitat: lakes, rivers, estuaries and coastal dunes.

A rare and localised breeder in the county; more research into its breeding preferences is needed.

Red kite *Milvus milvus* **D NP**
B L RDB W

Habitat: upland fringe, espccially wooded river valleys, with mainly broadleaved trees.

After two centuries of decline through persecution in the UK it is increasing, following protection and selective reintroduction.

It may expand into Northumberland from introduced populations elsewhere, but there are potential problems with game interests and egg collectors.

Marsh harrier *Circus aeruginosus* **D NP**
B L RDB W

Habitat: reedbeds; it will breed in smaller areas than bittern. In the eighteenth century it also bred on wet moorland in *Juncus* spp.

Widely persecuted in the UK in the 19th century, but is now recovering where suitable habitat is available.

A pair bred in 1976; otherwise marsh harriers have not bred in the county for more than a hundred years. Occasional passage birds linger into the summer, so it is a potential breeding species. There might be a problem with game interests.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

Hen harrier *Circus cyaneus* **D NR**
B BTOh L RDB W

Habitat: moorland, especially heather. It will feed but does not normally breed on grazed grass moorland, although it may use areas of recent afforestation.

Persecuted over large areas of grouse moor nationally and in Northumberland, so it remains a rare breeding species despite an abundance of good habitat.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Goshawk *Accipiter gentilis* **NR Pop**
L W

Habitat: forests and woodlands, mainly upland.

Following the afforestation of the uplands, the county has become a national stronghold for this rare breeding species, possibly reintroduced by falconers in the 1970s. It is steadily increasing, but is persecuted.

Buzzard *Buteo buteo* **NR**
L

Habitat: moorland, woodland, mainly upland.

An uncommon breeding species, steadily increasing but persecuted.

Golden eagle *Aquila chrysaetos* **NL NR**
Amb B L W

Habitat: remote upland areas.

A rare and localised breeding species despite adequate suitable habitat. Could become better established only if human disturbance could be reduced.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Osprey *Pandion haliaetus* **D NP**
B L RDB W

Habitat: usually near water as it feeds almost entirely on fish.

Persecuted to extinction as a breeding British bird by 1916. Recolonised Scotland in the 1950s, where it is increasing, and has been reintroduced elsewhere.

Regular passage migrant in the county and prospective breeding species. Nesting platforms have been provided in selected areas. Egg collectors remain the main threat to colonisation.

Merlin *Falco columbarius* **D NR**
B L RDB W

Habitat: open heather moorland. A ground nester but it will also take over stick nests on the upland forest edge, in shelter belt plantations or in tree lined valleys. It requires a steady supply of pipits and skylarks on which to feed.

Its overall numbers have declined in the UK, but there is no evidence that this is the case in Northumberland where the breeding population is now small but stable.

Nests are vulnerable to predation by mammals and crows. Breeding success is jeopardised by too extensive heather burning. Illegal activity by falconers and egg collectors is a problem.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Merlin,
by Allan Potts

Peregrine *Falco peregrinus* **NR**
Amb B L W

Habitat: mainly moorland although in other parts of the country it is found on coastal cliffs.

In Northumberland it nests mostly on inland cliffs and crags.

Problems include persecution on grouse moors and illegal activity by falconers and egg collectors.

Red grouse *Lagopus lagopus scoticus* **ND**

Habitat: heath and blanket bog.

Declining endemic sub-species.

The county population has declined but is still strong, reflecting the large areas of managed grouse moor.

Black grouse *Tetrao tetrix* **D NL**
M RDB

Habitat: moorland edge, rough grassland with trees, especially birch and Scots pine, scrub and rushes *Juncus* spp.; also young plantations and hay meadows.

The national population has declined by more than 25% since 1970, the county population scarcely less severely. Loss of specialised habitat, through afforestation and overgrazing, is probably the main cause.

Its stronghold is in the North Pennines, including south-west Northumberland, with a few leks in the National Park area. The 1988-92 survey identified 331 lekking males in the county (Day *et al.* 1995).

SPECIES ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Grey partridge *Perdix perdix* **D**
BTOh RDB S

Habitat: farmland and grass moorland.

Once common, this species has been greatly affected by changes in farming practices, largely determined by European and national agricultural policies, and has declined steeply both nationally and in the county. Measures to assist its recovery would include restoration of uncultivated field margins and less use of herbicides.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Quail *Coturnix coturnix* **D NR**
L RDB W

Habitat: hayfields and pasture at any altitude; breeds in dense tall herbage.

Numbers throughout Europe declined until fifty years ago, since when they may have stabilised at a low level.

Now a rare breeding species in Northumberland.

Water rail *Rallus aquaticus* **NR**
Amb L

Habitat: ponds and lakes with thick marginal vegetation cover.

Rare breeding species.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Corncrake *Crex crex* **D G NP**
B RDB S W

Habitat: farmland, especially hay meadows.

This migrant species has declined severely due to changes in agricultural practice, especially the use of mechanised hay making and the switch to early cut silage. It is globally threatened, but survives in the Hebrides and Orkney where recent emergency changes in haymaking practice have begun to improve breeding success and reverse the decline.

It bred commonly in the county before 1930 and sporadically to the 1950s, with one breeding record in 1992. It might recolonise suitably managed habitat.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Little ringed plover *Charadrius dubius* **NL NR**
L W

Habitat: gravel beds or disturbed ground, usually near water. It prefers bare shingle but will nest on any bare ground, even soil.

Since 1968, a rare, intermittent and very local breeder in the county, near the northern limit of its range. Care in restoring gravel pits could be rewarded. Ringed plover will drive this species out, so measures would need to be concentrated where the ringed plover is absent.

Ringed plover *Charadrius hiaticula* **NL**
Amb L

Habitat: sandy bays and offshore islands, or river sand or shingle.

Human disturbance on the Northumberland coast has limited breeding success here but it does nest inland. Nesting areas can be cordoned off where appropriate.

Golden plover *Pluvialis apricaria* **ND**
Amb B L Wp

Habitat: upland moorland, especially in young heather.

In long term decline as a breeding species in the UK including Northumberland. Afforestation of uplands and land drainage have affected populations.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Grey plover *Pluvialis squatarola* **NL**
Amb L

Habitat: coastal, especially mud flats.

Localised passage and winter visitor; stronghold Lindisfarne.

Purple sandpiper *Calidris maritima* **NL**
Amb L W

Habitat: rocky headlands at the coast.

Localised passage and winter visitor.

Dunlin *Calidris alpina* **NR**
Amb L

Habitat: breeds in upland bogs with small areas of open water.

Rare breeding species in the county, possibly declining. At risk from moorland drainage.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Ruff *Philomachus pugnax* **NP**
Amb B L W

Habitat: flat, flooded land especially near the coast.

Regular visitor, often overwintering and showing spring lekking behaviour but breeding has not been confirmed. Ruff bred at Prestwick Carr before it was drained in 1857.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Snipe *Gallinago gallinago* **ND**
Amb L

Habitat: rough, wet grassland, such as moorland edge and wet fields in lowlands.

In national long term decline, probably due to extensive drainage of agricultural grassland. Consequently most breeding populations in the county are found in the uplands where there has been less drainage.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Black-tailed godwit *Limosa limosa* **D NP**
L RDB W

Habitat: flood plains, like that of the ruff.

The species has bred in East Anglia since about 1930, having been extinct in Britain for the previous one hundred years.

It frequently visits, sometimes lingering in the county, and is a potential breeding species.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Bar-tailed godwit *Limosa lapponica* **NL Pop**
Amb L

Habitat: coastal, feeding on muddy or sandy tidal edges.

The wintering Lindisfarne population is nationally significant.

Curlew *Numenius arquata* **Pop**
Amb BTOm L

Habitat: lowland and upland grassland and moorland.

An estimated 9% of the British population breeds in the county. Adversely affected by agricultural intensification, overgrazing and afforestation.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Redshank *Tringa totanus* **ND**
Amb BTOm L

Habitat: rough wet grassland on moorland edge and in wet lowland fields, also along river flood plains.

It is declining as a breeding species; affected by drainage and other changes in land use.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Common gull *Larus canus* **NL NR Pop**
Amb

Habitat: coastal and inland, breeds on moorland.

The county's population of passage and wintering birds is nationally important; it is rare and localised as a breeding species.

Lesser black-backed gull *Larus fuscus graellsii* **NL**
Amb L

Habitat: mainly coastal, especially islands, but also breeds inland.

Localised breeding species.

Herring gull *Larus argentatus* **NL**
Amb L

Habitat: mainly coastal, especially islands, but also breeds inland.

A localised breeding species; not considered to be rare or under threat in Northumberland.

Great black-backed gull *Larus marinus* **NL NR**

Habitat: coastal, sometimes breeds inland.

Rare, irregular and localised as a breeding species.

Kittiwake *Rissa tridactyla* **NL**

Habitat: mainly coastal, nesting on cliffs.

Several breeding localities in the county; buildings along the River Tyne are used for fifteen kilometres upriver, as far as Newcastle Quayside.

Sandwich tern *Sterna sandvicensis* **NL Pop**
Amb B L

Habitat: coastal.

A nationally important population breeds mostly on the Farnes and Coquet Island; a few nest at Lindisfarne NNR. It could be encouraged to nest on other nature reserves adjacent to the coast.

Roseate tern *Sterna dougallii* **D NL NR Pop**
B M RDB W

Habitat: coastal; late-arriving summer visitor.

The population in the British Isles has declined severely since the early 19th century, dropping further by 80% since 1969. The county's small breeding population may now be 30% of the national total. It nests on the Farnes and Coquet Island, with occasionally a few pairs at Lindisfarne NNR. At risk from summer storms and competition for nesting sites, but the main threats may lie in its African winter quarters.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Common tern *Sterna hirundo* **NL Pop**
B L

Habitat: mainly coastal in Northumberland.

Nationally important numbers breed on the Farnes and Coquet Island. It has recently taken to nesting on artificial islands at inland nature reserves.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Little tern *Sterna albifrons* **NL NR**
Amb B L W

Habitat: sandy coasts and shingle beaches.

A very localised, small but stable protected breeding population, with a very low reproductive success, is at risk from storms, high tides, human disturbance and predators.

Guillemot *Uria aalge* **NL**
Amb

Habitat: sea cliffs.

Breeding population about 30,000 birds but localised, mainly on the Farne Islands.

Razorbill *Alca torda* **NL**
Amb L

Habitat: sea cliffs.

Increasing but localised breeding species, mainly on the Farne Islands.

Puffin *Fratercula arctica* **NL**
Amb L

Habitat: offshore islands.

Abundant, increasing but localised breeding species, on the Farnes and Coquet Island.

Turtle dove *Streptopelia turtur* **D NR**
BTOh M RDB

Habitat: open woods and parkland.

The main cause of the national decline in numbers over the last twenty-five years may lie outside the UK, but intensive farming in Britain may have contributed.

The county is at or beyond the northern limit of its contracting range; very few pairs have been recorded in recent years.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Barn owl *Tyto alba* **ND NR**
Amb L W

Habitat: rough, open grasslands, with old trees or buildings for nesting.

Afforestation of open countryside, refurbishment of old buildings, loss of old trees and changes in agricultural practices have led to a national decline, over at least fifty years.

Now an uncommon breeding species in the county, mainly in the north. It will take to nest boxes in suitable habitat.

Long-eared owl *Asio otus* **NR**
L

Habitat: woodland, mainly upland, especially coniferous forest.

A rare breeding species. Difficult to count, so census data may be unreliable.

Short-eared owl *Asio flammeus* **ND NR**
Amb B L

Habitat: open country and moorland, forest edge.

Recently declining as a breeding species in the county, and now rare. Suffers from persecution.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Nightjar *Caprimulgus europaeus* **D NL NR**
B M RDB

Habitat: heathland or felled forestry areas with heather and bracken, and with occasional trees such as birch.

After half a century of decline in the UK, the nightjar may have recovered a little in recent years.

In Northumberland it has adapted to clear-felled forestry areas and is increasing as a breeding species, though near the northern limit of its range.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Kingfisher *Alcedo atthis* **NR**
Amb B BTOm L W

Habitat: mainly slow flowing rivers with sandy banks for nesting. Often nests on tributaries of the main river.

Rare but stable breeding species, near the northern limit of its range.

Lesser spotted woodpecker *Dendrocopos minor* **NL NR**
BTOm L

Habitat: deciduous woodland. Needs standing dead wood.

A very occasional breeding species, at or beyond the northern limit of its range.

Skylark *Alauda arvensis* **D**
BTOh RDB S

Habitat: grassland and dunes.

Steep national decline since the 1980s due to agricultural change, particularly the increased use of pesticides, earlier harvesting dates and loss of winter stubble.

In the county, breeding numbers have declined in the lowlands. Its remaining stronghold is in the Cheviot foothills.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Rock pipit *Anthus petrosus* **NR**
L

Habitat: rocky shores, nesting in holes in rocky banks and cliffs.

About 60-70 breeding pairs in the county, half of them on offshore islands.

Yellow wagtail *Motacilla flava flavissima* **ND**
BTOh L

Habitat: wet meadows, riversides and rough grassland, nesting in hay meadows.

Agricultural intensification, especially drainage, silage cutting, overgrazing and application of pesticides and fertilisers have impaired habitat, and local numbers are declining. Blue-headed wagtail *Motacilla flava flava* has also bred.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Stonechat *Saxicola torquata* **NR**
Amb L

Habitat: coastal dunes, heathy scrub and heather moorland.

A rare and declining breeding species; loss of habitat may be a cause. Hard winters affect numbers.

Ring ouzel *Turdus torquatus* **ND**
Amb L

Habitat: open upland areas away from forest, nesting in cleughs and broken rocky ground.

Land-use change such as afforestation, moorland drainage and overgrazing may have caused the decline in the breeding population.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Song thrush *Turdus philomelos* **D**
BTOh RDB S

Habitat: woodland edge, parkland, gardens.

Since the mid 1970s there has been a steep national decline in this widespread breeding species, especially in rural areas, though this has not been documented in the county (Day *et al.*, 1995).

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Reed warbler *Acrocephalus scirpaceus* **NL NR**
L

Habitat: reedbeds with scrub, especially goat willow *Salix caprea.*

Since 1958, a few pairs have bred in one to three localities in the south-east of the county, at the northern limit of the species' range.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Wood warbler *Phylloscopus sibilatrix* **NL**
L

Habitat: mature woodland, usually with oak *Quercus* spp., and with glades for nesting.

A not uncommon but localised breeding species.

Spotted flycatcher *Muscicapa striata* **D**
BTOh M RDB

Habitat: parkland, forest edge. Will nest in open-fronted nestboxes in woods, on houses and in parkland.

The national population has declined to one quarter of its 1960s level, possibly because of drought problems in Africa. In the county, breeding remains widespread; numbers fluctuate, and no clear trend has been measured.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2..

Pied flycatcher *Ficedula hypoleuca* **NL**
L

Habitat: oakwoods, like that of the wood warbler, and alder *Alnus glutinosa* lined upland streams and rivers. Nests in holes in trees; takes to nestboxes in suitable habitat.

Has increased during this century, nationally and in the county.

Breeding population now stable, but localised, mainly in wooded valleys.

Raven *Corvus corax* **ND NR**
BTOm

Habitat: upland farmland, especially sheepwalks, and moorland.

Declining nationally, especially near the Scottish border.

In the county, now a very rare breeder, but no longer declining; afforestation and persecution by gamekeepers, shepherds and egg collectors are problems.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

North Pennines target species

Tree sparrow *Passer montanus* **D**
BTOh M RDB

Habitat: resident in lowland arable areas. Will take to nestboxes in suitable habitat.

Numbers fluctuate, but for twenty years it has been in rapid decline in the UK and in the county. Agricultural changes are likely to be the main cause.

SPECIES ACTION PLAN REQUIRED: PRIORITY 1.

Linnet *Carduelis cannabina* **D**
BTOm M RDB

Habitat: pastures, especially in marginal upland areas with gorse *Ulex* spp. and other scrub; also coastal grassland.

It has declined in the UK for at least thirty years, possibly largely because of the effect of changed farming practices on seed supplies.

Widespread as a breeding species in the county's lowlands, but may be declining. Gorse removal in some areas could reduce the population.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Twite *Carduelis flavirostris* **D NR**
BTOm L RDB

Habitat: moorland and fringes, nests in heather and feeds in adjacent herb-rich grassland.

National long-term and recently rapid decline, except perhaps in the Pennines.

Ceased to breed in the county by the 1950s, but recently very small numbers have bred in south Northumberland.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 1.

North Pennines target species

Common crossbill *Loxia curvirostra* **Pop**
L W

Habitat: conifer forests. Populations fluctuate widely.

Breeds regularly in the county, in some years in nationally important numbers.

Bullfinch *Pyrrhula pyrrhula* **D**
BTOh M RDB

Habitat: parkland and woodland, utilises conifer plantations.

Numbers in the UK increased following earlier persecution, but then declined steeply from the mid 1980s.

Breeding is widespread in the county but numbers are uncertain, fluctuating and may be declining.

SPECIES ACTION PLAN REQUIRED: PRIORITY 2.

Hawfinch *Coccothraustes coccothraustes* **NL NR**
Amb L

Habitat: parkland and mature deciduous woodland.

Northumberland has a very small, localised but stable breeding population.

Snow bunting *Plectrophenax nivalis* **ND**
Amb L W

Habitat: winters mainly on sand dunes and rough coastal grassland, also upland moorland.

Its numbers fluctuate from year to year. A regular but declining passage and winter visitor to the county.

Reed bunting *Emberiza schoeniclus* **D**
BTOh M RDB

Habitat: reedbeds, willow *Salix* spp. and bulrushes *Typha spp.*, marshy areas with trees, rushy areas in hills.

National and county breeding populations have declined since the 1970s, possibly due to intensive farming and lack of seeds in winter.

SPECIES AND/OR HABITAT ACTION PLAN REQUIRED: PRIORITY 2.

Corn bunting *Milaria calandra* **D**
BTOh M RDB

Habitat: traditional farmland with cereal crops, especially barley; also coastal dunes.

The population is in severe decline throughout the UK.

The remaining few breeding pairs in the county are confined to farmland near the coast.

SPECIES ACTION PLAN REQUIRED: PRIORITY 1.

Annex species

The following species are on the UK Amber List (RSPB 1996) or the BTO list (1997) because they have declined nationally, but they appear to have maintained their populations in Northumberland (**NM**).

Breeding species

Shelduck	*Tadorna tadorna*	Amb W
Kestrel	*Falco tinnunculus*	Amb BTOm
Moorhen	*Gallinula chloropus*	BTOm
Woodcock	*Scolopax rusticola*	Amb BTOh
Stock dove	*Columba oenas*	Amb
Little owl	*Athene noctua*	BTOm
Tawny owl	*Strix aluco*	BTOh
Swallow	*Hirundo rustica*	Amb
Tree pipit	*Anthus trivialis*	BTOh
Meadow pipit	*A. pratensis*	BTOm
Grey wagtail	*Motacilla cinerea*	BTOm
Pied wagtail	*M. alba yarrellii*	BTOm
Dunnock	*Prunella modularis*	Amb BTOm
Blackbird	*Turdus merula*	Amb BTOm
Mistle thrush	*T. viscivorus*	BTOm
Grasshopper warbler	*Locustella naevia*	Amb BTOh
Willow warbler	*Phylloscopus trochilus*	BTOm
Marsh tit	*Parus palustris*	BTOm
Willow tit	*P. montanus*	BTOm
Starling	*Sturnus vulgaris*	Amb BTOm

Greenfinch	*Carduelis chloris*	BTOm
Goldfinch	*C. carduelis*	Amb
Redpoll	*C. flammea*	BTOh
Yellowhammer	*Emberiza citrinella*	BTOm

Wintering species

Red-throated diver	*Gavia stellata*	B BTOm W
Greylag goose	*Anser anser**	Amb Wp
Eider	*Somateria mollissima**	Amb
Goldeneye	*Bucephala clangula**	Amb Wp
Oystercatcher	*Haematopus ostralegus*	Amb W
Golden plover	*Pluvialis apricaria**	Amb B Wp
Lapwing	*Vanellus vanellus*	Amb BTOh
Knot	*Calidris canutus*	Amb W
Turnstone	*Arenaria interpres*	Amb W

*Species which are included in the main list for their breeding populations.

REPTILES AND AMPHIBIANS

L J Kerslake and A M Tynan

There is very little available information about the current status and distribution of amphibians and reptiles in Northumberland. The situation in the county is likely to mirror the national trend of general decline and it is advisable that the status of these species be monitored.

Species have been selected for inclusion if they are protected under national or international legislation and are believed to be rare in the area. Species Action Plans have been proposed only for species which occur on the *UK Steering Group Report* short list (1995).

The annex list contains those species which are protected under national legislation but are not thought to be presently threatened or endangered in Northumberland. However, the populations of these species may be in unrecognised decline and further information on their status and distribution is needed.

Key to criteria and status codes

H	Listed on Annex II or IV of Habitats Directive
L	Listed on *UK Steering Group Report* long list 1995
North	At the northern limit of its distribution
NR	Rare in Northumberland (but may be common elsewhere)
S	Listed on *UK Steering Group Report* short list
W	Protected under Schedule 5 of *Wildlife and Countryside Act* 1981
Wp	Partial protection under Schedule 5 of *Wildlife and Countryside Act* 1981

Species		Criteria/status
Grass snake	*Natrix natrix*	**NR Wp** L North

Habitat: varied, mainly long grassland, often near water. Eggs are laid into piles of warm, rotting vegetation.

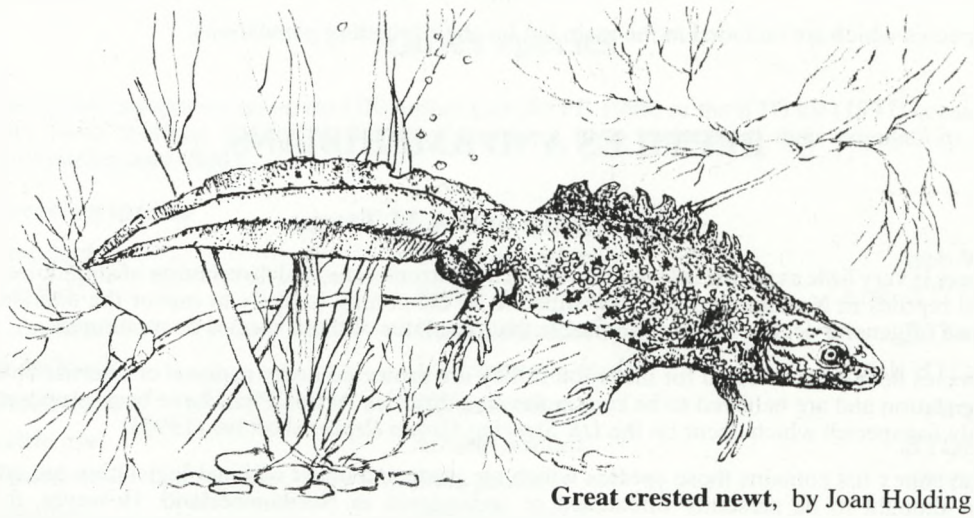
The grass snake is at the northern limit of its range but one or two colonies have been reported from Northumberland (Coult, 1995). It is likely to be found only in areas of optimum habitat; further survey needed.

Great crested newt *Triturus cristatus* **H NR S W**

Habitat: for breeding this species needs still water, deeper than other newts, at least 30-55cm, with some vegetation and open spaces. Much time is spent on land, often including hibernation. It often returns to the same breeding pond.

Known from widely scattered localities in lowland Northumberland. Further survey is required.

SPECIES ACTION PLAN REQUIRED.



Great crested newt, by Joan Holding

Annex species

Slow worm	*Anguis fragilis*	L Wp
Viviparous lizard	*Lacerta vivipara*	Wp
Adder	*Vipera berus*	L Wp
Common frog	*Rana temporaria*	L Wp
Common toad	*Bufo bufo*	L Wp
Smooth newt	*Triturus vulgaris*	L Wp
Palmate newt	*Triturus helveticus*	L Wp

FISH

L J Kerslake and J L Foster-Smith (marine species)

Information relating to the distribution of fish in the county, both freshwater and coastal, is limited. Davis (1983) summarised the available data on marine fish. Electro-fishing surveys carried out by the Environment Agency (formerly National Rivers Authority) since 1991 have supplied some data, mostly relating to salmonid species. The population status of fish in the county is therefore difficult to assess and more research is needed.

Species Action Plans have been proposed only for species which occur on the *UK Steering Group Report* short list (1995).

Fish species were selected for inclusion according to the following criteria:

H	Listed on Annex II or IV of the EU *Habitats Directive* (EEC 1992)
L	Listed on *UK Steering Group Report* long list
M	Listed on *UK Steering Group Report* middle list
S	Listed on *UK Steering Group Report* short list
W	Protected under Schedule 5 of *Wildlife and Countryside Act* 1981
Wp	Partial protection under Schedule 5 of *Wildlife and Countryside Act* 1981

Species **Criteria/status**

Lampern *Lampetra fluviatilis* **H L**

Habitat: rivers, estuaries and inshore waters.

Found in the Rivers Blyth, Coquet, Tweed and Tyne, and elsewhere along the coast. Possibly present in other rivers.

Brook lamprey *Lampetra planeri* **H L**

Habitat: burns and rivers.

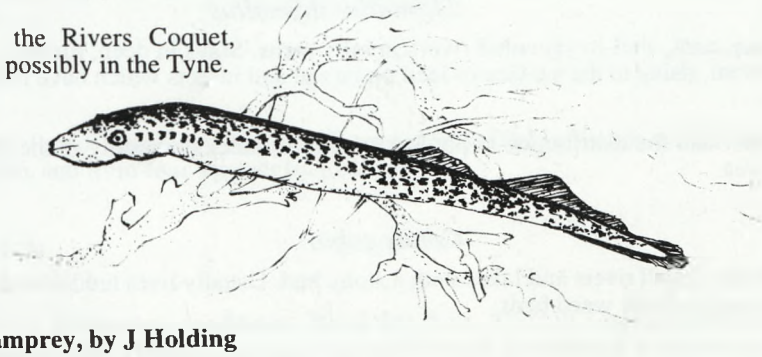
Found in the Coquet and possibly present in other rivers.

Marine lamprey *Petromyzon marinus* **H L**

Habitat: shallow water to depths of about 400m; often near river mouths and in fresh water.

Nationally and locally rare.

Present in the Rivers Coquet, Tweed and possibly in the Tyne.



Marine lamprey, by J Holding

Basking shark *Cetorhinus maximus* **M**

Habitat: open sea.

Until 1983 frequent sightings were made by local fishermen (Davis 1983). Its more recent status is not clear but records are infrequent. One young specimen was caught in a salmon net in 1997.

The species is being considered for inclusion on Schedule 5 of the *Wildlife and Countryside Act* 1981.

Sturgeon *Acipenser sturio* **H M W**

Habitat: open sea.

A rare visitor to British waters. Regarded as locally rare in 1981 (Davis 1983).

Allis shad *Alosa alosa* **H S Wp**

Habitat: inshore waters.

Nationally rare. Recorded between the mouths of the Tweed and Tyne from 1832 until 1919 although there may have been more recent unpublished records of this species, particularly in the Tweed (Davis 1983). One found dead near Blyth in 1986 (*Recording News* Dec. 1991).

SPECIES ACTION PLAN REQUIRED.

Twaite shad *Alosa fallax* **H S**

Habitat: inshore waters.

Nationally rare. Locally caught specimens were seen rarely at North Shields Fish Quay in 1976-82 (Davis 1983).

The species is being considered for inclusion on Schedule 5 of the *Wildlife and Countryside Act* 1981.

SPECIES ACTION PLAN REQUIRED.

Salmon *Salmo salar* **L**

Habitat: clean waters. Spawns in gravel beds in streams and rivers in upland areas, feeding in fresh water for up to three years before moving to the sea.

Found in all the major rivers in Northumberland, the Tweed, Coquet and Tyne being the most important.

Grayling *Thymallus thymallus* **L**

Habitat: clean, cool, well-oxygenated rivers in hilly areas. Stays in deep, running water near the river bottom, rising to the surface to feed on larvae and insects which have fallen into the water.

In Northumberland the distribution is patchy, with most stocks probably in the River Blyth catchment area.

Bullhead *Cottus gobio* **H L**

Habitat: streams, small rivers and lakes with a stony bed. Usually lives hidden under rocks or large stones and in dense weed beds.

In Northumberland it is found in the River Wansbeck and occasionally in the South Tyne.

MOLLUSCS

The principal accounts of the molluscs of Northumberland are an early catalogue by Joshua Alder (Alder 1848), the survey by the Reverend E P Blackburn (Blackburn 1934) and the more recent atlas (Lowe 1989).

Species with fewer than ten records for the county have been selected using the Invertebrate Site Register (1987), with additional information from G Simpson. Species accounts are brief, concentrating on distribution and habitat. A Species Action Plan has been suggested only for the one species which is also listed on the *UK Steering Group Report* short list (1995). The **codes** used are defined under Insects (page 101).

Lymnaea glabra **NR**
L RDB2

A mud snail, which occurs at the margin of temporary freshwater. Recorded from Crag Lough in 1972.

Gyraulus laevis **NR**
Scarce

A ramshorn snail of ponds and lakes. Recorded from Big Waters in 1981.

Azeca goodalli **NR**
Loc

A snail of moss and ground litter in open woodland, scrub and hedges. Recorded from Morralee Wood in 1986. Lowe (1989) records it in eight 10km squares.

Pupilla muscorum **NR**
Loc

A snail of dry calcareous grassland. Recorded from Gunnerton Nick quarry in 1976 and Holy Island in 1986 and in six 10km squares by Lowe (1989).

Limax cinereoniger **NR**
Reg

A slug found under bark and logs in woodland. Recorded from Morralee Wood and Wallington Hall in 1986, and from seven squares by Lowe (1989).

L. tenellus **NR**
L Scarce

A slug usually found in ancient woodland. Recorded from Dipton Woods in 1981 and Morralee Wood in 1986, and from four squares by Lowe (1989).

Helicella itala **NR**
Reg

A snail of dry, calcareous conditions. Recorded from Newton Links in 1960 and from a different site by Lowe (1989).

Margaritifera margaritifera Freshwater pearl mussel **NR**
H S Scarce Wp

A bivalve found in fast running water with a mixture of sand and stones. Recorded recently from the Rivers Rede and North Tyne south of the Rede confluence, and the Warks Burn in 1981.

SPECIES ACTION PLAN REQUIRED.

Zenobiella subrufescens **NR**
Loc

A snail of woodland and shady river banks, mainly in old woodland. Recorded from various sites (Lowe 1989 records it in eight 10km squares).

ANNELIDS

Species with fewer than ten records for the county have been selected using the Invertebrate Site Register (1987). Species accounts are brief, concentrating on distribution and habitat. Species Action Plans have not been suggested for any Annelids.

Rhynchobdellida (Leeches)

Pisicola geometra **NR**
Loc

A leech which is ectoparasitic on freshwater fish. Recorded from Crag Lough in 1972 and Holywell Pond in 1981.

Glossiphonia heteroclita **NR**
Loc

A leech which feeds on a range of aquatic organisms. Recorded from Littlemill, date unknown.

Batracobdella paludosa **NR**
Loc

A leech which feeds on freshwater gastropods. Recorded from Littlemill, date unknown.

INSECTS

The insects are the most diverse of all animal groups and it has been impossible to identify local experts to prepare lists for all the various groups. Consequently, unless otherwise stated, the sections below have been compiled by reference to the Invertebrate Site Register (ISR) for Northumberland (Ball 1987), sometimes augmented by records from other sources, including H Eales, H A Ellis, M L Luff, J D Parrack, S Rushton and G Simpson.

A historical account of entomology in Northumberland and Durham is to be found in Dunn (1983). Most published records for the county have appeared over the years in *The Vasculum* or in the *Transactions* of the Natural History Society. No general synthesis of local records exists, but a full account of the Lepidoptera (Dunn and Parrack (1986, 1992) has appeared and the documentation of the collections of the Hancock Museum and the field records database at the Museum together contain a considerable amount of information which awaits analysis.

Unless otherwise stated, insect species have been selected for inclusion if there are ten or fewer records for the county (**NR**). There is sufficient information about some of the Lepidoptera to permit their designation as declining (**ND**) or local (**NL**) in the county. Inevitably, species accounts vary in the detail available, but some indication of habitat requirements and local population or distribution status is given where possible. Species Action Plans have not been suggested for most insect groups because there is insufficient information on which to base a decision, but species on the short or middle lists of the *UK Steering Group Report* (1995) automatically qualify for an SAP.

The order of presentation of insects follows Kloet and Hincks (1964-1978).

Key to the national and local conservation status of insects and other invertebrates

H	Listed in the *EU Habitats Directive* (EEC 1992)
L	Listed on the*UK Steering Group Report* long list (1995)
Loc	Species of local distribution in the UK
M	Listed on the *UK Steering Group Report* middle list
NR	Species which may be nationally common but are rare in Northumberland
Pop	Species with a nationally important population in the county
pRDB	Provisionally to be included in the next edition of the national Red Data Book
Rare	Species recorded from fewer than thirty 10km squares in the UK
RDB	Species listed in the national Red Data Book (Nature Conservancy Council 1987b)
Reg	Species notable in the region in which they occur
S	Listed on the *UK Steering Group Report* short list
Scarce	Species recorded from 30-100 10km squares in the UK
U	Species distribution unknown
W	Protected under Schedule 5 of *Wildlife and Countryside Act* 1981
Wp	Partial protection under Schedule 5 of *Wildlife and Countryside Act* 1981

RDB species are further subdivided as follows:

1	Endangered Species in danger of extinction
2	Vulnerable Species likely to move into Endangered category if causal factors continue

3 Rare

Species with small populations which are not at present Endangered or Vulnerable, but are at risk

k Category not defined

Species for which there is insufficient information to assess to which of the above RDB categories it belongs.

Species **Criteria/status**

Ephemeroptera (Mayflies)

Habrophlebia fusca **NR**
Loc

Found in slow streams, and sometimes rivers, with vegetation or dead leaves. Recorded from Crag Lough in 1981.

Ephemerella notata **NR**
Loc

Larvae found in moderately fast-flowing rivers. Recorded from the River Coquet in 1976.

Centroptilum luteolum **NR**
Loc

Rivers, streams and exposed lake shores. Recorded from the River Coquet in 1976.

C. pennulatum **NR**
Loc

Breeds in rivers and streams where the current is not too fast. Recorded from the River Coquet in 1976.

Procloeon pseudorufulum **NR**
Loc

Found in rivers and streams where the current is not too fast. Recorded from the River Coquet in 1976.

Siphlonurus lacustris **NR**
Loc

Found mostly at higher altitudes in small lakes and slow flowing streams. Recorded from the River Coquet in 1976.

Ameletus inopinatus **NR**
Loc

Generally breeds in streams at high altitudes but also recorded from some Scottish lochs. Recorded from the River Coquet in 1976.

Odonata (Damselflies and Dragonflies)

L J Kerslake

Twenty-four species of dragonfly are found in the North East, just over half of the species found in Britain; of these only ten are likely to be encountered frequently (Jessop 1998 in preparation). The species of dragonfly become fewer with increased distance north in Britain, although a few Scottish species are absent from England and Wales. Most dragonfly records in Northumberland are from the lowland areas, especially the coastal plain which contains a variety of wetlands, often caused by mining subsidence. The peatland complex of the Border Mires however also supports a good assemblage of species.

Dragonflies are dependent upon both aquatic breeding sites and suitable adjacent habitat. They are usually territorial and the larger species can cover a land area two or more kilometres in diameter. The persistence of wetlands is paramount: dragonflies spend much of their life cycle as aquatic nymphs, so breeding sites must not dry out.

Most dragonfly records have been gathered in the last two decades and the information below has been largely taken from Jessop (in preparation) which provides a comprehensive summary of the current distribution of dragonflies in the North East. Additional information has been provided from surveys of Northumberland Wildlife Trust nature reserves carried out by the Trust in 1995.

Species have been selected for inclusion if they have been recorded from fewer than ten sites in Northumberland since 1970 (as described in Jessop, in preparation). Obvious vagrants have been excluded and two species, which have been recorded in Northumberland in recent years but which are normally restricted to southern parts of Britain, are included in square brackets. Species Action Plans have not been proposed for any dragonfly species.

[*Coenagrion pulchellum* Variable damselfly **NR**
Scarce

Inhabits ditches and watermeadows, mainly in southern Britain and Ireland. There have been only two recent records in Northumberland, at Close House and Big Waters. It is not always easy to separate from *C. puella*.]

Calopteryx splendens Banded demoiselle **NR**
Reg

Rivers and slow streams; predominantly a southern species. Records in Northumberland represent the most northerly extent of its range in the east of the country. There have been recent sightings on the Rivers Blyth and Wansbeck.

Aeshna cyanea Southern hawker **NR**

Found near ponds, including garden ponds, and ditches. Reaches the northern limit of its distribution in Northumberland. Most records are in the Tyne Valley area, with scattered sightings as far north as Newham.

[*Orthetrum coerulescens* Keeled skimmer **NR**
Reg

Found in streams, rivulets and pools in bogs, mainly in the south and west of Britain. There is one record, from Muckle Moss in 1982.]

Sympetrum danae Black darter **NR** Reg

Found in bogs; widespread in Britain and locally common. Very local in Northumberland. Recorded at several scattered sites including, recently, several of the Border Mires.

Insects

(continued – from the Invertebrate Site Register)

Plecoptera (Stoneflies)

Protonemura montana **NR** Loc

Found in small stony streams and rivers, usually at higher altitudes. Recorded from Morralee Wood in 1976.

Nemoura cambrica **NR** Loc

Found in small stony streams, especially where many dead leaves are present. Recorded from Briarwood Banks in 1984.

N. erratica **NR** Loc

Found in small stony streams. Recorded from Staward Woods in 1976 and Briarwood Banks in 1984.

Chloroperla tripunctata **NR** Loc

Found in rivers and streams with a stony substrate. Recorded from Park Burnfoot, near Haltwhistle, in 1976.

Orthoptera (Grasshoppers and crickets)

Tettix undulata Common ground hopper **NR** Loc

Found on bare ground, becoming increasingly coastal in the north. Recorded from Linbriggs in 1985.

Myrmeleotettix maculatus Mottled grasshopper **NR** Loc

Found in dry places on moorland (especially burned) and sand dunes. Recorded in 1983 from Harbottle Moors and 1985 from Ross Links.

Bugs (Hemiptera)

Sub-order Heteroptera

Aradinae (Flat bugs)

Aradus depressus **NR**
Loc

Usually found beneath the bark of broadleaved trees, where it feeds on fungi; not however confined to woodland. Recorded from Haydon Dene in 1982.

Pentatomidae (Shield bugs)

Zicrona caerulea **NR**
Loc

Sparse and rather local, found in a wide range of habitats but usually on low vegetation in open situations. Recorded at Muckle Moss in 1977.

Lygaeidae (Ground bugs)

Megalonotus chiragra **NR**
Reg

Found on the ground in dry, open places, particularly on sand. A common groundbug in the South East, but more local and more often coastal in the North and West, not reaching Scotland. Recorded from Mereburn Wood and Park Wood in 1978.

Stygnocoris rusticus **NR**
Loc

Found on the ground in dry, open places in a range of habitats. Recorded at Close House in 1980.

Reduviidae (Assassin bugs)

Empicoris culiciformis **NR**
Reg

Most commonly found on the trunks and branches of trees, probably under-recorded. Recorded from Park Wood in 1972 and Ross Links in 1985.

E. vagabundus **NR**
Loc

Most commonly found on the trunks and branches of trees; may be under-recorded. Recorded from Jesmond Dene and Briarwood Banks in 1982.

Cimicidae (Flower bugs)

Anthocoris limbatus **NR**
Reg

A predator associated almost entirely with willows *Salix* spp., predominantly in fens, but also around other water bodies. Recorded from Gosforth Park in 1978.

Microphysidae

Myrmedobia distinguenda **NR**
Loc

Often associated with old conifers, but also found in and around broadleaved trees; possibly greatly under-recorded. Recorded from Ross Links in 1985.

Miridae (Capsid bugs)

Conostethus brevis **NR**
Loc

A coastal species, feeding on grasses in saltmarshes. Some confusion occurs with another similar species, so its exact status is uncertain. Recorded from Holy Island in 1985.

Dicyphus constrictus **NR**
Loc

Predatory but associated with plants with secretory hairs. Commoner in the north and west of Britain. Recorded from Close House in 1981, Jesmond Dene and Chollerton in 1983 and Darras Hall in 1985.

Halticus apterus **NR**
Loc

Usually associated with bedstraws *Galium* spp. and possibly legumes. Largely confined to southern England and Wales. Recorded from Redpath and Fallowlees in 1981.

Pachytomella parallela **NR**
Reg

Generally distributed in the north of England and Scotland, usually associated with grassland. Recorded from Nelly's Moss Lakes in 1981 and Ross Links in 1985.

Globiceps dispar **NR**
Loc

Found in a range of habitats, from dry coastal dunes to the vegetation at the margins of moorland pools. Possibly associated with leguminous plants. Recorded from the Farne Islands in 1955-56.

Heterocordylus genistae **NR**
Loc

Partly predacious; usually associated with dyer's greenweed *Genista tinctoria*, though occasionally found on broom or gorse. Recorded from Beltingham Gravels in 1980.

Cytorhinus caricis **NR**
Loc

Found amongst clumps of sedges *Carex* spp. and rushes *Juncus* spp. in wet places; widely distributed. Recorded from Prestwick Carr in 1983.

Lygus punctatus **NR**
Scarce

In Scotland may be associated with wood sage *Teucrium scorodonia*. Exact distribution and status uncertain. Recorded from Gosforth Park in 1978 and Longhorsley Moor and Doddington Bridge in 1983.

Orthops viscicola **NR**
Loc

A southern species, restricted to mistletoe *Viscum album*. Nevertheless recorded from Jesmond Dene in 1983.

Dichrooscytus rufipennis **NR**
Loc

Feeds mainly on Scots pine *Pinus sylvestris* but recorded from other conifers. Recorded from Close House in 1977.

Saldidae (Shore bugs)

Salda muelleri **NR**
Reg

Primarily associated with the wetter parts of northern moorland. Recorded from Sweethope Loughs in 1970.

Veliidae

Microvelia pygmaea **NR**
Scarce

Extinct in the county. Last seen: Jesmond Dene in 1872.

Gerridae (Pond skaters)

Gerris costai **NR**
Loc

A pond skater mainly of northern and western acid peaty waters. Recorded from Chartners Lough in 1980.

Nepidae

Nepa cinerea Water Scorpion **NR** Loc

Found in clean, well-vegetated ponds. Recorded from Big Waters in 1981 and New Hartley Pond in 1984.

Notanectidae (Water boatmen)

Notanecta obliqua **NR** Loc

Found in acid pools, where there is some aquatic vegetation. Widely distributed. Recorded from Gosforth Park in 1967.

Corixidae (Lesser water boatmen)

Micronecta minutissima **NR** RDB3

Extinct in the county. Last seen: Wallington Hall in 1872.

Callicorixa wollastoni **NR** Loc

A corixid of northern and western distribution, particularly associated with dystrophic or oligotrophic waters at high altitude. Recorded from Harbottle Moors in 1980 and East Kielder Moor, Redpath, Fallowlees and Muckle Moss in 1981.

Corixa dentipes **NR** Reg

Widely distributed in still and slow flowing waters, but generally in small numbers. Recorded from Grindon Lough in 1985.

Hesperocorixa castanea **NR** Reg

Found in base-deficient standing water, particularly at shallow margins with emergent vegetation and *Sphagnum*; more frequent in the north and west. Recorded from Woolsington Hall Pond in 1970 and Muckle Moss in 1981.

Arctocarisa carinata **NR** Loc

A corixid confined to northern England and Scotland, occurring in upland pools, typically with little vegetation. Recorded from Harbottle Moors in 1980 and from East Kielder Moor, Redpath and Fallowlees in 1981.

Sigara limitata

NR
Loc

Found in rich pools, often at low densities. Most frequent in south and east England. Recorded from Wallsend Swallow Pond in 1981 and both Arcot Hall and the River Wansbeck in 1982.

S. selecta

NR
Loc

Generally found in salt-marsh pools and other brackish pools and ditches near the coast. Nevertheless, recorded at Prestwick Carr and Nelly's Moss Lakes in 1970.

Sub-order Homoptera

Cicadellidae (Leaf-hoppers)

Lamprotettix nitidulus

NR
Loc

Found on various species of tree; its usual range in England is north to Yorkshire. Recorded from Haydon Dene in 1978.

Sonronius dahlbomi

NR
Loc

Found on rosebay willowherb *Chamerion angustifolium*, usually in woodland. Recorded at Close House in 1974.

Fagocyba carri

NR
Loc

Feeds on oak. Recorded from Brownsbog Wood in 1978.

Cixiidae (Lace-hoppers)

Cixius similis

NR
Loc

A lace hopper found in bogs. Recorded from the Holystone Valley in 1971.

Delphacidae (Plant-hoppers)

Javesella forcipata

NR
Loc

A widely distributed plant-hopper on grasses, often near woods. Recorded from Chollerton and Cold Martin Moss in 1983.

Tyrphodelphax distinctus **NR**
Loc

Very local; feeds on cotton grass *Eriophorum* spp. in peat bogs. Recorded at Felicia Moss in 1982.

Neuroptera (Lacewings)

Raphidia xanthostigma **NR**
Reg

Appears to be confined to willows. Recorded from Horsleyhope Ravine in 1978 and Chollerton in 1983.

Coniopteryx parthenia **NR**
Reg

Confined to conifers. Recorded from the Harthope Valley in 1981.

Osmylus fulvicephalus **NR**
Loc

Found very locally in colonies beside shady streams. Recorded from Dipton Woods in 1975.

Sisyra fuscata **NR**
Reg

Found near waters where the freshwater sponges (Spongillidae), with which the larvae are associated, occur. Recorded from Chollerton and Plessey Woods in 1979 and Bothal in 1980.

Hemerobius atrifrons **NR**
Loc

Rather local throughout Britain, mainly on conifers, especially larch *Larix* spp. Recorded from Horsleyhope Ravine in 1978, Slacks Plantation (Heddon-on-the-Wall) and Close House in 1980 and Lilburn and Roddam Dean in 1981.

H. perelegans **NR**
Scarce

A rare Scottish species with very few records, from conifers. Recorded from Horsleyhope Ravine and Brownsbog Wood in 1978.

H. pini **NR**
Loc

Was considered rare but has been found abundantly in spruce *Picea* sp. plantations in northern England. Recorded from various locations across the county between 1977 and 1981.

H. simulans **NR**
Loc

Rather local on conifers throughout Britain with a preference for larch *Larix* sp. Recorded from various locations across the county between 1977 and 1981.

Sympherobius elegans **NR**
Loc

Local in good broadleaved woodland, preferring oak *Quercus* spp., hazel *Corylus avellana* and beech *Fagus sylvatica*. Recorded from Horsleyhope Ravine, Brownsbog Wood, Mereburn Wood and Park Wood in 1978 and Holywell Dene in 1980.

S. fuscescens **NR**
Loc

Local, but abundant where it occurs, on conifers. Recorded from Close House in 1968 and Briarwood Banks in 1980.

S. pygmaeus **NR**
Reg

Common on oak *Quercus* spp., especially when infected with blight. Recorded from Close House between 1968 and 1971.

Drepanepteryx phalaenoides **NR**
Loc

Very local in good broadleaved woodland, often in steep-sided valleys. Thinly distributed in northern England and Scotland. Recorded from Briarwood Banks in 1980.

Wesmaelius concinnus **NR**
Loc

Somewhat local on conifers, with a preference for Scots pine *Pinus sylvestris*. Recorded from Close House in 1976, Happy Valley in 1977 and Beltingham Gravels and Rothley Lake in 1980.

Nothochrysa capitata **NR**
Loc

Rather local in conifers, especially Scots pine, throughout Britain. Recorded from the River Breamish and Roddam Dean in 1981.

Mecoptera (Scorpion flies)

Boreus hyemalis Snow flea **NR**
Loc

Found in moss, often on rocks or tree roots. Predatory on small organisms; active in winter, sometimes on snow. Probably under-recorded. Found in the Holystone Valley in 1970.

Trichoptera (Caddis flies)

Wormaldia subnigra **NR**
Loc

Found in small fast streams. Recorded from the Delf Burn between 1983 and 1985.

Hydropsyche angustipennis **NR**
Reg

Often in slightly polluted streams and rivers. Recorded from Crag Lough in 1972.

Agrypina pagetana **NR**
Loc

Widespread in ponds and fens. Recorded from Crag Lough in 1972.

Limnephilus binotatus **NR**
Reg

Widespread in lakes. Recorded from Crag Lough in 1972.

L. bipunctatus **NR**
Loc

Believed to breed in temporary streams or ponds. Recorded from Longhirst Brocks in 1973.

L. fuscicornis **NR**
Loc

Recorded from the Delf Burn between 1983 and 1985.

L. nigriceps **NR**
Loc

Locally abundant in sedge *Carex* spp. fens of small upland lakes. Recorded from Harbottle Moors in 1980.

L. politus **NR**
Reg

Widespread in lakes. Recorded from Crag Lough in 1972.

Hydatophylax infumatus **NR**
Loc

Larvae found amongst rotting wood in small streams. Recorded from the Devil's Water between 1973 and 1983 and Hartburn in 1974.

Athripsodes fulvus **NR**

Larvae found amongst freshwater sponges (Spongillidae) in lakes and large ponds. Recorded from Bolam Lake in 1970.

Mystacides nigra **NR**
Loc

Probably extinct in the county. Last seen: Plessey Woods in 1939.

BUTTERFLIES AND MOTHS (LEPIDOPTERA)

J D Parrack

Butterflies and moths are the best recorded of all the invertebrate groups in the region. A survey of the butterflies and moths of Northumberland and Durham was published by J E Robson (1899-1913) and since then many recorders have continued the tradition. A comprehensive account of the distribution and ecology of butterflies and moths in the region can be found in Dunn and Parrack (1986, 1992) and Cook (1990) produced an atlas of the butterflies.

Many species are subject to relatively sudden population changes in response, for example, to climatic variation, or to increases in parasitic flies or wasps. In Northumberland sudden contrasts between the milder, damper oceanic and the generally drier continental weather seem to occur particularly frequently and may sometimes be extreme. If these occur in successive years or at a time of imago emergence, temporary extinctions or expansions are more likely to occur.

Some species can be imported on nursery-grown young trees and the use of local stock should be preferred for tree planting.

The accounts of the butterfly species give information on habitat, foodplant, distribution and other issues. Due both to the large number of moths included and the more limited information available about them, the accounts of the moth species are shorter and typically contain only a general description of the distribution. There are exceptions, however, where more information is available. Regular trapping programmes at Kielder Castle (Rothamsted Institute) and at Allerwash (P L Tennant) for more than twenty years have given special emphasis to the moth records from these sites; and, more recently, trapping programmes have been set up at Embleton, Holy Island, Newton-by-the-Sea and Rothbury. Authorities for the records mentioned will be found in Dunn and Parrack (1986, 1992) with additional more recent contributions by the author and Mrs J Beadle, N J Cook, P J Corkhill, H T Eales, H E Ellis, N Foggo, M A Freeman, J B Keenan, R McCormick, J A Pearson, B N Rossiter, P J Tennant and B & I D Wallace.

Species have been selected for inclusion when there are ten or fewer records for the county, occasionally more if the status is changing, (**NR**) or when the species is declining (**ND**) or is very local (**NL**) in the county. In addition, the large heath butterfly is included because Northumberland holds a nationally important population (**Pop**). Obvious vagrants have been excluded. Species of which the identifications are noted as unconfirmed are included in square brackets. Species on the short or middle list of the *UK Steering Group Report* have been proposed for Species Action Plans, together with a few species that are locally threatened.

Species not seen in the county since 1945 are listed at the end of each section.

Butterflies

Species		Criteria/status
Thymelicus sylvestris	Small skipper	**NR** Reg

Habitat: prefers grassy, herb-rich waste ground.

It is expanding its range northwards, possibly as a result of recent warm summers and may become relatively common. The first county record was in July 1994 at Park Wood; in 1995 it was found in Horsley Wood and Tyne Riverside Country Park, and in 1996 it was recorded

from Big Waters and Weetslade Colliery. Colonies were found at seven localities in North Tyneside and south-east Northumberland in 1997.

Erynnis tages Dingy skipper **NR** Loc

Habitat: sites with calcareous substrates, for example the spoil heaps at Prudhoe, which provide ample quantities of its foodplant, bird's-foot trefoil *Lotus corniculatus*.

It is expanding northwards following recolonisation of the mid Tyne Valley at the beginning of the twentieth century. During the last decade it has been recorded from about nine sites in the mid Tyne Valley and also from Newcastle and the Stobswood area. It may be more common than the records indicate.

Quercusia quercus Purple hairstreak **NR** Reg

Habitat: requires mature oakwoods for breeding.

There are only occasional early records from the county, the last from Kyloe Woods in July 1949; it reappeared in the Hexham area in the early 1990s.

Strymonidia w-album White letter hairstreak **NR** Scarce W

Habitat: woodland margins. The larvae feed on elm *Ulmus* spp.

This southern species, a new arrival in the county in 1996, has been seen in the Prudhoe area but there have been no sightings north of the Tyne. It continues to expand its range.

Cupido minimus Small blue **NL NR** L Reg W

Habitat: mainly on chalky soils. Food plant: kidney vetch *Anthyllis vulneraria* and other small legumes.

It was present in north Northumberland around the time of the second world war. Records on the cliff faces at Marshall Meadows, just north of Berwick, are approximately ten years old and need to be checked. Other suitable sites occur, such as Cocklawburn Dunes, where the food plant is plentiful.

Celastrina argiolus Holly blue **NR** Reg

Habitat: woods, gardens and hedges. Food plants: holly *Ilex aquifolium* and, in the autumn, ivy *Hedera helix.*

There were no Northumberland records until the early 1990s when it spread rapidly throughout coastal areas as far north as Bamburgh and up to twenty miles inland, mainly along the Tyne Valley. More recent cold spells during May have caused it to retreat again to a northerly limit in the Tyne Valley or further south.

Polygonia c-album Comma **NR** Reg

Habitat: woods, gardens and hedges; the larvae feed on nettles *Urtica dioica*.

The recent increase in the number of records parallels the northward expansion of this species. It is well established in Castle Eden Dene (County Durham) and was seen at Tynemouth in

1995, in Newcastle, Slaley Forest and the valley of the River Wansbeck in 1996, and in the Wansbeck and Blyth Valleys and at Bamburgh in 1997.

Boloria selene Small pearl-bordered fritillary **NR**
L Reg

Habitat: damp woodlands and marsh.

This species appears to be increasing; colonies have been reported from Ford Moss, the Sweethope area, Kielder Forest and a few other sites. The food plant, marsh violet *Viola palustris*, does not often appear in sufficient quantity to support sizeable permanent colonies.

B. euphrosyne Pearl-bordered fritillary **NR**
S Scarce W

Habitat: open woodlands, the larvae feeding on violets *Viola* spp.

There have been only about six Northumberland records in this century. The last definite record was in west Tynedale in 1962; it may be extinct in the county.

SPECIES ACTION PLAN REQUIRED.

Coenonympha tullia Large heath **Pop**
L Reg Wp

Habitat: wet moorland.

Although the large heath is not endangered in the county, Northumberland has more colonies of this species than any other English county, 72% of all English sites (Eales, 1995 and personal communication, 1997). This is due to the relatively large number of surviving peat bogs which are its favoured habitat. The larvae feed on hare's tail cotton grass *Eriophorum vaginatum,* and the adults on the nectar of cross-leaved heath *Erica tetralix*. Some genetic isolates may have resulted from the separation of colonies by conifer forests.

Large heath, photographed by H E Ellis.

Species of butterfly not seen in the county since 1945

Pyrgus malvae	Grizzled skipper	Reg
Aricia artaxerxes salmacis	Durham argus	Scarce
Nymphalis polychloros	Large tortoiseshell	RDB1 W
Pararge aegeria[1]	Speckled wood	Reg
Erebia aethiops	Scotch argus	Loc
Pyronia tithonus	Gatekeeper	Reg

Macro moths

Species **Criteria/status**

Lasiocampidae

Lasiocampa quercus quercus Oak eggar **NR**

A larva from Holy Island in the 1980s, apparently on creeping willow *Salix repens*, that may have been of this form is the only recent coastal lowland record.

Drepanidae

Falcaria lacertinaria Scalloped hook tip **ND NR** Loc

Thinly but widely distributed at the end of the last century, it is now known from only one or two upland sites, principally in the Kielder/Otterburn area, where it seems to be decreasing.

Thyatiridae

Tethea ocularis Figure of eighty **NR**

There are four records: at Close House in 1976, Allerwash since 1986 and Corbridge and North Shields in 1994.

1 An unconfirmed record, in 1982, for this species puts its current status in doubt.

Geometridae

Jodis lactearia Little emerald **NR** Reg

Restricted to a few localities in the Dipton Woods area and the Derwent Valley, from which it is showing no signs of extending its range.

Timandra griseata Blood vein **NR** Loc

One was taken at Kielder in 1970, since when it has been found at three sites, Allerwash, Newton-by-the-Sea and Whitley Bay. The species may be in the process of spreading.

Scopula marginepunctata Mullein wave **NR** Reg

Two were taken at Bedlington Station in 1976.

S. immutata Lesser cream wave **NR** Reg

There is only one record, from Thorngrafton Common in 1977.

Idaea fuscovenosa Dwarf cream wave **NR** Reg

The only recent records are from Stocksfield in 1930, Seaton Sluice in 1976 and Newton-by-the-Sea in 1981.

I. straminata Plain wave **NR** Reg

Common at Riding Mill during the 1950s and 1960s; there were no further records until three were found in 1977 (at Rothley, Cupola Bridge and Allerwash), since when there have been only three more.

Orthonama vittata Oblique carpet **NR** Reg

There is one record, of a strong colony at Greenlee Lough in 1993-94.

Epirrhoe rivata Wood carpet **NR** Reg

The species was regularly found in the Tyne Valley until the 1960s; since then, recorded only from Dipton Woods (in 1984) and Allerwash (in 1987 and 1988). It now appears to be very scarce in the North East.

Larentia clavaria The mallow **NR**

Regular in the Tyne Valley until the 1960s. The only recent record is for Beadnell in 1986. The foodplant, mallow *Malva sylvestris*, is declining.

Thera firmata Pine carpet **ND**

Fairly widespread in plantations of mature Scots pine *Pinus sylvestris* but always scarce and at risk from the felling of mature stands of pine. Declining.

T. juniperata Juniper carpet **NR**
Scarce

It has been associated with juniper *Juniperus communis*, at Harehope Moor. Occasional records elsewhere probably represent individuals imported on garden junipers.

Colostygia olivata Beech-green carpet **ND NR**
Loc

The species has decreased markedly during the present century and is now confined to a few sites in the mid Tyne Valley.

Rheumaptera cervinalis Scarce tissue **NR**
Loc

There is a 1954 Riding Mill record. This species may survive on cultivated forms of barberry *Berberis* in gardens, where it may be overlooked.

R. undulata Scallop shell **NR**
Loc

Known only from two or three sites in the Corbridge area. It is increasing in Yorkshire. The foodplants are sallow *Salix* spp., aspen *Populus tremula* and bilberry *Vaccinium myrtillus*.

Euphyia unangulata Sharp-angled carpet **NR**
Loc

A single specimen was found at Kielder in 1971.

Perizoma taeniatum Barred carpet **NR**
Rare

There is only one record, for Oakpool in 1975.

P. blandiata Pretty pinion **NR**
Scarce

There is a single record, for Bedlington Station in 1977.

Eupithecia linariata Toadflax pug **NR**

The species is at its northern limit in the county; it is known from a few sites in the mid Tyne Valley but may be under-recorded elsewhere. The food plants are toadflaxes *Linaria* spp.

E. abietaria Cloaked pug **NL NR**

Recorded only from Catcleugh (1932-33 and 1985), Kyloe Woods (1984) and recently between Kielder and Plashetts Burn. Its food plant is Norway Spruce *Picea abies*.

E. valerianata Valerian pug **NR**
Scarce

Found in the mid Tyne Valley until the 1960s but there is only one recent record, at Prestwick Carr in 1970, where it used to occur until the 1930s.

E. trisignaria Triple spotted pug **NR**
Loc

This species just reaches the county, in the Derwent and Tyne valleys, at the northern limit of its range.

E. tripunctaria White spotted pug **NR**
Loc

The species just crosses the Tyne; it has been taken at Riding Mill, Allerwash and Close House.

E. distictaria constrictata Thyme pug **NR**
Scarce

There are a few records, scattered over the higher land in the west of the county; it is possibly under-recorded.

E. indigata Ochreous pug **ND NR**

Formerly well distributed in mature Scots pine *Pinus sylvestris* woodland, this species has declined markedly in recent years, in line with the felling of mature plantations. It may also feed on larch *Larix* spp.

E. pusillata Juniper pug **ND NR**
Loc

Still fairly widespread on stands of juniper *Juniperus communis*, but this species is decreasing.

Chloroclystis v-ata The V-pug **NR**

Recorded only from Kielder since the 1970s, but it may be extending its range; the county is near its northern limit.

Chesias rufata Broom tip **NR**
L Reg

There is one record only, from Beltingham in 1983.

Aplocera efformata Lesser treble bar **NR**
Loc

The species was recorded in the county for the first time in 1987, both at Burnstones (on the South Tyne) and at West Monkseaton. It may be extending its range northwards.

Euchoeca nebulata Dingy shell **NR**
Loc

The species is near the northern limit of its range but it has been taken recently in the mid Tyne Valley, Hartburn, Druridge Bay and Plashetts.

Asthena albulata Small white wave **NR** Reg

It has been taken in the mid Tyne Valley and, more recently, at Ovingham in 1985.

Hydrelia flammeolaria Small yellow wave **NR** Reg

Very scarce although it is still found in a few sites in the mid Tyne Valley, and reached Gosforth Park in the 1970s.

Lobophora halterata The seraphim **NR** Reg

There are only three recorded sites, Cupola Bridge in 1977, Rochester in 1979 and Allerwash, several times since 1988; it may be extending northwards. It feeds on aspen *Populus tremula* and other poplars.

Pterapherapteryx sexalata Small seraphim **NR** Reg

One very recent record, a specimen taken near Kielder Viaduct in 1997.

Acasis viretata Yellow-barred brindle **NR** Reg

This is another species near the northern limit of its range; there is one record from Cupola Bridge in 1981 and three from Allerwash since 1989.

Plagodis pulveraria Barred umber **NR** Loc

There are only three records: Cupola Bridge in 1971 and Dipton Mill Wood and High Wood, both in 1980.

P. dolabraria Scorched wing **NR** Reg

One was at Kielder Castle in 1970 and it has been taken almost annually since 1986.

Epione parallelaria Dark-bordered beauty **ND NR** M RDB3

One of its three or four national sites was at Newham Fen where a small colony persisted until at least the mid 1980s. There was a possible record from Fallowlees Burn in 1952 but it has not been found there since. The food plants are willows *Salix* spp. and birch *Betula* spp.

SPECIES ACTION PLAN REQUIRED.

Pseudopanthera macularia Speckled yellow **NR** Reg

There are only two county records of this elsewhere widespread species, from the College Valley and Hethpool, both in 1974.

[*Ennomos quercinaria* August thorn **NR** Reg

There are two unconfirmed records, for Kielder Castle in 1974 and Stocksfield in 1981. This species is rare elsewhere in the North East.]

[*E. fuscantaria* Dusky thorn **NR**

One was found at Sidwood in about 1921. There is one recent unconfirmed record at Stocksfield in 1982.]

E. erosaria September thorn **NR** Loc

At the northern limit of its range, this species has been found at Rochester in 1976, Kielder in 1973 and 1976, and Allerwash in 1985-89.

Selenia tetralunaria Purple thorn **NR** Loc

Very scarce and thinly distributed; it may be mistaken for the dark form of the common *S. lunularia*, but there are a few confirmed recent records. It feeds on a variety of broadleaved trees.

Apocheima hispidaria Small brindled beauty **NR** Reg

Localised in the mid Tyne Valley up to the 1960s. There is a single more recent record at Stublick in 1974. The county is at the northern limit of the species' distribution.

Lycia hirtaria Brindled beauty **NR** Loc

A rare species in the north of England. There are records for Kielder Castle in 1969 and 1975 and for Stocksfield in the 1980s.

Biston strataria Oak beauty **NR** Loc

This species is at the north-eastern limit of its range, but is established in the mid Tyne valley and has now reached Kielder.

Alcis jubata Dotted carpet **NR** Scarce

This is a very thinly distributed species in the county except for a large colony in the Kielder area. It is at the southern limit of the range of the Scottish population.

[*Ectropis consonaria* Square spot **NR** Loc

The first record for this county is from Kyloe Woods in 1988, but is unconfirmed.]

Gnophos obscuratus The annulet **ND NR**
Reg

This was a widely but thinly distributed species in upland and coastal areas of the county before the mid 1970s; there are no more recent records.

Perconia strigillaria Grass wave **NR**
Scarce

There is only one record, from Devil's Water near Steel in 1982; it is generally rare in eastern Britain.

Sphingidae

Sphinx ligustri Privet hawk moth **NR**
Reg

A larva in Heaton in 1969 is the only record for this century.

Smerinthus ocellata Eyed hawk moth **NR**
Reg

This species spread northwards into the Tyne Valley between 1850 and 1950 but declined thereafter. There is a single recent record at Ninebanks in 1974.

Notodontidae

Furcula bifida Poplar kitten **NR**
Reg

Recorded occasionally from Riding Mill in the 1950s and 1960s and from Close House in 1976. At the northern limit of its range.

Pterostoma palpina Pale prominent **NR**
Loc

Widely but thinly distributed in the county; since the 1970s, mostly in the north.

Lymantriidae

Euproctis chrysorrhoea Brown tail **NR**
Reg

Not recorded in the present century until the 1990s, when there was an influx into south-east Northumberland, including possible breeding on sea buckthorn *Hippophae rhamnoides* at Hauxley.

E. similis Yellow tail **NR**

Apparently absent until 1967 when it colonised the south-west of the county. Recently it may have begun to decrease again.

Leucoma salicis White satin moth **NR**
Reg

Once common at Newham Fen, but last seen there in 1896. There are recent records for Riding Mill in 1957 and Allerwash in 1983.

Arctiidae

[*Thumatha senex* Round winged muslin **NR**
Loc

There is a recent unconfirmed record from Fenwick Granary in 1988; possibly it is overlooked.]

Cybosia mesomella Four dotted footman **NR**
Reg

There was one record from Riding Mill in the early 1960s and a few from Kielder Castle in the following decade. The most recent record was from Allerwash in 1992.

Eilema lurideola Common footman **NR**
Loc

There are a few recent records from the coast between Beadnell and Ross Back Sands.

Diacrisia sannio Clouded buff **NR**
Reg

Uncommon but widespread until the 1920s. Since then, recorded only near Holystone in 1973 and 1985 and on the Otterburn Ranges in the early 1990s.

Noctuidae

Euxoa obelisca grisea Square-spot dart **NR**
Scarce

There are two records for 1985, both from Holy Island.

E. cursoria Coast dart **NR**
Scarce

Virtually confined to dune systems from Druridge Bay northwards.

Agrotis cinerea Light feathered rustic **NR**
L Scarce

There are two records, for Newton-by-the-Sea in 1981 and Warkworth dunes in 1990.

A. clavis Heart and club **NR**
Reg

The only localities since 1900 are at Cocklawburn in 1983 and Holy Island in 1985.

Agrotis puta Shuttle shaped dart **NR**
Reg

The only records are at Blyth Links in 1927 and Kielder in 1974.

A. ripae Sand dart **NR**
Scarce

First recorded in 1970; a subsequent survey revealed nine sites between the mouth of the Coquet and Berwick harbour, but with very small numbers at each site.

Axylia putris The flame **NR**
Loc

Very thinly distributed, in coastal areas.

Noctua interjecta caliginosa Least yellow underwing **NR**

There are signs that the species may be spreading north; it has been recorded from County Durham, and from Allerwash in Northumberland in 1997.

Diarsia florida Fen square spot **NR**
Loc

At present this species is known only from Prestwick Carr, in 1970-77, and from Burnstones on the South Tyne in 1980, but it may be under recorded.

Xestia alpicola alpina Northern dart **NR**
M Rare

One battered specimen from the summit of The Cheviot in 1975 remains the only county record although it is better known across the Cumbrian border.

SPECIES ACTION PLAN REQUIRED.

X. rhomboidea Square spotted clay **NR**
M Scarce

Records of this species are few and mainly coastal. These may represent immigrants, but the situation merits investigation.

SPECIES ACTION PLAN REQUIRED.

Anarta myrtilli Beautiful yellow underwing **ND NR**

Since the 1970s, this moorland species has apparently decreased greatly.

A. melanopa Broad bordered white underwing **NR**
L RDB3

One, taken at the summit of The Cheviot in 1974, is the only English record.

Sideridis albicolon White colon **NL NR**
Scarce

Restricted to a few scattered coastal colonies.

Lacanobia suasa Dog's tooth **NL NR**
Reg

There is one fairly well established colony in the Holy Island/Ross Back Sands area.

Panolis flammea Pine beauty **NR**

This species remains very scarce despite some increase in suitable Scots pine *Pinus sylvestris* forest. It is virtually unknown in lodgepole pine *P. contorta* forest at Kielder.

Mythimna litoralis Shore wainscot **NL NR**
Scarce

At present believed to be restricted to three or four coastal localities.

Lithomoia solidaginis Golden rod brindle **NR**
Loc

Few records; probably thinly distributed on a number of Northumberland moors.

Xylena exsoleta Sword grass **ND NR**
M Scarce

This species was widely but thinly spread until the late 1960s but decreased thereafter, both in the county and nationally. It may now be extinct in Northumberland.

SPECIES ACTION PLAN REQUIRED.

Xylocampa areola Early grey **NR**
Reg

There are three to four records of this essentially western species, covering the period 1967 to 1983, but no more recent occurrences.

Dryobotodes eremita Brindled green **NR**
Reg

It spread into the county in the 1920s-30s but declined and disappeared in the 1960s. Taken again at Allerwash since 1981, and regularly since 1987.

Polymixis flavicincta Large ranunculus **NR**
Reg

Specimens from Kielder Castle in 1969 and Rochester in 1979 may be indicative of a small local population. The main concentration in England is in the South East.

Conistra ligula Dark chestnut **NR**

This species reaches the north-eastern limit of its British range in the county, but shows signs of retreating southwards.

Xanthia citrago Orange sallow **NR**

Very thinly distributed in the county, limited by the distribution of its food plant, the lime tree *Tilia* sp.

Acronicta megacephala Poplar grey **NR**
Loc

A species which began to colonise the county in the 1930s and appears to be maintaining its modest numbers.

A. alni Alder moth **NR**
Loc

A relatively new arrival, taken at Allerwash, first in 1980 and regularly in the 1990s.

Amphipyra berbera svenssoni Svennson's copper underwing **NR**
Loc

There are four very recent records, for 1996, in Briarwood Banks, Jesmond, Tynemouth and the Irthing Gorge. At each of the first two sites more than twenty specimens were trapped (Cook 1997).

Ipimorpha subtusa The olive **NR**
Loc

This moth has always been scarce or rare in Northumberland and there have been no records since one in 1976, at Close House.

Hyppa rectilinea The saxon **NR**
Scarce

Known from three or four sites in the Kielder area and at least one other site in the north. County records probably represent a southward range extension of this Scottish species; it has now reached Allerwash.

Apamea maillardi assimilis Northern arches **NR**
Rare

Three were trapped in 1993-94 in the Belling Burn area. This suggests a marked southerly extension of the range of this species.

Photedes captiuncula Least minor **ND NR**
L RDB3

Formerly one of the strongholds of this species in Britain, Northumberland has probably now lost its last known breeding colony, at Arcot Hall. The food plant is the glaucous sedge *Carex flacca.*

SPECIES ACTION PLAN REQUIRED.

P. elymi Lyme grass **NR**
Rare

Restricted to a few coastal localities by the distribution of its food plant, lyme-grass *Leymus arenarius.*

Amphipoea fucosa paludis Saltern ear **NL NR**
Loc

One fairly stable population appears to be centred on the Holy Island/Fenham Flats area.

Celaena leucostigma The crescent **NR**
Reg

One was at Cocklawburn beach in 1970 and a few individuals were at Newton-by-the-Sea in 1984. Unaccountably scarce in the north-east of England.

Chilodes maritimus Silky wainscot **NR**
Scarce

Four or five, from a possible breeding colony, were found at Newton-by-the-Sea in 1981 but it has not been seen since. Generally confined to south-eastern Britain.

Pyrrhia umbra Bordered sallow **NL NR**
Reg

At present this species is known from six or seven localised sites, being entirely dependent on restharrow *Ononis repens*, which is now virtually confined to dune systems.

Pseudoips fagana britannica Green silver-lines **ND NR**
Loc

Decreasing recently in the Tyne Valley; and there is only one recent record for north Northumberland, at Kyloe woods in 1984.

Nycteola revayana Oak nycteoline **NR**
Reg

There are six to seven records in the last hundred years, with a slight increase in recent years, mostly from the Tyne Valley.

Colocasia coryli Nut tree tussock **NR**
Loc

Four or five widely dispersed, localised concentrations.

Polychrysia moneta Golden plusia **NR**
Loc

This species arrived in the county in the 1920s but, after increasing, its numbers collapsed in about the 1960s, and there have been no records since the mid 1980s.

Plusia festucae Gold spot **NR**

Status unclear, most possible specimens turning out to be *P. putnami*. The impression is that this species is much scarcer than formerly.

Abrostola trigemina Dark spectacle **ND NR**
Loc

Always scarce and localised to the mid Tyne Valley; but declining since the late 1970s.

Euclydia glyphica	Burnet companion	**ND NR** Loc

Records have decreased during the present century and there have been only three since the 1960s, at Ross, Redpath and Stobswood. The decrease is possibly due to the loss of calcareous grassland.

Phytometra viridaria	Small purple barred	**ND NR** Loc

Formerly well distributed but its range has decreased since the 1960s, since when it has been recorded from only three or four sites.

Schrankia costaestrigalis	Pinion streaked snout	**NR** Scarce

There are records from two sites, at Newham Fen in 1985 and Allerwash in 1994 and 1995.

Species of macro moth not seen in the county since 1945

Eriogaster lanestris	Small eggar	L Scarce
Habrosyne pyritoides	Buff arches	
Tethea or	Poplar lutestring	Loc
Tetheella fluctuosa	Satin lutestring	Scarce
Thera cognata	Chestnut-coloured carpet	Scarce
Perizoma minorata ericetata	Heath rivulet	Scarce
Eupithecia pygmaeata	Marsh pug	Loc
E. subumbrata	Shaded pug	Loc
Semiothisa brunneata	Rannoch looper	Rare
Serraca punctinalis	Pale oak beauty	Reg
Cleorodes lichenaria	Brussels lace	Reg
Aethalura punctulata	Grey birch	Reg
Hyles euphorbiae	Spurge hawk moth	
Ptilophora plumigera	Plumed prominent	Rare
Drymonia dodonea	Marbled brown	Reg
Lithosa quadra	Four spotted footman	Loc
Nola cucullatella	Short cloaked moth	Loc
Eugnorisma depuncta	Plain clay	Loc
Standfussiana lucerna	Northern rustic	Loc
Noctua orbona	Lunar yellow underwing	M Rare
Spaelotis ravida	Stout dart	
Xestia ditrapezium	Triple spotted clay	Reg

Cerastis leucographa	White marked	Scarce
Lacanobia contigua	Beautiful brocade	Loc
L. w-latinum	Light brocade	Reg
Orthosia populeti	Lead coloured drab	Loc
Enargia paleacea	Angle striped sallow	Scarce
Apamea oblonga	Crescent striped	Scarce
A. anceps	Large nutmeg	Reg
Charanyca trigrammica	Treble lines	Loc
Spodoptera exigua	Small mottled willow	
Panemeria tenebrata	Small yellow underwing	Loc
Heliothis armigera	Scarce bordered straw	
Catocola nupta	Red underwing	Loc

Micro Moths

Many early records were made by Bolam (1925-1930), based in north Northumberland, and Robson (1899-1913), based in Hartlepool. J B Hodgkinson of Preston, Lancashire gave Robson a list of microlepidoptera he had found in west Northumberland in the 19th century, without specific locations or dates; some of these remain the only county records. The species which have not been seen since the reports of these authors are listed separately at the end of the main entries. The following accounts relate to species recorded since 1945.

The author's experience in the microlepidoptera is based largely on collecting and identifying their leaf-mines and with species collected by the use of Rothamsted and Heath traps. Many of the records, particularly of species in the first twelve families listed below, are based primarily on leaf-mine characters, rather than specimens. Many groups – the Coleophoridae are a case in point – are extremely difficult to identify; others are elusive in their flight habits and may be missed by Heath trapping. These factors and the location of observers all affect the frequency and location of records.

Species marked with * might benefit from increased planting of the relevant food plant; on this and other details further information is available in Dunn and Parrack (1992).

Species **Criteria/status**

Micropterigidae

Micropteris mansuetella **NL NR**
Loc

Known only from Newham Fen in 1986. Shortage of suitable habitat may explain its scarcity – it requires wet fen conditions with an abundance of sedges *Carex* spp.

Eriocraniidae

Eriocrania sparrmanella **NR**
U

There are only two recent records, at Throckley Pond and Muckle Moss, in 1981. Possibly under-recorded although the food plant, birch *Betula* spp., is widespread. It is at best a very localised species and is widely but thinly scattered in Britain.

E. salopiella **NR**
U

Nationally fairly common and widespread, feeding on birch *Betula* spp., but rare in Northumberland. One record only, at Gubeon Plantation, Morpeth in 1976.

Hepialidae

Hepialus hecta Gold swift **ND NR**
Loc

A bracken *Pteridium aquilinum* feeder which seems to have declined since the 1960s.

Nepticulidae

Ectoedemia angulifasciella **NR**
Loc

This species appears to be spreading north but is at its northern limit in Northumberland.

E. atricollis **NR**
U

This species appears to be spreading north but is at its northern limit in Northumberland.

E. mediofasciella **NR**
U

A species which seems recently to have begun to spread eastwards, having been recorded recently from south-west Northumberland, Powburn and Kyloe. It is still scarce.

E. subbimaculella **NR**
U

The only county record is of a mine on oak *Quercus* sp. in Kyloe Woods in 1956. This is well to the north of its normal range.

E. quercifoliae **NR**
U

This species has extended its UK range north-eastwards; the only county record is for Callaly, in 1986.

E. pulverosella

NR
U

Appears to be retreating; there is only one recent record, at Cornhill on Tweed in 1968.

Stigmella tengstroemi

NR
Scarce

The first record for England was in 1988 on Whitfield Moor, a possible southward spread from the Scottish Highlands.

S. continuella

NR
U

Mines were found at Lambley in 1989. It appears to have spread from the west coast.

S. plagicolella

NR
Loc

Fairly widely but very thinly distributed. A blackthorn *Prunus spinosa* feeder at the northern limit of its English range (although there is a small, isolated Scottish population).

S. obliquella

NR
U

The only definite record is from Ford Moss in 1989. Its distribution in northern areas is becoming disjunct.

S. trimaculella

NR
U

There are only three widely separated modern records for south Northumberland and none for the north of the county, possibly due to shortage of the preferred food plant, black poplar *Populus nigra*, but it is also at the northern limit of its distribution.

S. ulmivora

NR
U

A record near Tillmouth, on wych elm *Ulmus glabra* in 1988, shows that this species has been able to survive the effects of Dutch elm disease. This is the most northerly record for the species and the only Northumberland record.

S. spinosissimae

NR
Rare

The first English mines of this species were found on burnet rose *Rosa pimpinellifolia* at Newton Links in 1988 and later others were found on Tughall Links.

S. malella

NR
Loc

Scarce, and very thinly but widely distributed; at its northern limit.

Opostegidae

Opostega salaciella **NR**
U

Only one modern county record, for Yarnspath Law in the Cheviots in 1976. However there were a number of records in County Durham in 1991 so it could be encountered on marginal pasture where the food plant, sheep's sorrel *Rumex acetosella*, is found.

O. crepusculella **NR**
U

There is only one Northumberland record of this elsewhere widespread species, at Holywell Pond in 1986. It appears to be associated with mint *Mentha* sp. in marginal aquatic habitats.

Incurvariidae

Lampronia oehlmanniella **NR**
U

Found in very few, widespread sites, and possibly decreasing. A population disjunction may be developing in the Borders.

Nematopogon metaxella **NR**
U

Found only at Langleeford in 1888-90 and at Howick Grange in 1987. At the northern limit of its range.

Adela croesella **NR**
Loc

A single record at Twizell in 1984; the most northerly site except for an isolated population in Perthshire.

A. rufimitrella **NL NR**
Loc

A very thinly distributed species localised in three or four sites in the mid Tyne Valley. Cuckoo flower *Cardamine pratensis* and garlic mustard *Alliaria petiolata* are the preferred food plants.

Heliozelidae

Heliozela sericella **NR**
U

There are recent records for Priestclose Wood in 1980 and Roddam Wood in 1981. Apart from one in Dumbartonshire, this is the most northerly site. Its food plant is oak *Quercus* sp.

H. resplendella

NR
U

Three records: for Derwent Reservoir in 1987, Chollerton in 1981 and Coe Burn in 1988. Near the northern limit of its range.

Cossidae

Cossus cossus Goat moth **NR**
Scarce

Borings from willow *Salix* sp. at Tilesheds, near Chathill, in 1987 showed recent occupancy by this species, but this is the only modern record.

Tineidae

Haplotinea insectella

NR
Scarce

There are two modern records, from Priestclose Wood in 1980 and Embleton in 1986. It generally feeds on fungi and detritus and may be decreasing.

Nemaxera betulinella

NR
U

Thinly scattered; found where bracket fungi are plentiful. At its northern limit.

Triaxomera fulvimitrella

NR
Loc

Taken at Kielder Castle in 1986 and 1988 and at Rothbury in 1989. Generally a very local species.

Monopis ferruginella

NR
Loc

One record by the Barhaugh Burn in 1986. Very scarce, with a fragmented distribution in the north. A detritus feeder; its decrease is possibly due to improved management of garbage.

M. imella

NR
Scarce

Two modern records, in a bird's nest from Gosforth Park in 1976 and on the Snook, Holy Island in 1988. Widely but thinly distributed in northern areas, with a preference for the coast; generally dependent on refuse, birds' nests etc.

Tineola bisselliella Common clothes moth **ND NR**
U

Once common, now rarely seen. Only one modern record, at Ordley in 1985.

Niditinea fuscipunctella Brown dotted clothes moth **ND NR U**

Another species of greatly decreased abundance, dependent on birds' nests, animal refuse etc. The only records in recent years are from four well separated sites, in Tynedale and by Holystone Burn.

Tinea pellionella Case-bearing clothes moth **ND NR U**

Now virtually dependent on birds' nests in relatively warm situations such as barns. There are only a few modern records, concentrated in the Tyne Valley.

T. flavescentella **ND NR U**

Scarce, though widely distributed in Britain; it has decreased markedly. One was bred in 1963 from larval cases taken from a feather cushion in a house in Berwick, the only county record.

Ochsenheimeriidae

Ochsenheimeria vacculella **NR** Scarce

There is one record, at Low Newton in 1981, the most northerly for the British Isles.

Lyonetiidae

Bucculatrix crataegi **NR U**

A single record, of a mine, at Parkside, Allendale in 1987. Near its northern limit.

B. demaryella **NR U**

One record, of a mine on birch *Betula* sp. at Sweethope Lough in 1986. Scarce generally in the North, so the English and Scottish populations are becoming disjunct.

Gracillariidae

Caloptilia cuculipennella **NR** Loc

There are only two records, at Whitley Bay in 1986 and at Ordley in 1987. The distribution of this species is strangely disjunct.

C. robustella **NR U**

The only record is of a mine on an oak leaf from Letah Wood, Linnells in 1987. Apart from a small, isolated Scottish population this appears to be the most northerly record.

C. semifascia **NR**
U

There are only two records, Gosforth Park in 1980 and College Burn in 1981 (unconfirmed). This is the northern extremity of an isolated northern English population, not helped by relative scarcity of the food plant, field maple *Acer campestre*.

C. leucapannella **NR**
Loc

One was at Prospect Hill in 1976. It prefers young oaks, preferably in humid situations. Populations are scattered and disjunct in eastern Britain.

[*Calybites auroguttella* **NR**
U

Recorded by Hodgkinson. One probable but unconfirmed recent record, at Ordley in July 1986.]

Parornix finitimella **NR**
Reg

There are only two records, one in Embleton in 1987 and one at Mereburn. Its absence from south Northumberland is surprising.

Phyllonorycter blancardella **NR**

There are two records, at Whitley Bay in 1987 and Kielder in 1988. Near the northern limit of its range. Food plant: apple trees *Malus* spp.

P. nigriscentella **NR**
U

Recorded by Robson. One modern record from Gosforth Park in 1978. Localised in a narrow band across southern England and disjunctly in the North. It may be overlooked but it appears to be declining despite being fairly common in County Durham. It feeds on legumes.

P. lautella **NR**
U

There is only a single modern record, of a vacated mine at Shield Hall in 1986. It may be becoming increasingly scarce in eastern Britain.

P. emberizaepenella **NR**

Only a single modern record. The food plants are honeysuckle *Lonicera periclymenum* and snowberry *Symphoricarpos albus*.

P. tristrigella **NR**
Loc

Only four modern records for Northumberland, probably reflecting a generalised decrease as it is on the northern limit of its range and it feeds on elm.

P. stettinensis **NR**
U

Only one modern record, Rothley Lakes in 1980. Apart from two isolated Scottish sites, the county is near the northern limit of this species.

P. froelichiella **NL**

Uncommon and virtually confined to mid Tynedale. Feeds on alder *Alnus* spp.

P. kleemannella **NL**

Confined to a small area in mid Tynedale, almost exclusively on grey alder *Alnus incana.*

Sesiidae

Sesia bembeciformis* **NR**

One modern record on old willows at Whitley Bay in 1988. It may be decreasing in the North. Its main food plant is goat willow *Salix caprea.*

Synanthedon formicaeformis **NR**
Scarce

The most recent records were from several localities in south Northumberland between 1924 and 1952. These records represent the northern limits of its range.

Glyphipterigidae

Glyphipterix haworthana **NR**
U

The only record is for Muckle Moss in 1981. It feeds on cotton grass *Eriophorum* spp., occurs on bogs and may be overlooked.

Yponomeutidae

Argyresthia arceuthina **NR**
U

A single record from the Holystone Valley in 1980.

A. ivella **NR**
Loc

One record from Newton-by-the-Sea in 1985.

A. mendica **NR**
Loc

Two recorded localities, Kielder in 1988 and Newton Links in 1985. The species has always been scarce in the North East.

Yponomeuta rorrella **NR**
pRDB3

Essentially southern; found at Embleton in 1990 and Hauxley in 1991. Food plant: willow *Salix* spp.

Y. sedella **NR**
Scarce

Another southern species, with county records at Catton and Embleton.

Swammerdamia compunctella **NR**
Scarce

There are only three modern records for Northumberland, including Kyloe Woods. It occurs sporadically as far north as central Scotland. Rowan *Sorbus aucuparia* is the food plant.

Paraswammerdamia albicapitella **ND NR**
Loc

Nowadays much scarcer than at the beginning of the twentieth century when it was regarded as common. There are only two recent county records.

Cedestis gysseleniella **NR**

There are only a few recent records including one at Whitley Bay in 1985. Feeds on pine *Pinus* spp.

Ypsolopha nemorella **NR**
Loc

Local at the beginning of the century. There are a few recent records but it must be regarded as scarce.

Y. scabrella **NR**

First recorded at Whitley Bay in 1985; there have been two or three subsequent records.

Y. sylvella **NR**
U

One record at Honeycrook Burn (Tony's Patch) in 1980.

Orthotaelia sparganella **NR**
Loc

One specimen of this very scarce species was taken at Hauxley in 1991.

Digitivalva pulicariae **NR**
U

One modern record at Newpark Wood in 1975.

Epermeniidae

Phaulernis fulviguttella **NR**
U

Only one modern record, at Pegwhistle Burn, Netherton in 1981.

Epermenia chaerophyllella **NR**
U

Only a single modern record, at the Linnels in 1987.

Coleophoridae

This family is difficult to identify and is doubtless under-recorded.

Coleophora flavipennella **NR**
U

One record only, at Stocksfield in 1984.

C. coracipennella **NR**
U

One modern record, at Warkworth Dunes.

C. cerasivorella **NR**

There is one modern record, from Whitley Bay.

C. frischella **NR**
Scarce

Recorded from Scremerston Dunes in 1955.

C. lineola **NR**
U

A case found in Plessey Woods in 1986 was regarded as belonging to this species.

C. lithargyrinella **NR**
Scarce

One taken at Stocksfield in 1984 is the only record.

C. lixella **NR**
U

Found only on the Scremerston shore area, in 1955 and 1983.

C. striatipennella **NR**
U

Taken originally in the 1950s, probably in the Scremerston Dunes area. There is a more recent record at Beadnell in June 1987. Widely distributed elsewhere but rare in the North East.

C. peribenanderi **NR**
U

The only Northumberland record is from the Scremerston/Cocklawburn area in 1959.

C. virguareae **NR**
U

One record, from Warkworth salt-marsh in 1990.

C. saxicolella **NR**
U

One record, probably from the Scremerston/Cocklawburn area, in the late 1950s.

C. artemisiella **NR**
U

Another salt-marsh species, taken in the late 1950s and more recently at Embleton in 1987.

Elachistidae

Elachista albifrontella **NR**
U

Only four recent records for Northumberland; it has always been scarce.

E. cerusella **NR**
Loc

Two modern records, at Beltingham Gravels in 1983 and at Newton-by-the-Sea in 1984.

E. triatomea **ND NR**
U

Common in the early twentieth century, now scarce. Found in the Scremerston area in 1955 and 1959, and at Cresswell in 1982.

E. subocellea **NR**
Loc

Always an uncommon species in the North East; there is only one modern county record, at Newton-by-the-Sea in 1984.

E. dispunctella **NR**
Scarce

Taken only at Prudhoe in 1980 and Linnels in 1987.

E. unifasciella **NR**
Scarce

Very scarce, but possibly increasing. One was at Gosforth Park in 1978 and one at Whinnetley in 1986.

E. revinctella **NR**
Scarce

Found only at Kielder, in 1987.

E. bisulcella **NR**
U

There is a single modern record, from Rothley in 1984.

Biselachista serricornis **NR**
Scarce

Recently discovered among cotton grass bogs at three sites in south-west Northumberland, in 1989.

B. utonella **NR**
U

Two modern records only, at Harwood Forest and Fontburn in 1981.

Cosmiotes freyerella **ND NR**
U

Only two recent records, the Linnels in 1987 and Whitfield Moor in 1990. There has been a marked recession in the present century.

Oecophoridae

Schiffermuelleria subaquilea **NR**
Loc

There are only three modern records, from moorland sites in south-west Northumberland in 1990.

Borkhausenia fuscescens **NR**
U

There are about five widely separated sites, but it has probably been overlooked elsewhere.

Esperia sulphurella* **ND NR**

There are only five modern records for south-west Northumberland and none for the north of the county, attesting to an evident retreat from our area. The larvae feed on rotten wood.

Pseudatemelia josephinae **NR**
Loc

Unknown in the North East until it was found on heather/bilberry/birch scrub by Holystone Burn in 1983. It is increasing in Durham but there have been no further records in Northumberland.

Semioscopis steinkellneriana **NR**
Loc

There are now five widespread sites in Northumberland. Open heathland with scattered trees, including rowan *Sorbus aucuparia* and hawthorn *Crataegus monogyna*, seems to suit it.

Depressaria daucella **NR**
U

Apparently increasing in County Durham, but there are only three records for Northumberland, all coastal.

D. badiella **NR**
Loc

There are four modern records from coastal sites, three in north Northumberland (Newton-by-the-Sea and Holy Island) and one from south Northumberland (Druridge Bay). It feeds on umbellifers in damp or marshy sites.

D. pulcherrimella **NR**
U

Only two modern records, at Rothbury during 1987-88 and at Brandon by the River Breamish on gorse *Ulex europaeus*, in 1994.

Agonopterix propinquella **NR**
U

A thinly distributed species; at six widely separated sites in the county.

A. atomella **NR**
Scarce

Only two records, from Embleton in 1987 and at Rothbury later the same year. It is limited by the distribution of its food plant, dyer's greenweed *Genista tinctoria*.

A. scopariella **NR**
Loc

A rare species, taken only at Ordley in 1984-85.

Gelechiidae

Isophrictis striatella **NR**
U

One record only, at Cresswell in 1983.

Chrysoesthia sexguttella **NR**
U

Found at Sweethope Lough in 1925. The only other record is of larvae on orache *Atriplex* sp. at Alnmouth in 1980.

Rhynchopacha mouffetella **NR**
U

The only modern record is from Callaly Woods in 1987. It feeds on honeysuckle *Lonicera periclymenum.*

Teleiodes vulgella **NR**
U

Only a single modern record, from Kielder in 1988.

T. decorella **NR**
U

Only recently identified in the county. One was in Roddam Dean in 1981 and three or four at Kielder in 1988.

T. notatella **NR**
U

The only modern record is of two or three specimens from Kielder in 1988.

T. fugitivella **NR**
U

Widely but thinly spread, at least until 1986. Dutch elm disease may have affected it.

T. paripunctella **NR**
U

A single record of one at Whinnetley in 1986, among bilberry *Vaccinium myrtillus*, was well beyond the previously recorded limits of its range.

T. sequax **NR**
Loc

Found at Kyloe in about 1883, on rock-rose *Helianthemum nummularium.* There is only one other record, from Bondicarr dunes in 1987, possibly associated with imported hortal rock-rose.

Bryotropha affinis **NR**
U

Most of this genus is under-recorded, so only those species known to be rare are listed here. There are just two records, from Berwick in 1887 and Whitley Bay in 1984.

B. desertella **NR**
U

On Scremerston Dunes in 1956, the only modern record north of Yorkshire.

Chionodes fumatella **NR**
Scarce

Two modern records, at Scremerston Dunes in 1956 and 1963.

Gelochia sororculella **NR**

The only record is of one bred from larvae found in 1984 on willow *Salix* sp. on Longhorsley Moor.

Scrobipalpa samadensis plantaginella **ND NR**
U

This was common on the coast early in the twentieth century. There are only three modern records: Whitley Bay and Holy Island in 1984 and Warkworth Dunes in 1987.

S. instabilella **NR**
U

Three or four were taken at Warkworth salt-marsh in 1990 and several at the mouth of the Long Nanny Burn in 1992.

S. atriplicella **NR**
U

One record, at Whickhope Nick, Kielder Forest in 1988.

S. costella **NR**
Loc

Two were taken at Embleton in 1989.

S. acuminatella **NR**
U

Once 'more or less common' in north Northumberland; the only modern records are from Scremerston dunes in 1959 and Cresswell in 1983. This species is widespread in Britain and is probably overlooked.

Caryocolum fraternella **NR**
Loc

Unknown to early collectors, this species is now widespread in County Durham; only four widely separated sites are recorded for Northumberland.

C. blandella **NR**
U

The are only three records of this elsewhere generally common species, all clustered in the mid Tyne Valley, suggesting a marked contraction in its range.

Syncopacma sangiella **NR**
Scarce

The main centre of population of this species seems to be in County Durham, but there is only one Northumberland record, at Scremerston Dunes in 1959.

Momphidae

Mompha propinquella **NR**
U

There are two 19th century county records, and one for Prospect Hill in 1976.

[*M. subbistrigella* **NR**
U

One probable specimen, at Stocksfield in 1985.]

Limnaecia phragmitella* **NR**
U

Now noted from several coastal localities as far north as Alnmouth. Notwithstanding its name, its food plants are bulrushes *Typha* spp.

Cochylidae

Aethes hartmanniana **NR**
U

Early records are unreliable because of confusion with the next species, but there is one modern record from Acklington in 1984.

A. piercei **NR**
Scarce

Only one recent record, at Embley Fell in 1985.

A. smeathmanniana **NR**
Loc

Still scarce and entirely coastal in Northumberland; it may be a relatively recent arrival that has not yet become well established.

Falceuncaria ruficiliana **NR**
Loc

There have been only two recent records, from Cocklawburn Dunes in 1983 and Warkworth Dunes in 1990. It may have been overlooked in Northumberland as it is still well represented in County Durham.

Tortricidae

Pandemis corylana **ND NR**

Well known to early collectors in the county, but there is only one recent record, at Prospect Hill in 1976.

P. dumetana **NR**
Scarce

Essentially a southern species but there is a recent record at Rothley Lakes in 1991.

Archips xylosteana **ND NR**

Once common, this species has thinned out appreciably in north Northumberland and has disappeared completely from the south of the county, although it is fairly widespread in County Durham.

A. rosana **ND NR**

This species was common until the 1930s but there are only three modern records for Northumberland, all coastal; the reasons are probably climatic.

Cacoecimorpha pronubana **NR**
Loc

The most northerly British record is for Spital Tongues, in 1981.

Ditula angustiorana **ND NR**

Formerly common, but the only recent records are from Gosforth Park in 1980 and Whitley Bay in 1992.

Olindia schumacherana **NR**
Loc

One early record (for Kyloe) and more recently three widespread sites in south Northumberland and one in the north, at Brunton in 1988.

Eana penziana **NR**
Scarce

There are six records, mostly from the north and north-west of the county, and mainly of the nominate (Scottish) form.

Aleimma loeflingiana **NR**

Once regarded as widespread and common in the north, but all four modern records are for south Northumberland, three in the Tyne Valley and one at Holystone.

Acleris ferrugana **NR**
U

Only two sites, Kielder Castle and Gubeon Plantation, in 1975.

A. rufana **ND NL NR**
U

Formerly known from several sites in north Northumberland. There is one recent record at Newham Fen in 1986, in its typical habitat, humid woodland with eared willow *Salix aurita.*

A. abietana **NR**
pRDB2

A new arrival from Scotland which continues to turn up from time to time in the Kielder area but does not seem to be spreading to any great extent.

A. literana **NL NR**
Loc

Seems to be confined to the Tyne Valley, where it remains extremely localised.

Olethreutes cespitana **NR**
Loc

Formerly common in north Northumberland, but there are only two recent records: Holy Island in 1985 and Beadnell in 1987. There is no record for south Northumberland.

O. rivulana **NR**
Loc

Two specimens were found in the mid 1980s, probably in south-west Northumberland; there are no other modern records.

Apotomis semifasciana **NR**
Loc

There are two 19th century records, and one at Beltingham Gravels in 1982.

A. sauciana **NR**
U

There have been only two records of this species, which was unknown to the earlier collectors: Whinnetley in 1985 and a later coastal specimen in north Northumberland, possibly a wind-blown stray from a colony on the Fell Sandstone.

Bactra furfurana **NR**
U

Only two recent records, at Cresswell in 1983 and Beadnell in 1987.

Ancylis mitterbachiana **NR**
Loc

Known to Bolam at four or five sites before 1930. There are only two modern records, at Gosforth Park in 1976 and Holystone Oaks in 1985.

A. laetana* **NR**
Loc

Only two modern records for Northumberland, from Stannington Vale and Gosforth Park. Its range is probably limited by the scarcity of black poplar *Populus nigra*.

Epinotia bilunana **NR**

Four modern records for south Northumberland, but none from the north where it has evidently decreased markedly.

E. immundana **NR**
U

The only county record is from Bothal in 1979.

E. nisella **ND NR**
Loc

Only three recent records: at Stannington Vale in 1977, the gravels at Beltingham in 1980 and Newham Fen in 1984. It has decreased markedly in the north of the county.

E. nanana **NR**
U

Recorded in the early twentieth century from five sites. Thereafter unknown until a very recent record from Butteryhaugh, Kielder in 1997; possibly it has been overlooked.

E. rubiginosana **NR**
U

Only two modern records, for Acklington in 1984 and Callaly Woods in 1987. It feeds on Scots pine *Pinus sylvestris*, and may be overlooked.

E. sordidana **ND NR**
U

Only one recent record, at Beltingham Gravels in 1983. It has evidently decreased in the county.

E. brunnichana **NR**
Loc

Early records are considered unreliable and we have only one modern record, for Slacks Plantation, Heddon-on-the-Wall in 1981.

Griselda stagnana **NR**
U

One was taken at Embleton in 1990, the first record in this century.

G. myrtillana **NR**
Loc

There are four widely spread though mainly westerly colonies for this upland species, which is probably more common than the records would indicate.

Gypsonoma sociana **NR**
Loc

There are four sites, reaching north to Acklington. It is probably limited only by the distribution of its foodplants, poplar *Populus* spp.

[*G. oppressana* **NR**
U

A specimen taken at Whitley Bay in 1984 was submitted for verification and lost.]

Epiblema rosaecolana **NR**
Loc

Only four records: Haggerston Mead in 1898, Ordley in 1987 and Kielder in 1976 and 1977.

E. foenella **NR**
Loc

The first county records were specimens taken at Whitley Bay in 1981 and 1984. In 1984 it was also taken at Acklington. It may be attempting to spread northwards.

Eucosma tripoliana **NR**
U

This species was unknown in the county until it appeared in numbers at Newton-by-the-Sea in 1984 and was taken at Acklington in the same year. In 1990 it was taken at Warkworth and Embleton.

E. obumbratana **NR**
U

A scarce species known only from two widely spaced sites in south Northumberland and two coastal sites in north Northumberland, Scremerston Dunes in 1959 and Ross Links in 1986.

Clavigesta purdeyi **NR**
U

A relative newcomer, imported with pine *Pinus* spp.; Northumberland has only one record, from Briarwood Banks in 1980.

Blastesthia posticana **NR**
U

There is only a single record of this scarce and local species, at Catton in 1984.

Rhyacionia pinivorana **NR**
U

There are four modern records for the south of Northumberland and one for the north, and one early record (Kyloe in 1887).

Pammene inquilana **NR**
U

A specimen was bred from an oak gall found in Dipton Woods in 1989.

P. argyrana **NR**
Loc

The only recent record is for Ovingham, in 1980.

P. fasciana **NR**
Scarce

The only Northumberland record is for Gosforth Park in 1976.

P. rhediella

NR
U

Only two recent records, at Waldridge Fell in 1987 and Eshottheugh in 1987.

Cydia internana

NR
U

Found at Longhorsley Moor in 1986 and at Arcot Hall the following year, the first county records for nearly a hundred years.

C. janthinana

NR
U

Our only record is for Scremerston Dunes in 1959.

C. splendana

NR

This was never a common species in the North East; there are only two modern sites, Kielder in 1969 and Ordley in 1985.

C. pomonella

NR

In recent years, this species has been noted only after relatively warm summers – at Acklington in 1984 and Whitley Bay in 1990.

C. gallicana

NR
U

There are now five widespread sites, mostly in coastal areas; it may be increasing.

Dichrorampha simpliciana

NR
Loc

The only confirmed record is from Beltingham Gravels in 1982.

*D. sedatana**

NR
U

Known only from Gloucester Lodge Dunes, Blyth, in 1987. Tansy *Tanacetum vulgare*, the food plant, grows not far away but seems to be becoming scarcer.

Pyralidae

*Chilo phragmitella**

NR
Loc

A longstanding colony survives at Newham Fen and it has also been recorded from Beadnell, in 1988.

Agriphila selasella **NR**
Loc

There have been a few recent scattered records around Holy Island and the Newton/Embleton area. Also two strange records for this salt marsh species from Spital Tongues and Kielder Castle; it does closely resemble some forms of *A. tristrella*.

A. inquinatella **NR**

Very scarce, taken only at Cheswick Links in 1898, Kielder in 1971 and Newton-by-the-Sea in 1984.

A. latistria **NR**
Loc

Only a single record, at Tilesheds, Chathill in 1987.

Catropia pinella **NR**
Loc

There are two early records, at Kyloe in 1888 and near Wooler in 1890. The only modern record is from Kielder in 1969. It is closely associated with hair grasses *Deschampsia* spp. so the reason for its scarcity is not clear.

C. falsella **NR**
Loc

Five modern county records, mostly from mid Tynedale, indicate some improvement during the present century.

Pediasia aridella **NR**
Scarce

A new arrival, known from Warkworth Dunes and Budle Bay, both in 1987.

Acentria ephemerella **NR**

Four modern records, from Beltingham Gravels, Bolam Lake and coastal ponds at Cocklawburn and Newton-by-the-Sea.

Scoparia basistrigalis **NR**

There are early records around Morpeth and at Berwick in 1898. The only modern record is from south Northumberland.

S. ancipitella **NR**
Scarce

The only records are from Langleeford in 1888, Mereburn and Park Wood in 1978 and Linnels in 1985.

Eudonia pallida **NR**
Loc

There are early records from Cheswick and Scremerston. Recently it has been taken from Newham Fen, in 1983 and 1986.

E. delunella

NR
Scarce

The only record is for Mereburn in 1978.

Parapoynx stagnata Beautiful china mark **NR**

Formerly more widespread, but there are only four modern records: from two sites in the Kielder area, Allerwash Hall during the late 1980s and Arcot Hall in 1987.

Evergestis pallidata

NR
Loc

A single record at Druridge Bay in 1982.

Pyrausta aurata

NR
Loc

Only one modern locality, Kielder in 1970 and 1974.

P. cespitalis

NR
Loc

Recently only taken once, at Kielder in 1976.

P. cingulata

ND NR
Loc

The only modern record is from Happy Valley in 1978; it has decreased markedly.

Margaritia sticticalis

NR
Extinct

Although listed as extinct in the ISR, two were taken at Allerwash Hall on 2 August 1995, which may have been immigrants.

Ostrinia nubilalis

NR
Loc

One record from Close House in 1977.

Phlyctaenia coronata **NR**

Northumberland has only two records, despite its widespread occurrence in County Durham: Newton-by-the-Sea in 1982 and Whitley Bay in 1984.

Hypsopygia costalis Gold triangle **NR**

There are three or four nineteenth century records. Recently taken at Catton in 1984 and at Dipton Wood in the same year.

Pyralis farinalis Meal moth **NR**

Formerly common in flour mills etc. but not so plentiful nowadays. There are only two modern records, from Prospect Hill in 1976 and Close House in 1977.

Aglossa caprealis Small tabby **NR**

A single specimen was taken at Kielder in 1986. Synanthropic.

Achroia grisella Lesser wax moth **NR**

There is one record, from Beadnell in 1988.

Numonia suavella **NR**
Loc

A single specimen of this essentially southern species was recorded from Whitley Bay in 1992.

N. advenella **NR**
Loc

This species has recently become established in west Northumberland, at Catton in 1984 and Allerwash in the 1990s.

N. marmorea **NR**
Loc

Several were at Scremerston Dunes in August 1955 and 1956. The county has no other records.

Dioryctria mutatella **NR**
Naturalised alien

Only recently separated from *D. abietella*, this species has been recorded only from Stannington Vale, in 1977, and Prestwick Carr, in 1987.

Hypochalcia ahenella **NR**
Loc

The only recent record is from Acklington in 1984.

Pempeliella diluta **NR**
Loc

The only record is from Blanchland Moor in 1984.

Ephesia elutella **NR**

There is one early record, for Berwick in 1898. Two were at Scremerston Dunes in 1963 and three, possibly imported, at Stocksfield in 1984. Synanthropic.

Phycitodes binaevella **NR**
Loc

A scarce species which may be increasing. There are only three definite records: from Acklington in 1984, Embleton in 1986 and Beadnell in 1987.

[***P. maritima*** **NR**
Loc

It is possible that this species occurs on the coast in north Northumberland, where it has been suspected at Beadnell and Embleton. This requires further investigation.]

Pterophoridae

Amblyptilia punctidactyla **NR**
U

Occurred at Kielder Castle between 1969 and 1983.

Platyptilia ochrodactyla* **NR**
Scarce

Scarce and possibly limited by the distribution of the food plant, tansy *Tanacetum vulgare*, which appears to be decreasing.

Stenoptilia pterodactyla **NL**
U

There are a few localised colonies. Probably not in danger, although scarcer than it used to be.

Leioptilus osteodactylus **NR**
U

Only two records, for Learmouth in 1888 and Close House in 1975. It possibly requires more humid conditions than generally occur in the county in places where the food plants, ragwort *Senecio* spp. and goldenrod *Solidago virgaurea*, grow.

Emmelina monodactyla **NR**

One record for Park Wood near Ebchester in 1977.

Microlepidoptera species not seen in the county since 1945

Ectoedemia argyropeza		Loc
Lampronia morosa		U
L. pubicornis		Scarce
Trichophaga tapetzella	Tapestry moth	Scarce
Argyresthia glabratella		??
Cydia coniferana		Scarce
Aglossa pinguinalis	Large tabby	Loc

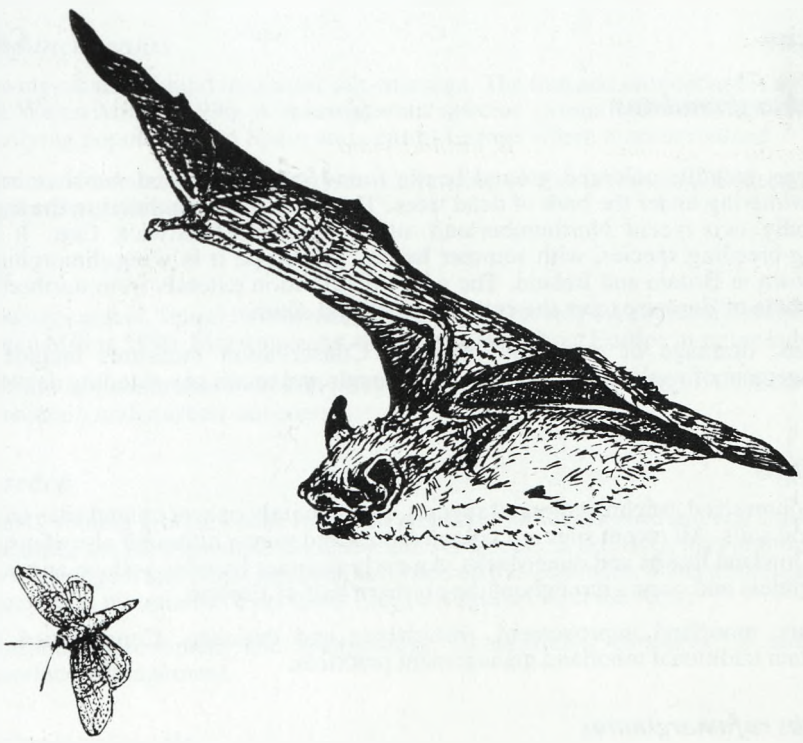
Microlepidoptera species not seen since Bolam (1925-1930)

In Bolam's time, fluctuations in weather brought about both unusual northern extensions of the range of some species and population explosions in northern species, resulting in temporary southern excursions between 1885 and 1890. Consequently climatic variation is doubtless the cause of many of the following records that have never been repeated.

Adela cuprella
A. fibulella
Adscita statices
Mompha terminella
Trachysmia inopiana
Hysterophora maculosana
Piercea vectisana
Phalonidia affinitana
Commophila aeneana
Cochylidia rupicola
Cochylis dubitana
C. pallidana
Archips crataegana
Choristoneura diversana
C. hebenstreitella
Epagoge grotiana
Cnephasia communana
C. conspersana
Neosphaleroptera nubilana
Eana argentana
Croesia holmiana
Acleris permutana
A. umbrana
A. maccana
Celypha striana
Olethreutes arbutella
O. olivana
O. bifasciana
Hedya salicella
Endothenia quadrimaculana
Lobesia reliquana
Ancylis paludana
Epinotia nemorivaga
E. fraternana
E. maculana
Rhopobota ustomaculana
Gypsonoma aceriana
Epiblema incarnatana
E. grandaevana
E. turbidana
Thiodia citrana
Blastesthia turionella
Rhyacionia buoliana
Enarmonia formosana
Eucosmomorpha albersana
Pammene splendidulana
P. obscurana
P. populana
P. germmana
Cydia tenebrosana
C. corollana
Catropia furcatellus
C. verellus
Donacaula mucronellus
Eudonia lineola
Pyrausta ostrinalis
Mutuuraia terrealis
Anania funebris
Psammotis pulveralis
Ebulea crocealis
Pempelia palumbella
Metriostola betulae
Gymnancyla canella
Ephestia figulilella
Plodia interpunctella
Platyptilia isodactyla
Adaina microdactyla

Microlepidoptera species not seen since Hodgkinson (19th century) or Robson (1899 - 1913)[R]

Ectoedemia arcuatella
Fomoria septembrella
Levarchama cryptella
Stigmella pomella
S. regiella
Leucoptera wailesella
Bucculatrix nigricomella
Oinophila v-flava[R]
Phyllonorycter muelleriella[R]
Cedestis subfasciella
Ocnerostoma piniariella
Atemelia torquatella
Coleophora siccifolia
C. viminetella
C. anatipennella
C. pyrrhulipennella
Stephensia brunnichella
Elachista gleichenella
E. alpinella
E. humilis
E. megerlella
E. gangabella
Biselachista trapeziella
B. cinereopunctella
B. albidella
Schiffermuelleria similella
Borkhausenia minutella
Amphisbatis incongruella
Eulamprotes atrella
Bryotropha domestica
Aroga velocella
Caryocolum viscariella
Aproaerama anthyllidella
Syncopacma taeniolella



Noctule bat, by Joan Holding

COLEOPTERA (BEETLES)

Carabidae (Ground beetles)

M L Luff

The Carabidae or ground beetles comprise about 350 species in Britain. The status of all the 210 species then recorded from north-east England was discussed by Eyre *et al.* (1986) and Eyre and Luff (1987); the former work provides distribution maps of all 114 species recorded from ten or more tetrads in Northumberland and Durham combined. Fifty-two species of ground beetle are listed below, representing some 25% of the local ground beetle fauna.

Species which occur in Northumberland have been selected for inclusion either if they are nationally graded Notable b (**Scarce**) or above, or if there are five or fewer recent Northumberland localities (**NR**), according to Eyre and Luff (1987) or later information (see Luff *et al.* 1996). Records from the 19th century or earlier, summarised in the list of Hardy and Bold (1852) and its revision by Bold (1872) are loosely referred to as 'old' records; most are discussed more fully in the papers already cited. The species which have not been seen in the county since 1945 are listed at the end.

Each species account gives the national status of the species, a description of habitat, ecology and distribution, followed by any threats and finally possible conservation measures. A Species Action Plan has been proposed for *Bembidion testaceum*, the only Northumberland species on the *UK Steering Group Report* (1995) middle list.

Species **Criteria/status**

Carabus granulatus **NR**
Reg

A large, metallic coloured ground beetle found in wet lowland marshes and carrs, often overwintering under the bark of dead trees. The species has declined in the region and there are only two recent Northumberland sites, including Prestwick Carr. It is an annual, spring-breeding species, with summer larvae. In Europe it is wing-dimorphic, but flight is unknown in Britain and Ireland. The wider distribution extends from northern Spain across the whole of Europe except the extreme north and south.

Threats: drainage of carrs and marshes. Conservation measures include the positive management of wetlands to maintain water levels and retain any standing dead timber in such sites.

C. nitens **Scarce**

A medium sized, brightly coloured species, found mainly on wet upland sites on both peat and mineral soils. All recent sites are upland moors and mires, although elsewhere it is recorded from lowland heaths and dune slacks. An early summer breeder with an annual life cycle. It is flightless and occurs throughout the northern half of Europe.

Threats: moorland improvement, disturbance and drainage. Conservation measures: to maintain traditional moorland management practices.

Leistus rufomarginatus **NR**
Loc

A moderately small, blackish beetle with paler lateral margins, found in woods. First found in Britain in 1942 and has spread north and west, reaching south-east Northumberland by 1990

and Kielder by 1996. Currently found at four localities in the county. It is a winged species whose European distribution includes most of central and southern Europe, and is spreading.

Threat: woodland clearance. Conservation measures: to maintain woodlands.

L. spinibarbis

NR
Reg

A moderately small, metallic bluish beetle, found in deciduous woods. Previously presumed extinct in the region, but recently found at two localities north of Newcastle. Believed to feed on springtails and may require a thick litter layer as well as dead timber for overwintering sites. In Europe it is found in central and southern regions to north Africa and Britain is the northern limit of its distribution.

Threats: woodland clearance or over-intensive management. Conservation measures: to maintain woodlands.

Blethisa multipunctata

Scarce

A medium sized, metallic species with prominent elytral punctures, found in lowland marshes and fens. There are only four Northumberland localities, the most recent at Callerton in 1991. Wings are well developed and flight has been observed. Occurs throughout Europe except the extreme south.

Threats: drainage or pollution of carrs and marshes. Conservation measures: positive management of wetlands to maintain water levels and prevent pollution.

Dyschirius impunctipennis

Scarce

A small, burrowing carabid, found in coastal salt-marshes. The first and only record is a single specimen from Waren Mill in 1996. A macropterous species, primarily found in north-east Europe with outlying populations in Spain and central Europe where it occurs inland.

Threat: destruction of habitat due to holiday developments or coastal erosion. Conservation measures: to maintain undisturbed salt-marsh.

D. thoracicus

NR

A small, burrowing carabid, found in coastal salt-marshes. The only recent record is from the marshes at Waren Mill in 1996. Macropterous, occurring throughout Europe in saline habitats.

Threat: destruction of habitat due to holiday developments or coastal erosion. Conservation measures: to maintain undisturbed salt-marsh.

Miscodera arctica

Scarce

A medium-small, shining ground beetle found on upland moorland sites on mineral soils. The only recent localities are Hexhamshire Common and Redesdale. It breeds in the autumn, with winter larvae; it is winged, and flight has been recorded on the Continent. It has a boreo-alpine distribution across the mountains of northern Europe, together with the Alps.

Threats: moorland improvement and overgrazing. Conservation measures: to maintain traditional moorland management.

Thalassophilus longicornis

Rare

A small brown, flattened subterranean species, living in fine shingle by rivers. The only record this century is from the River Coquet near Holystone in 1997. It is a winged spring/summer breeder.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain bare sand and gravel habitats at river or pond margins.

Trechus rivularis **pRDB3**

A small, iridescent blackish species found in upland mires in Kielder Forest, formerly only known from East Anglia and Yorkshire. A wing-dimorphic autumn breeder, restricted to northern and eastern Europe.

Threats: drainage and afforestation of upland mires. Conservation measures: to maintain water table levels in upland mires.

T. rubens **Scarce**

A local, primarily northern species, found usually in coniferous woods, often near streams. Found recently at several sites in Kielder Forest. Full winged, flying at night; it breeds in the autumn with winter larvae. Its wider distribution is circumpolar, throughout northern Europe and North America.

Threat: woodland clearance. Conservation measures: to maintain current forest management practices.

Asaphidion pallipes **Scarce**

A small, bronze species with mottled elytra, living on fine, bare sand or silt beside streams, rivers or on the coast. Recorded recently from the South Tyne and in 1995 from Dilston Haughs. A local species with a discontinuous distribution; commonest in the Scottish Highlands, and in more southerly English coastal localities. It is a summer/autumn breeder with winter larvae; it can fly and extends thoughout northern and eastern Europe.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain bare sand and gravel habitats at river or pond margins.

Bembidion litorale **Scarce**

A small bronzish carabid with mottled elytra, found on sand banks and fine shingle, rarely by standing water. Recorded recently from the Rivers South Tyne, West Allen and Till and, in 1995, from Dilston Haughs. It is a northern and western species in Britain and is a summer breeder, flying readily. It occurs throughout Europe.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain bare sand and gravel habitats at river margins.

B. nigricorne **Scarce**

A small purplish-bronze species, invariably associated with ling *Calluna vulgaris*, usually on dry, sandy heaths or moors. The only recorded locality is in Hexhamshire Common. Wing-dimorphic, probably breeding in spring. The wider distribution is from north-central Scotland to Dorset and Hampshire, then eastwards through Scandinavia to the Baltic countries.

Threats: destruction of heather moorland by overgrazing or agricultural improvement. Conservation measures: to maintain traditional heather management.

B. bipunctatum **Scarce**

A small bronze beetle with prominent depressions on the elytra, found on fine sand or gravel near both still and running water. It has been found on the Tyne, the only recent records being from near Corbridge and at Tyne Watersmeet. Primarily northern, macropterous and spring-breeding, it extends throughout Europe.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain bare sand and gravel habitats at river or pond margins.

B. pallidipenne **Scarce**

A small mottled yellow and brown beetle, occurring mainly on the coast on bare sand by fresh water springs and flushes. Recorded in the last century from Blyth and Holy Island and in 1985 from Cresswell. It is found locally throughout Britain, is macropterous, and extends from Spain northwards to southern Scandinavia.

Threats: pollution and destruction of coastal habitats. Conservation measures: to maintain bare sand by coastal fresh water habitats.

B. stomoides **Scarce**

A small greenish-black beetle occurring in river shingle. Found at Staward Woods, Whitfield and Dilston Haughs, as well as on the North Tyne. It is a winged spring breeder, with a montane distribution in central Europe from the Pyrenees eastwards through the Alps to the Black Sea.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain shingle banks by rivers.

B. andreae **NR**
Reg

A small, pale spotted species found in sand and fine gravel on river margins. There are old records from Devil's Water and it has occurred recently at Staward Woods. It is an active flyer, spring-breeding, with a wide but scattered British and European distribution.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain shingle banks by rivers.

B. fluviatile **Scarce**

A small, pale spotted species which lives in clayish river banks. The only record is from Alwinton. A northern and western species, it is winged and breeds in spring. It has a localised distribution in central and southern Europe, reaching its northernmost limits in Britain.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain clayey banks by rivers.

B. lunatum **Scarce**

A small, pale-spotted species found locally on river banks often near the coast. Found on the Tyne and the Till. It breeds in the autumn, overwintering as larvae and its range extends from central and eastern Europe into Asia.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted sand and gravel habitats by rivers.

B. maritimum **Scarce**

A small, pale-spotted species found on mud, fine sand and gravel by estuarine river banks. It has been recorded on the Tyne as far inland as Close House. It is a spring breeder that flies readily and is restricted to the coasts from Denmark to western France, and is at its northern limit in southern Scotland.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted sand and gravel habitats by tidal sections of rivers.

B. monticola **Scarce**

A small greenish beetle that is commonest in northern England, but with scattered records in other parts. It occurs on many rivers in the county. It is a winged spring breeder, with a central and south-eastern European distribution.

Threats: river engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted gravel habitats by rivers.

B. saxatile **Scarce**

A small spotted or dark greenish species that occurs locally on sand and gravel by water, often at the base of cliffs on the coast. There are old records from the Tyne, and more recent ones from near Wylam and St Mary's Island. It is a winged spring breeder, with a northern and eastern European distribution.

Threats are river and coastal engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted sand and gravel habitats by rivers or on the coast.

B.stephensi **NR**

A medium small greenish carabid, found on bare clayish soil near water, both on the coast and by lowland rivers throughout most of Britain. The only confirmed Northumberland record is from the Tyne at Close House. It flies readily and breeds in the spring. It is a central European species, at its northern limit in Scotland.

Threats: river and coastal engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted habitats by rivers or on the coast.

B. testaceum **M Scarce**

A small dark green beetle with brownish elytra, found on fine sand and gravel by slow-running or standing water. Recorded recently from Tyne Watersmeet and Dilston Haughs. It is a macropterous spring breeder, extending south and east through central Europe to the eastern Mediterranean. England and Wales represent the northern and western limits of its distribution.

Threats: river and coastal engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted sandy and gravelly habitats by rivers.

SPECIES ACTION PLAN REQUIRED.

B. laterale **Scarce**

A small, flattened species with metallic forebody and paler elytra, found exclusively in tidal salt marshes; it occurs locally in suitable habitats around the coast of Britain. There are a few 19th century records for the county and in 1996 it was found at Waren Mill and on the mainland side of the Holy Island causeway. It is active in the day and normally brachypterous, although winged examples have been seen in Europe, where it extends from Denmark south and west along the coast to North Africa. Britain represents the northern limit of its distribution.

Threat: destruction of habitat due to holiday developments or coastal erosion. Conservation measures: to maintain undisturbed salt-marsh.

B. schueppeli **Rare**

A small greenish species, restricted to the border counties of England and Scotland, where it is found on well-vegetated sand and fine gravel at the edge of streams and rivers. It is wing-dimorphic, although probably primarily brachypterous in Britain. It is mainly spring

breeding, and has a discontinuous boreo-montane distribution in Europe, being found in Scandinavia, the Pyrenees and the Alps.

Threats: river and coastal engineering work, sustained periods of flooding, and pollution. Conservation measures: to maintain unpolluted sandy and gravelly habitats by rivers.

B. minimum **NR**
Reg

A very small, black species, found exclusively in tidal salt marshes. Recorded recently from Alnmouth, Waren Mill and Holy Island. It occurs locally in suitable habitats all round the coast of Britain. It is diurnal, spring/summer-breeding and macropterous. The distribution extends along most European coasts.

Threats: destruction of habitat due to holiday developments or coastal erosion. Conservation measures: to maintain undisturbed saltmarsh.

B. doris **NR**

A small dark species with apical spots, found in constantly wet lowland habitats such as marshes and *Sphagnum* bogs. There is an old record from the River Till and recent ones at Newton Links and Callerton. It is winged, breeds in the spring and is found throughout Europe.

Threats: drainage or pollution of carrs and marshes. Conservation measures: to manage wetlands to maintain water levels and avoid pollution.

B. quinquestriatum **NR**

A small, dark species found mainly on walls and in buildings. There are old records from the Newcastle area, and the only recent records are from urban Newcastle and the Farne Islands. The species is winged and probably breeds in the autumn/winter. It has a central European distribution.

Threats and conservation measures unknown.

B. lunulatum **NR**
Reg

A small, dark species with apical spots, found on damp, partly vegetated ground near water, as well as on the coast. The only record from the county is at Close House in the 1960s. A southern species, reaching its limit in the extreme north of England. It flies well and spring swarms have been observed on the coast, prior to breeding. It is predominantly a central and southern European species.

Threats and conservation measures unknown.

Pterostichus aethiops **Scarce**

A medium sized black beetle, found in cool upland habitats, including forests as well as grass and moorland. Widespread on the moors at Redesdale and Kielderhead. It is probably a summer breeder, and cannot fly. On the continent it is a northern and eastern forest species.

Threat: moorland improvement. Conservation measures: to maintain traditional moorland management.

P. angustatus **Scarce**

This medium sized black species with prominent elytral punctures is a recent introduction and is spreading northwards. Recorded from Belsay, Close House and Hyons Wood. Typically it is said to be found on burnt ground but recent records are from woods as well as unburned

heaths on sandy or peaty soils. It is a spring breeder that emerges in the autumn, when there is a synchronised dispersal flight. It occurs throughout central and eastern Europe and is known to be extending its range in Scandinavia.

Threats and conservation measures unknown.

P. cristatus — Scarce

A large, shining black species with iridescent elytra, found mainly in woodlands with abundant litter, as well as in gardens and rough grassland. Despite its nationally notable status, it is common in lowland regions of the county as its British distribution is centred on north-east England. It is a flightless autumn breeder; in Europe it occurs in a narrow longitudinal band, south through France and adjacent countries to Italy.

Threats and conservation measures unknown.

P. minor — NR Reg

A moderately small black carabid, found in wet, well-vegetated lowland habitats near water. Recorded from Prestwick Carr since the 1800s, it is now also known from a limited range of bogs and fens in the county. It is wing-polymorphic and breeding takes place in spring/summer. It occurs throughout most of Europe.

Threats: drainage or pollution of wetland sites. Conservation measures: to maintain well-vegetated marshes and margins of standing water.

Laemostenus terricola — NR

A large, dark bluish species found in a variety of habitats and possibly associated with the runs of small mammals. The only confirmed Northumberland records are from Close House and Berwick. It is wingless, breeds in the autumn and occurs throughout most of Europe except the extreme north.

Threats unknown. Conservation measures include encouraging rabbit warrens.

Platyderus ruficollis — Scarce

A small, flattened brown carabid, found on dry, sandy or chalky soils, in open situations. The only Northumberland records are from Heddon-on-the-Wall and Newcastle and these represent the northern limit of this species. It is probably winged, and autumn breeding. It occurs only in the more western countries of Europe, where it is often montane.

Threats and conservation measures unknown.

Agonum ericeti — Scarce

A small-medium sized, brightly metallic-coloured species, extremely hygrophilous, running in sunshine on bare, peaty ground in both lowland and upland acid peat bogs with *Sphagnum.* It is found at Redesdale and from several of the Kielder mires. It occurs throughout Britain although extremely locally in the south. It is brachypterous and breeds in spring/summer. It has a scattered distribution in northern and central Europe.

Threats: drainage or pollution of bogs and mires. Conservation measures: to maintain the water table and reduce grazing levels on wet upland sites.

A. marginatum — NR

A medium sized, green species with yellow elytral margins, found in wet clay or sandy habitats with little vegetation, usually close to standing water. Only three recent Northumberland

localities, two coastal and one by the River Tyne. It is a full-winged spring breeder and is found throughout Europe except for the far north and the Mediterranean.

Threats: drainage or pollution of coastal and lowland ponds. Conservation measures: to maintain the water table and preserve pond margins without trampling.

A. micans **NR**
Reg

A moderately small, slightly metallic species, found on muddy edges of ponds and lakes, also in carrs and winter-flooded woods. The only recent localities are Bakethin, and the Tyne riverbank at Prudhoe and Close House. It is a winged spring breeder and is distributed across central, northern and eastern Europe.

Threats: drainage and pollution of marshes and carrs. Conservation measures: to maintain water levels in well-vegetated wet lowland sites.

A. obscurum **NR**
Reg

A small, black and brown species, found in damp woodland and well-vegetated marshes, where there is a good litter layer. It sometimes overwinters in large numbers in hair grass *Deschampsia* sp. tussocks at the edge of winter ponds. Recorded only from Newham Fen and Close House and at the northern limit of its range. It is usually brachypterous and spring-breeding. It occurs throughout the central latitudes of Europe.

Threats: drainage and pollution of marshes and carrs. Conservation measures: to maintain water levels in well vegetated wet lowland sites.

Amara convexiuscula **NR**
Reg

A medium-sized metallic brownish species, found in salt marshes and coastal grasslands, as well as more locally on dry, open sites inland. Recent Northumberland records from Sheepshed near Ashington, Close House and the Farne Islands. It flies regularly and comes to light traps; it is an autumn breeder, occurring along the coasts of northern and eastern Europe, as well as inland at saline localities in central and south-east Europe.

Threats and conservation status unknown.

A. eurynota **NR**
Reg

A medium-sized coppery beetle with prominent elytral striae. Found on dry, weedy cultivated land and set-aside; the few recent records are from Horsley, Heddon-on-the-Wall and Throckley in the Tyne Valley. It flies readily and breeds in late autumn. It occurs throughout most of Europe.

Threat: the excessive use of pesticides. Conservation measures: to reduce pesticide inputs and develop conservation headlands around field margins.

A. fulva **Scarce**

A medium-sized, sand-coloured species, found in open dry, sandy or gravelly situations, sometimes near water. There are scattered records from riversides throughout Northumberland as well as on the coast. It is capable of flight and breeds in the autumn. It occurs throughout most of Europe.

Threats: riverside engineering work or pollution. Conservation measures: to maintain open, dry riverbanks.

A. praetermissa **Scarce**

A moderately small, dark brown species, which seems to be almost indicative in the region of dry and disturbed old industrial areas. Found on a disused railway near Wylam, and on the Spetchels at Prudhoe. It is a winged autumn breeder that is found in central and north eastern Europe as well as in the mountains of southern Europe.

Threats: the redevelopment of undisturbed old industrial pit heaps and wasteland. Conservation measures: to maintain former waste industrial sites open but relatively undisturbed.

Harpalus rufibarbis **NR**
Reg

A medium sized, dark brown, pubescent species, associated with dry grasslands. All records are from the Tyne Valley or the coastal strip; recent occurrences are from Heddon-on-the-Wall, Prudhoe, Wide Open, St Mary's Island and the Farne Islands. The species is winged, and probably breeds mainly in the spring. It is found in most of Europe except the extreme north.

Threats: cultivation or building development on dry, semi-natural grasslands. Conservation measures: to maintain open, dry, grassy habitats.

H. rubripes **NR**

A medium sized species, black or green, found on open, dry sand or chalk soils. The only recent occurrences are at Close House and the Spetchels, near Prudhoe. It is mainly a spring breeder, full winged and occurs throughout Europe except the extreme north.

Threats: cultivation or building development on dry, semi-natural grasslands. Conservation measures: to maintain open, dry, grassy habitats.

Bradycellus sharpi **NR**

A small, dark brown species, usually found in lowland woodlands and shaded places with litter. The only Northumberland record is from Close House. It is usually brachypterous but occasional full-winged individuals have been found. The species has a very restricted continental distribution in northern France, Belgium and the southern part of the Netherlands.

Threat: woodland clearance. Conservation measures: to maintain semi-natural woodlands.

Lebia chlorocephala **Scarce**

A moderately small carabid with reddish forebody and bright green shiny elytra. It occurs in rough, tussocky grasslands often near rivers. There are widely scattered occasional records throughout the county, the most recent being the Tyne river bank at Close House and Prudhoe. It is a spring/summer breeder, whose larvae are ectoparasitic on pupae of Chrysomelidae. It occurs over most of Europe except at extreme latitudes.

Threat: cultivation of grasslands along river margins. Conservation measures: to maintain semi-natural grasslands, especially adjacent to major rivers.

Dromius agilis **NR**
Reg

A small, flattened brown beetle, found in all types of woodland. There are old records from Twizell and Longbenton, and more recent occurrences by the Lilburn and Harthope Burn. It

is one of a group of arboreal species, living on the tree during the spring and summer, when it breeds, but overwintering at the base of the tree trunks. It is full-winged, and occurs across Europe except the extreme south.

Threat: woodland clearance. Conservation measures: to maintain woodlands.

D. meridionalis **NR**
Reg

A small, flattened brown beetle, found in all types of woodland. There are old records from Gosforth and Wallington but few occurrences this century. It is one of a group of arboreal species, living on the tree during spring and summer and overwintering at the base of tree trunks. The species is winged and has a very western European distribution.

Threat: woodland clearance. Conservation measures: to maintain woodlands.

Metabletus foveatus **NR**
Reg

A small, flat, bronze coloured species, found in dry, open grasslands, river banks and heaths. Old records include Wooler and Whitley (Bay); recent occurrences from the Tyne river bank at Close House, the Spetchels, the River Till at Doddington Bridge and the coast at Bamburgh. It is diurnal, spring breeding and does not fly. It is found in most of Europe except the extreme north.

Threats: cultivation or development of open grassland. Conservation measures: to maintain dry, semi-natural grasslands.

Cymindis vaporariorum **Scarce**

A medium-sized, dark reddish beetle with dense surface puncturation and pubescence. It occurs in mires and fens, especially at altitude. Old records are from the moors above Twizell, but it has recently been found in two of the Kielder mires and at Plenmeller in 1996. It is wing-dimorphic and probably summer breeding. In Europe it is found across the north to the arctic, as well as in mountainous regions in the south.

Threats: drainage and afforestation of upland mires. Conservation measures: to maintain water table levels in upland mires.

Species of Carabidae not seen in the county since 1945

Species	National Conservation Status
Carabus monilis	Scarce
Leistus montanus	Rare
Dyschirius aeneus	Reg
Patrobus septentrionus	Scarce
Aepus marinus	L Scarce
A. robini	Scarce
Bembidion obliquum	Scarce
B. genei	Reg
Pogonus chalceus	Reg
Pterostichus cupreus	

P. gracilis	Scarce
Sphodrus leucophthalmus	
Agonum quadripunctatum	pRDB1
A. viduum	
Amara fusca	pRDB1
A. lucida	Scarce
Harpalus puncticollis	M pRDB3
H. tardus	Reg
Badister sodalis	

Other Coleoptera (Beetles)

Records for beetles, other than ground beetles which have been more fully treated above by Dr M L Luff, have been taken from the Invertebrate Site Register, together with the records of nationally notable species held by the Environmental Entomology Group (Dr Luff, Dr M D Eyre) at the University of Newcastle (Luff *et al.* 1996) and from G Simpson. Some information on water beetles has been obtained from the Regional Atlas by Eyre *et al.* (1985). Inevitably the resulting list is at best incomplete, and the species accounts are brief, concentrating on the location of records and any available information on preferred habitat. The English names of families are given where they are in common use.

Species other than the ground beetles have been selected for inclusion if they are graded nationally 'notable b' (**Scarce**) or above, or if there are ten or fewer records for the county (**NR**). A Species Action Plan has been suggested only for the weevil *Procas granulicollis* which qualifies because it is on the *UK Steering Group Report* (1995) middle list.

Haliplidae

Haliplus apicalis **Scarce**

A water beetle found in brackish waters on saltmarshes. Recorded from Swallow Pond in 1985 and Cambois around 1993.

H. confinis **NR**
Reg

A water beetle usually found in lakes and quarry ponds. Recorded from various sites around the county.

H. fulvus **NR**
Loc

A water beetle usually found in lakes. There are records from various sites around the county.

H. laminatus **Scarce**

Probably extinct in the county. Last seen: Crag Lough in 1935.

Dytiscidae

Hygrotus quinquelineatus **Scarce**

A small water beetle found in lochs and northern fen drains, mainly in Scotland. Formerly known from Gosforth Park, Crag Lough and Prestwick Carr; more recently recorded from Big Waters in 1960.

Coelambus confluens **NR**
Loc

Reputedly recorded from the River Breamish from 1970 onwards, although this water beetle is a pioneer species found in small, polluted ponds. Listed from three post-1950 tetrads in the county.

C. novemlineatus **Scarce**

Typically found in open, unvegetated pools and lakes. A northern water beetle occurring as far south as Yorkshire. Recorded from Broomlee Lough and Rothley Lake from 1950 onwards and Greenlee Lough from 1970 onwards.

Stictonectes lepidus **Scarce**

A water beetle of clear running water. Recorded from various sites around the county.

Graptodytes pictus **NR**
Reg

A water beetle found in ditches and ponds. It occurs mainly in man-made water bodies in the North East, where it appears to be declining. Recorded from various sites around the county.

Porhydrus lineatus **NR**
Reg

Extinct in the county. Last seen: Prestwick Carr in 1855.

Deronectes latus **Scarce**

A water beetle found in clean, well oxygenated running water. Recorded from the Irthing Gorge from 1970 onwards.

Oreodytes davisi **Scarce**

A water beetle of sand and gravel in fast flowing streams. Recorded from more than ten sites in the county.

Agabus affinis **NR**
Loc

An acid water species of water beetle associated with *Sphagnum*, but not at higher altitudes. Recorded from various sites between 1970 and 1982.

A. labiatus **Scarce**

Extinct in the county. Last seen: Prestwick Carr in 1855.

A. melanarius **Scarce**

A water beetle found in shallow runs in woods rich in decaying leaf litter; it likes conifer plantations. Recorded from Morralee Wood from 1970 onwards.

A. uliginosus **Scarce**

A water beetle found in shallow water in relict fenland sites. Recorded from Campfield Kettle Hole in 1977.

A. unguicularis **Scarce**

A water beetle, usually found in grassy temporary pools. Recorded from various sites from 1970 onwards.

Ilybius aenescens **Scarce**

Recorded from Chartners Lough, Muckle Moss, Redpath and Fallowlees from 1970 onwards.

I. guttiger **Scarce**

A water beetle found in shaded, mossy pools in relict fens. Recorded from Crag Lough from 1970 onwards, and from Prestwick Carr in 1982.

I. quadriguttatus **NR**
Reg

A water beetle found in ponds and ditches. Recorded from Gosforth Park in 1960.

I. subaeneus **Scarce**

A water beetle found in lowland ponds. Recorded from Grindon Lough from 1970 onwards, Stanley Burn in 1981 and Swallow Pond in 1985.

Rhantus bistriatus **NR**
Reg

A peat bog species of water beetle, recorded from the Otterburn Ranges and Corsenside Common since 1950.

R. exsoletus **NR**
Loc

A water beetle of lowland, acid ponds. Recorded from various sites around the county.

R. suturalis **Scarce**

A water beetle found in ponds. Recorded from Rothley Lakes in 1981.

Acilius sulcatus **NR**
Reg

A water beetle, found in open water in ponds and ditches. Scarce in the North. Recorded from Redpath and Fallowlees from 1970 onwards and Close House in 1985.

Dytiscus semisulcatus **NR**
Reg

Recorded from Holywell Pond from 1981 onwards.

Suphrodytes dorsalis **NR**
Reg

A water beetle of well established fens. Recorded from Hadrian Park Pond in 1985.

Hydroporus ferrugineus **Scarce**

A water beetle usually found in subterranean waters such as spring systems and culverts. Recorded from The Cheviot summit from 1970 onwards and Close House in 1985.

H. longicornis **Scarce**

A water beetle found in relict spring-fed bogs and fens. Recorded from East Kielder Moor from 1970 onwards.

H. longulus **Scarce**

Recorded from the River Breamish and Callaly Crags and Woods from 1970 onwards and from Wooler Common in 1981.

H. obsoletus **Scarce**

A small water beetle occurring mainly in soft water springs. Recorded from The Cheviot summit until 1950.

Gyrinidae

Gyrinus caspius **NR**
Loc

A whirligig beetle generally restricted to coastal drains in England but found inland in Scotland. Recorded from Newton Links from 1970 onwards and Holywell Pond and Big Waters in 1981.

G. marinus **NR**
Reg

Extinct in the county. Last seen: Jesmond Dene in 1860.

G. urinator **Scarce**

Extinct in the county. Last seen: Jesmond Dene in 1860.

Hydrophilidae

Hydrochus brevis **RDB3**

Probably extinct in the county. Last seen: Gosforth Park in 1929.

Helophorus arvernicus **Scarce**

A small water beetle of the banks of slow flowing rivers. Common in the county, despite its national status.

H. porculus **NR**
Reg

A turnip beetle; the adults and larvae attack turnips but can also be found in sand dunes. Recorded from Close House from 1970 onwards.

Cercyon tristis **Scarce**

A scavenging water beetle found in decaying reed litter in shallow water. Recorded from Campfield Kettle Hole in 1984.

Laccobius atratus **Scarce**

A water beetle of mossy flushes in acid water conditions. Recorded from Blanchland Moor from 1970 onwards.

L. atrocephalus **Scarce**

A small water beetle associated with small flushes of water, often on acid soils. Recorded from Newburn Marsh from 1970 onwards.

Enochrus affinis **Scarce**

A water beetle, usually found in acid pools. Recorded from Harbottle Moors and Muckle Moss from 1970 onwards.

E. quadripunctatus **Scarce**

A water beetle with three subspecies. Recorded from Harbottle Moors and Muckle Moss from 1970 onwards.

Georissus crenulatus **Rare**

Found in trickles and flushes in muddy conditions. Recorded from the River Breamish in 1983, Doddington Bridge in 1993 and Dilston Haughs in 1995.

Sphaeritidae

Sphaerites glabratus **RDB3**

Extinct in the county. Last seen: Harthope Valley in 1870.

Histeridae

Gnathoncus nanus **NR**
Loc

A black beetle living in carrion, sometimes in the nests of birds, especially raptors. Recorded from the Holystone Valley in 1984.

Hydraenidae

Ochthebius auriculatus **Scarce**

A water beetle found in shallow muddy pools in salt-marshes and saline lagoons. Recorded from Alnmouth, Cresswell and Newton Links from 1970 onwards.

O. bicolon **Scarce**

A water beetle found in the muddy margins of sluggish rivers and ponds. Recorded from various sites around the county.

O. exsculptus **Scarce**

A water beetle found in riffly stretches of fast-flowing rivers. It requires clean water and is apparently declining. Recorded from Briarwood Banks in 1981.

O. marinus **Scarce**

A small water beetle which occurs in mud at the margins of brackish water. Recorded from Alnmouth and Holy Island from 1970 onwards and from Cresswell Pond and Dunes in 1985.

Hydraena britteni **NR**
Loc

A water beetle associated with decomposing plant material in slow flowing water. Recorded from Sweethope Lough from 1970 onwards and from Grasslees Wood in 1996.

H. minutissima **Scarce**

A water beetle found in riffly stretches of rivers. Recorded from Littlemill and Redesdale from 1970 onwards.

H. nigrita **Scarce**

A water beetle found in sluggish muddy streams, usually in the lowlands. Recorded from Close House in 1985.

H. pulchella **pRDB3**

A water beetle found in rivers. Recorded from the Irthing Gorge from 1970 onwards.

H. rufipes **Scarce**

A water beetle found in rivers. Recorded from the Irthing Gorge from 1970 onwards.

Limnebius nitidus **Scarce**

A water beetle usually found in poorly vegetated ponds. Recorded from Newburn Marsh and Littlemill Quarry from 1970 onwards.

Leiodidae

Triarthron maerkeli **Scarce**

A small brown fungus beetle, usually found attracted to light. Recorded from Close House and Ned's Whin in 1993.

Hydnobius punctatus **Scarce**

Found in open, dry sandy or chalky grasslands. Recorded from Newton-by-the-Sea in 1980, and the Spetchels in 1994.

Leiodes nigrita **RDBk**

A small subterranean fungus beetle found by the Tarset Burn in 1991.

Agathidium marginatum **Scarce**

A coastal species recorded from Cambois, Alnmouth, Newbiggin and Newton-by-the-Sea in 1990.

A. varians **NR**
Loc

Found under the dead bark of broad-leaved trees. Recorded from Haydon Dene in 1982.

Catops coracinus **NR**
Loc

Found in decaying fungus and carrion. Recorded from Haydon Dene in 1982, Acomb and Blagdon in 1991, Kielder and Holystone in 1996, and Ned's Whin between 1991 and 1996.

C. longulus **Scarce**

A brown beetle found in wood litter. Recorded from Tyne Watersmeet in 1991.

Colon latum **Scarce**

A small scavenging beetle associated with small mammal runs. Recorded from various woods since 1980.

C. viennense **pRDBk**

A small beetle found in woodland litter. Recorded from Close House in 1993.

Silphidae

Aclypea opaca **Rare**

A phytophagous 'carrion' beetle, found in moss and litter. Recorded from Close House in 1972, the Honeycrook Burn in 1980 and Brownsman Island in 1995.

Dendroxena quadrimaculata **Scarce**

A yellow 'carrion beetle' with four black spots, feeding on caterpillars on broadleaved trees. Found at Hyons Wood in 1994.

Scydmaenidae

Stenichnus bicolor **NR**
Loc

Found under the bark of dead broadleaved trees, mainly in old woodland. Recorded from Park Burnfoot in 1984.

Scaphidiidae

Scaphidium quadrimaculatum **NR**
Loc

A black fungus beetle with prominent red spots. Recorded from Ned's Whin in 1994.

Scaphisoma agaricinum **NR**
Loc

Found in fungi, usually in woodland. Recorded from Cold Martin Moss in 1983.

Staphylinidae (Rove beetles)

Acidota cruentata **Scarce**

A small brown rove beetle found in woodland litter. Recorded from Bakethin in 1986, Allenheads in 1989, Ned's Whin in 1992 and Heddon-on-the-Wall in 1995.

Phyllodrepoidea crenata **Scarce**

A rove beetle living under stones and dead bark. Recorded from Redesmouth in 1983.

Dropephylla ioptera **NR**
Loc

A small rove beetle found on flowers. Recorded from Close House in 1983.

Omalium allardi **Scarce**

A small rove beetle found in woodland litter. Recorded only from Heddon-on-the-Wall in 1987 and Blagdon in 1991.

O. rugatum **Scarce**

A small rove beetle found in woodland litter. Found at William's Cleugh in 1994.

Phloeonomus pusillus **NR**
Loc

A rove beetle found under conifer bark. Recorded from Haydon Dene in 1982.

Bledius annae **NR**
Loc

A subterranean rove beetle, local on sandy patches on riverbanks. Recorded from Doddington Bridge and Abberwick in 1983.

Deleaster dichrous **Scarce**

A bright red and brown rove beetle, usually found in riverside shingle and gravel, but it also flies to light. Recorded from Close House in 1993 and Dilston Haughs in 1995.

Ochthephilus venustulus **Scarce**

A rove beetle found in wet moss on the banks of rivers. Recorded from Tyne Watersmeet in 1981 and Dilston Haughs in 1995.

Carpelimus subtilis **Scarce**

A rove beetle living on wet sand by ponds and rivers. Recorded from the River Tweed at St Cuthberts in 1984.

Thinobius longipennis **Scarce**

A minute subterranean rove beetle found in river shingle. Known with certainty in Britain only from the River Till at Doddington Bridge, since 1988.

T. praetor **Scarce**

A minute subterranean rove beetle found in river shingle. Recorded from the River Till at Doddington Bridge in 1988.

Platystethus cornutus **NR**
Loc

A rove beetle found on bare mud and peat at the side of ponds, rivers and peaty pools. Recorded from St Cuthberts in 1984.

Stenus comma **NR**
Reg

A rove beetle of wet mud on river and pond margins. Recorded from the River Breamish and Doddington Bridge in 1983 and 1992 and St Cuthberts in 1984 and 1996.

S. fuscicornis **NR**
Reg

A rove beetle found in moss in damp places. Recorded from Close House and Gosforth Park in 1981.

S. glacialis **pRDBk**

Probably extinct in the county. Last seen: on The Cheviot sometime between 1900 and 1910.

S. lustrator **NR**
Loc

A rove beetle of marshy places. Recorded from Beltingham Gravels and Cold Martin Moss in 1983.

S. nanus **NR**
Reg

A rove beetle of marshy places. Recorded from various sites around the county.

S. nigritulus **Scarce**

A rove beetle of marshy places, recorded from Thirlings, by the River Till in 1992.

S. nitens **NR**
Loc

A rove beetle of marshy places. Recorded from Kimmer Lough in 1984.

S. niveus **Scarce**

A rove beetle of marshy places. Recorded from Kimmer Lough in 1984.

S. ossium **NR**
Loc

A rove beetle found in vegetable litter and moss. Recorded from various sites around the county.

S. picipennis **NR**
Loc

A rove beetle of marshy places. Recorded from the River Breamish and Doddington Bridge in 1983.

S. tarsalis **NR**
Reg

A rove beetle of marshy places. Recorded from Tyne Watersmeet and Beltingham in 1983 and The Lakes (a mire in Kielder Forest) in 1984.

S. umbratilis **NR**
Reg

A rove beetle of marshy places. Recorded from various sites around the county.

Dianous coerulescens **NR**
Loc

Recorded from Bothal, the River Breamish and Doddington Bridge in 1983.

Lathrobium longulum **NR**
Loc

A rove beetle found under stones in grass tussocks. Recorded from Kimmer Lough in 1984.

L. zetterstedti **Scarce**

An upland rove beetle found in grass tussocks, litter and under stones. Recorded from Ford Moss and Kimmer Lough in 1984, and from Allendale Common and Spring House in 1989.

Gabrius bishopi **Scarce**

Recorded from Heddon-on-the-Wall and Dilston Haughs in 1995, Grasslees Wood in 1996 and the River Coquet near Sharpeton in 1997. A small black rove beetle found in wet litter especially by rivers.

G. osseticus **Scarce**

A small black rove beetle found in litter in dry places, recorded from Spetchels in 1994 and Cheswick in 1990.

Philonthus rubripennis **NR**
Loc

A small black rove beetle with bright red elytra, found widely on river shingles in the county. Recorded from the Rivers Breamish, Coquet and Till.

Platydracus latebricola **Scarce**

A medium-large rove beetle with red elytra, found in upland litter. Recorded from Bakethin in 1996.

P. pubescens **Scarce**

A metallic rove beetle, mottled by pubescence, found in various habitats, often in dry dung. Found at Grasslees Wood and Billsmoor Park in 1996.

Ocypus nero **Rare**

A large black rove beetle found in woodland and grassland. Recorded from Close House and Horsley Wood in 1990 and on the Spetchels in 1994.

Euryporus picipes **pRDBk**

A medium sized black rove beetle, found in woodland litter. Recorded from Chevington in 1992 and Grasslees Wood in 1996.

Quedius fulvicollis **Scarce**

A medium sized rove beetle with red elytra, found in damp litter. Recorded from several, mainly woodland localities in the county.

Q. longicornis **Scarce**

A medium sized dull-brown rove beetle, associated with moles' runs. Recorded from Prudhoe and Ned's Whin in 1994 and Bakethin in 1996.

Q. puncticollis **Scarce**

A medium sized black rove beetle, usually associated with the nests of moles and other animals. Recorded from Holystone in 1996.

Q. riparius **pRDBk**

A small black rove beetle found in wet moss. Recorded from Bakethin in 1996.

Q. xanthopus **Scarce**

Recorded from the Holystone Valley in 1984. A rove beetle found under dead bark, usually in old woodland.

Mycetoporus baudueri **Scarce**

A small rove beetle found mainly in upland habitats as well as in coastal dunes. Recorded from Alnmouth, Newbiggin, Newton Links and Cheswick in 1990, and Bakethin in 1996.

M. nigricollis **NR**
Loc

A rove beetle found in moss and litter. Recorded from Redesmouth in 1983.

M. punctus **Scarce**

A small reddish brown rove beetle found in upland and coastal litter. Recorded from Newton Links in 1990 and Bakethin in 1996.

Bryoporus crassicornis **NR**
Doubtfully native

A small reddish rove beetle, probably associated with woodland fungi. Single specimens from Riding Mill in 1976 and Allerwash in 1991 are the only post-1969 records in Britain.

Sepedophilus constans **Scarce**

A small pubescent rove beetle found in litter. Recorded from Newbiggin-by-the-Sea in 1990.

Tachyporus transversalis **NR**
Loc

A rove beetle found in moss and litter in marshy and heathy places. Recorded from Ford Moss and Kimmer Lough in 1984.

Tachinus rufipennis **pRDB3**

A black rove beetle with red elytra, found in upland moorland and plantations, possibly associated with moles' nests. Recorded from Allendale in 1989.

Gyrophaena angustata **Scarce**

A small rove beetle found in fungi in woodland. Recorded from Tyne Watersmeet in 1993.

Tachyusa scitula **pRDBk**

A rove beetle living on open sand on river banks. Recorded from Doddington Bridge in 1983.

Hydrosmecta delicatula **pRDBk**

A small rove beetle found by rivers, recorded from Doddington, by the River Till in 1993.

H. thinobioides **Scarce**

A small rove beetle found by rivers, recorded from Doddington, by the River Till in 1993.

Aloconota eichhoffi **Scarce**

A small riverside rove beetle, recorded from Dilston Haughs in 1995.

Neohilara subterranea **pRDBk**

A small rove beetle found in moss and litter in diverse habitats. Recorded from Alnmouth in 1980, one of only two post-1960 British records.

Atheta aquatilis **Scarce**

A small riverside rove beetle, recorded from Dilston Haughs in 1995.

A. obfuscata **Scarce**

A small riverside rove beetle, recorded from Dilston Haughs in 1995.

A. sylvicola **pRDBk**

A rove beetle found amongst dead leaves in woods. Recorded from the Holystone Valley in 1984.

Ilyobates nigricollis **pRDBk**

A small brown rove beetle found in litter. Recorded from Newham Fen in 1988 and Grasslees Wood in 1996.

I. subopacus **Scarce**

A small brown rove beetle found in woodland litter, recorded from Close House in 1994, Tyne Watersmeet in 1995 and Grasslees Wood and Holystone in 1996.

Oxypoda spectabilis **Scarce**

A small brown rove beetle found in a wide range of habitats in litter and fungi. Recorded from Allerwash in 1991 and Ned's Whin in 1992.

Aleochara ruficornis **Scarce**

A medium-sized reddish brown rove beetle, occurring widely in woodland, grassland and even on moorland in the county.

Pselaphidae

Bryaxis curtisi **NR**
Loc

Found under bark, and in moss and grass litter. Recorded from Park Burnfoot in 1984.

Pselaphus heisei **NR**
Loc

Lives in grass tussocks and moss in bogs and marshy places. Recorded from Kimmer Lough in 1984, Newham Fen in 1988 and Kielder (Bakethin) in 1996.

Lucanidae

Sinodendron cylindricum **NR**
Reg

A rhinoceros beetle, whose larvae bore into firm dead timber of broad leaved trees. Associated with old woodland. Recorded from various sites around the county.

Scarabaeidae (Dung beetles)

Aegialia sabuleti **Scarce**

A small scarab beetle found on riverside sand and on coastal sand dunes. Recorded from Beltingham Gravels in 1982, Allerwash in 1991, Staward Woods in 1987 and Tyne Watersmeet in 1991.

Euchlora dubia **NR**
Loc

A bright green or green and brown chafer, found on coastal dunes. Recorded from Druridge Bay in 1995.

Helodidae

Prionocyphon serricornis **Scarce**

A small brown beetle found in water-filled rot holes in old trees. An ancient woodland indicator. Recorded from Close House in 1981.

Byrrhidae

Morychus aeneus **NR**
Reg

A golden pill beetle living and feeding on moss on the banks of streams. Recorded from Beltingham Gravels in 1980, the Spetchels in 1994 and by the River Coquet near Holystone in 1997.

Heteroceridae

Heterocerus marginatus **NR**
Loc

A small, slow moving beetle burrowing into sand and mud by rivers, streams and ponds. Recorded from Doddington Bridge in 1983 and 1992 and St Cuthberts in 1984 and 1996.

Elmidae

Normandia nitens **RDB2**

Extinct in the county. Last seen: at Close House in 1855.

Riolus cupreus **Scarce**

A riffle beetle, found in swift calcareous streams and rivers. Recorded from the Irthing Gorge from 1970 onwards and from Linnheads in 1996.

R. subviolaceus **Scarce**

A riffle beetle, found on stones and vegetation in swift streams and rivers, preferably calcareous. Recorded from the Irthing Gorge from 1970 onwards.

Elateridae (Click beetles)

Ampedus balteatus **NR** Loc

A click beetle most often found in rotted birch *Betula* sp., but also feeding on peat. Recorded from Prestwick Carr in 1984.

Fleutiauxellus maritimus **Rare**

A small black click beetle, found in river shingle. Recorded from Staward Woods in 1988 and by the River Coquet near Sharpeton in 1997.

F. quadripustulatus **Rare**

A small click beetle with yellow-spotted elytra. Recorded from Bywell in 1987 and the River Till at Fenton Town in 1992.

Negastrius sabulicola **pRDB2**

A small click beetle with yellow-spotted elytra, living on sandy river banks. Recorded from the River Till at Fenton Town in 1992 and Dilston Haughs in 1995.

Cidnopus aeruginosus **NR** Loc

A click beetle of sandy places, usually on the coast. The larvae are wireworms feeding on grass roots. Recorded from Watersmeet in 1977, Ovingham in 1980 and Prudhoe in 1994.

Kilbunea minuta **NR** Loc

A click beetle of dry grassland. The larvae are wireworms feeding on grass roots. Recorded from various sites around the county between 1979 and 1994.

Ctenicera pectinicornis **Rare**

A click beetle, mainly of flowery meadows. Recorded from the College Valley in 1981.

Cantharidae (Soldier beetles)

Cantharis obscura **Scarce**

A soldier beetle of mainly damp places. Recorded from Close House in 1977.

C. pallida **NR**
Loc

A predatory soldier beetle, found on flowers, mostly in damp places. Recorded from Warton and Alnmouth in 1986.

C. thoracica **NR**
Loc

Recorded from Plessey Woods in 1981 and Warton and Alnmouth in 1986.

Rhagonycha translucida **Scarce**

A soldier beetle on flowers. Recorded from Elf Hills and Honeycrook Burn in 1980.

Malthinus frontalis **Scarce**

A small yellow-spotted soldier beetle associated with mature trees. Found at Heddon-on-the-Wall in 1983.

Malthodes flavoguttatus **NR**
Loc

A soldier beetle of woodlands; the larvae are predatory under dead bark, the adults usually on tree foliage. Recorded from Briarwood Banks and Honeycrook Burn in 1979.

M. guttifer **Scarce**

A soldier beetle of woodlands; the larvae feed under dead bark, the adults usually on tree foliage. Recorded from Nelly's Moss Lakes and Rothley Lake in 1986.

M. maurus **Scarce**

A small soldier beetle found in damp broad-leaved woodland. Recorded from Ned's Whin in 1995 and Linnheads in 1996.

M. mysticus **NR**
Loc

A soldier beetle found in woodland rides, glades and edges, on flowers and foliage. The carnivorous larvae are found under dead bark. Recorded from Nelly's Moss Lakes and Rothley Lake in 1986, Widdrington in 1992 and Ned's Whin in 1993.

Lampyridae

Lampyris noctiluca **NR**
Reg

The 'glow worm' found in dry grasslands feeding on snails. Recorded from Allerwash since 1989.

Nitidulidae

Meligethes ochropus **Scarce**

A small black pollen beetle associated with woundworts *Stachys* spp. Recorded from Alnmouth in 1990.

Epuraea fuscicollis **Scarce**

A small brown sap beetle found in broad-leaved and pasture woodlands, associated with sap and *Cossus* larval borings. Recorded from Linnheads in 1996.

Soronia grisea **NR**
Loc

A sap beetle usually found on flowers and at tree sap. Recorded from Chollerton and Haydon Dene in 1982 and Linnheads in 1996.

Rhizophagidae

Rhizophagus cribratus **NR**
Loc

A beetle found at the roots of deciduous trees, in leaf litter or occasionally under bark. Recorded from Gosforth Park in 1978.

R. nitidulus **Scarce**

Found under the dead bark of trees and in fungus. Recorded from Haydon Dene in 1982.

Erotylidae

Triplax aenea **NR**
Loc

Found in bracket fungi on trees, especially birch *Betula* sp.. Indicative of older woodland in the northern part of its range. Recorded from Gosforth Park in 1979.

T. scutellaris **RDB3**

Found in bracket fungi and apparently restricted to north-east England. Recorded from Gosforth Park in 1979.

Dacne bipustulata **NR**
Loc

A small spotted fungus beetle, recorded from Tyne Watersmeet in 1992.

Cerylonidae

Cerylon fagi **Scarce**

A small black predatory beetle found under the bark of deciduous trees. Recorded from Hyon's Wood, 1994.

C. ferrugineum **NR**
Loc

Lives under the dead bark of deciduous trees. Indicative of old woodland in the North. Recorded from various sites between 1982 and 1986.

Coccinellidae (Ladybirds)

Subcoccinella vigintiquattropunctata **NR**
Loc

A phytophagous ladybird of grassland and marshy places. Recorded from Close House in 1975.

Scymnus schmidti **Scarce**

A small black ladybird found in dry places. Recorded from Alnmouth, Newbiggin-by-the-Sea, Newton Links and Cheswick in 1990.

S. suturalis **NR**
U

A small ladybird found in damp places. Recorded at East Lilburn in 1987.

Chilocorus bipustulatus **NR**
Loc

A ladybird found in dry places and on conifers. Recorded from the Holystone Valley in 1984.

Coccinella hieroglyphica **NR**
Loc

A ladybird feeding on aphids in heather on moors and lowland heathland. Recorded from Kimmer Lough in 1984.

C. quinquepunctata **RDB3**

Extinct in the county. Seen in the Harthope Valley until 1852.

Myrrha octodecimpunctata **NR**
Loc

A ladybird feeding on aphids in woodland, usually on conifers. Recorded from Newburn Marsh in 1981.

Halyzia sedecemguttata **NR**
Loc

A ladybird found in grassland and on wood margins. Recorded from Campfield Kettle Hole in 1981 and Close House in 1995.

Endomychidae

Endomychus coccineus **NR**
Loc

Feeds on fungus, mainly under the bark of broadleaves. Recorded from Morralee Wood in 1986.

Lathridiidae

Enicmus fungicola **Scarce**

Lives in fungus on dead trees, mainly in old woodland. Recorded from Redesmouth in 1983.

Cisidae

Cis festivus **Scarce**

A fungus beetle living on brackets in trees. Recorded from Haydon Dene in 1982.

Mycetophagidae

Mycetophagus atomarius **NR**
Loc

Found under fungus-infected bark of broadleaved timber, especially beech *Fagus sylvatica*. Recorded from Wallington Hall in 1986.

Tenebrionidae

Crypticus quisquilius **Scarce**

A medium-sized black darkling beetle that mimics a ground beetle, found in dry sandy sites. Recorded from Newbiggin-by-the-Sea in 1990.

Tetratomidae

Tetratoma ancora **Scarce**

Found in bracket fungi or fungus-infected bark in woodland. Recorded from Briarwood Banks in 1980.

T. fungorum **NR**
Loc

Found on fungi on trees, mainly in old woodland. Recorded from Brownsbog Wood in 1976.

Salpingidae

Vincenzellus ruficollis **NR**
Loc

A beetle predatory on small invertebrates under dead bark, mainly in older woodland. Recorded from various sites around the county.

Scraptiidae

Anaspis thoracica **Rare**

A small beetle found on hawthorn *Crataegus monogyna* blossom in early summer. The larvae are found under dead bark and in rotten wood. Recorded from Haydon Dene in 1982.

Rhipiphoridae

Metoecus paradoxus **NR**
Loc

A yellow and black beetle with reduced elytra, whose larvae develop in wasps' nests. Recorded from Close House in 1972.

Meloidae

Meloe proscarabaeus **NR**
Reg

An oil beetle of heaths, moors and coastal cliffs. The larvae are parasitic on bees. Recorded from Holystone North Wood in 1977.

Anthicidae

Notoxus monocerus **NR**
Loc

A small brown mottled beetle with a prominent pro-thoracic horn, found in dry sandy sites, usually coastal. Recorded from Doddington Bridge in 1992 and Dilston Haughs in 1995.

Cerambycidae (Longhorn beetles)

Asemum striatum **NR**
Loc

A large black longhorn beetle, associated with old timber and standing dead trees. Recorded from Close House in 1992.

Rhagium bifasciatum **NR**
Reg

A longhorn beetle with larvae in rotten timber of most species of tree, particularly conifers. Recorded from various sites around the county.

R. mordax **NR**
Loc

A longhorn beetle: the larvae feed in the rotten timber of most species of broadleaved tree. Recorded from Horsleyhope Ravine in 1978, Honeycrook Burn in 1979 and Haydon Dene in 1982.

Alosterna tabacicolor **NR**
Reg

A small yellow longhorn beetle; the larvae are found in rotting wood and the stumps of broadleaved trees, the adults on flowers. Recorded from Briarwood Banks and the Honeycrook Burn in 1980.

Judolia cerambyciformis **NR**
Loc

A longhorn beetle; there are six Northumberland records including Kielder (Bakethin) in 1986.

Strangalia maculata **NR**
Reg

The larvae are associated with dead wood, the adults are found on flowers. Recorded from Briarwood Banks in 1980 and Morralee Wood in 1986.

S. quadrifasciata **NR**
Loc

Probably extinct in the county. Last seen: Wallington Hall in 1930.

Clytus arietus **NR**
Reg

A wasp-mimic longhorn beetle. The larvae are found in hard dead timber, usually of willow *Salix* spp. and birch *Betula* spp. Recorded from Whittle Dene in 1976, Ovingham in 1980 and Close House from 1984 to 1997.

Leiopus nebulosus **NR**
Reg

A longhorn beetle whose larvae are found in dead wood; strongly associated with old woodland in the North. Recorded from various sites around the county.

Saperda scalaris **Rare**

A longhorn beetle breeding in dead wood and under the bark of deciduous trees. Recorded from Briarwood Banks in 1980.

Stenostola dubia **Scarce**

A longhorn beetle, with larvae in dead wood of deciduous trees, especially lime *Tilia* spp. Recorded from Briarwood Banks in 1981 and Close House in 1990.

Chrysomelidae (Leaf beetles)

Plateumaris sericea **NR**
Loc

A reed beetle; the larvae live at the roots of aquatic plants, especially bur-reed *Sparganium* sp. Recorded from Rothley Lakes in 1980.

Zeugophora subspinosa **NR**
Loc

A leaf beetle which feeds on aspen *Populus tremula*. Recorded from Tyne Watersmeet in 1981.

Oulema lichenis **NR**
Loc

A leaf beetle living on thistles. Recorded from Dipton Woods in 1979, Bothal in 1981, Middleton and Heddon-on-the-Wall in 1985, Ned's Whin in 1994 and Linnheads in 1996.

Cryptocephalus moraei **NR**
Loc

A small orange and black leaf beetle, found on St John's wort *Hypericum* spp. in dry places. Recorded from the Spetchels in 1994.

Chrysolina brunsvicensis **NR**
Loc

A leaf beetle found on square-stalked St John's wort *Hypericum quadrangulum.* Recorded from Close House in 1973-74 and Ned's Whin in 1993.

C. hyperici **NR**
Loc

A leaf beetle on St John's wort *Hypericum* spp. in grasslands, verges and woodland rides. Recorded from Close House in 1975 and Prudhoe in 1994.

C. oricalcia **Scarce**

A leaf beetle, possibly associated with umbellifers. Recorded from Whittle Dene in 1980 and Close House in 1990-91.

Prasocuris phellandrii **NR**
Loc

A leaf beetle feeding on buttercups *Ranunculus* spp. in marshy places. Recorded from Chollerton in 1983.

Chrysomela aenea **NR**
Loc

A leaf beetle; the adults and larvae are found on alder *Alnus glutinosa*. Recorded from various sites between 1980 and 1986.

Phytodecta olivacea **NR**
Loc

A leaf beetle feeding on broom *Cytisus* spp. and gorse *Ulex* spp. Recorded from various sites across the county.

P. pallida **NR**
Loc

A leaf beetle on hazel *Corylus avellana* foliage. Recorded from Holystone in 1973 and Briarwood Banks in 1980.

P. viminalis **NR**
Loc

A leaf beetle on poplars *Populus* spp. and willows *Salix* spp. Recorded from Briarwood Banks in 1981.

Luperus flavipes **Scarce**

A leaf beetle feeding on willow *Salix* spp. and birch *Betula* spp. Recorded from Close House between 1973 and 1974 and Beltingham in 1978.

Sermylassa halensis **NR**
Loc

A leaf beetle feeding on bedstraws *Galium* spp. in sandy places. Recorded from Close House and Beltingham in 1981, Alnmouth in 1986 and Prudhoe in 1994.

Phyllotreta nodicornis **NR**
Reg

A leaf beetle associated with mignonette *Reseda* spp. in sandy and chalky places. Recorded from Close House between 1973 and 1974, Ryton in 1985 and Prudhoe in 1994.

P. tetrastigma

NR
Loc

A flea beetle on Cruciferae in marshy places. Recorded from Close House between 1973 and 1974 and Beltingham Gravels in 1981.

Aphthona nonstriata

NR
Loc

A flea beetle found on yellow flag *Iris pseudacorus* in wet places. Recorded from Chollerton in 1981.

Longitarsus ganglbaueri

Rare

A flea beetle on ragwort *Senecio jacobaea*. Recorded from the Farne Islands in 1955-56.

L. reichei

NR
Loc

A small flea beetle found in dry open places. Recorded from the Spetchels in 1994.

L. suturalis

Scarce

A flea beetle recorded from the Farne Islands in 1955-56.

Altica britteni

NR
Loc

A flea beetle feeding on heather foliage. Recorded from the Holystone Valley in 1973 and Callaly Crags and Woods in 1975.

A. ericeti

Scarce

A flea beetle of wet heathland, feeding on heather. Recorded from Aid Moss from 1970 onwards.

Batophila rubi

NR
Loc

A flea beetle on bramble *Rubus* sp., often in woodland. Recorded from Close House in 1973 and 1974.

Hippuriphila modeeri

NR
Loc

A flea beetle found on horsetails *Equisetum* sp. in marshy places. Recorded from Close House, the River Breamish and Doddington Bridge in 1983 and 1992.

Mantura matthewsi

NR
Loc

A flea beetle whose larvae mine the leaves of rock rose *Helianthemum* sp. Recorded from Newton Links in 1986.

M. obtusata **Scarce**

Small dull metallic flea beetle, found in damp sites associated with sheep's sorrel *Rumex acetosa*. Recorded from Bakethin in 1996.

M. rustica **Scarce**

A flea beetle whose larvae mine the leaves of sorrel *Rumex acetosa/acetosella*. Recorded from Close House in 1983.

Apteropeda orbiculata **NR**
Loc

A flea beetle on low growing plants. Recorded from Close House in 1973 and 1974.

Mniophila muscorum **Scarce**

A small metallic flea beetle, found in moss on trees. Recorded from Bakethin in 1986 and Linnheads in 1996.

Cassida flaveola **NR**
Loc

A tortoise beetle feeding on stitchworts *Stellaria* spp. in meadows and marshes. Recorded from Close House in 1973 and 1974.

Attelabidae

Attelabus nitens **NR**
Loc

A primitive weevil causing characteristic leaf rolls on oak. Recorded from Gosforth Park in 1980.

Rhynchites sericeus **NR**
Doubtfully native

Regarded as extinct in the county. There are some possible 19th century records and an unconfirmed report from Gosforth Park in 1978.

Deporaus mannerheimi **NR**
Reg

A primitive weevil causing leaf rolls on sallow *Salix* sp. Very local in the North. Recorded from Prestwick Carr in 1984.

Apionidae

Apion cerdo **Scarce**

Recorded from Close House in 1983 and the Spetchels in 1994. A weevil developing in the seed pods of tufted vetch *Vicia cracca*. Found in woodlands, grasslands and hedges.

A. cruentatum **NR**
Loc

Recorded from Close House in 1975. A seed weevil associated with sorrel *Rumex acetosa/acetosella* in sandy places. The larvae bore into stems and roots.

A. curtisi **Rare**

Recorded from Holy Island in 1968. A weevil of coastal cliffs and dunes. Found on clover *Trifolium* sp. and horseshoe vetch *Hippocrepis* sp. on the continent.

A. pallipes **NR**
Loc

A weevil found in broadleaved woodland particularly on base-rich soils. Feeds on dog's mercury *Mercurialis perennis* where the larvae develop in the stems. Recorded from Priestclose Wood in 1980, Lilburn and Beltingham in 1981 and Tyne Watersmeet in 1982.

A. pisi **NR**
Loc

A weevil, developing in the buds of medick *Medicago* spp. Recorded from the Farne Islands in 1955-56.

A. punctigerum **NR**
Loc

A weevil developing in the pods of bush vetch *Vicia sepium,* in woodland and grassland. Recorded from Chollerton in 1979 and Tyne Watersmeet in 1982.

Curculionidae (Weevils)

Otiorhynchus desertus **Scarce**

A weevil found in dry grasslands. Recorded from Newton Links and from the Spetchels in 1994.

Omiamima mollina **Rare**

A small brown weevil, found in grassy vegetation near rivers. Recorded from Close House since 1980, on the River Till in 1995 and on the Spetchels in 1994.

Polydrusus flavipes **Scarce**

A metallic weevil found in open woodland, feeding on young trees. Recorded from Ned's Whin in 1992-95.

P. mollis **Scarce**

A weevil feeding on the foliage of various deciduous trees and shrubs, especially hazel *Corylus avellana.* Recorded from Horsleyhope Ravine in 1980 and Acomb in 1990.

Barypeithes sulcifrons **Scarce**

A spider weevil living at grass roots in dry grassland, maritime cliff vegetation and in light woodland. Recorded from Ford Moss in 1984.

Brachysomus echinatus **Scarce**

A small weevil found widely in the county since 1980, in dry open riverside vegetation.

Strophosomus faber **Scarce**

A weevil of herbaceous vegetation in dry places. Found at Close House in 1985 and on the Spetchels in 1994.

S. nebulosus **NR**
Loc

A weevil living on the foliage of various trees. Recorded from Close House in 1983, Middleton in 1985, Newbiggin in 1990 and Linnheads in 1996.

Barynotus moerens **NR**
Loc

A weevil feeding on the foliage of dog's mercury *Mercurialis perennis*. Recorded from various sites between 1979 and 1983.

B. squamosus **Scarce**

A medium sized metallic weevil found since 1980, on all types of vegetation especially in grassland and moors.

Tropiphorus obtusus **Rare**

A weevil living on dog's mercury *Mercurialis perennis* in woodland. Recorded from various woodland sites since 1980.

T. terricola **Scarce**

A weevil living on dog's mercury *Mercurialis perennis* in woodland. Recorded from various woodland sites since 1980.

Sitona ambiguus **NR**
Loc

A weevil feeding on meadow vetchling *Lathyrus pratensis* in grassland. Recorded from Close House in 1983.

S. ononidis **Scarce**

A weevil feeding mostly on restharrow *Ononis* spp. and possibly other legumes. Recorded from Tranwell Woods in 1975.

Cleonus piger **Scarce**

A weevil found on sand dunes where it is associated with thistles. Recorded from Newton Links in 1970, Blyth Dunes in 1980 and Cresswell in 1985.

Cleopus pulchellus **NR**
Loc

A weevil feeding on leaves and flowers of figwort *Scrophularia* spp. Recorded from Holy Island in 1968.

Magdalis carbonaria **Scarce**

A small black weevil associated with dead trees, especially birch *Betula* spp. Recorded from Close House in 1987 and Ned's Whin in 1993.

Cryptorhynchus lapathi **Scarce**

An uncommon weevil found on willows *Salix* spp. in wetland. Recorded from Beltingham Gravels in 1981.

Acalles ptinoides **Scarce**

A small weevil occurring in litter in birch *Betula* spp. and oak *Quercus* spp. woods. In Northumberland it is recorded widely from woodland and other litter.

Dorytomus melanopthalmus **NR**
Loc

A weevil developing in the catkins of alder *Alnus glutinosa.* Recorded from Beltingham in 1981 and Close House in 1983.

D. tortrix **NR**
Loc

A weevil developing in sallow *Salix* sp. catkins. More local in the North. Recorded from Tyne Watersmeet between 1978 and 1981.

D. tremulae **Scarce**

A weevil found on catkins of poplars *Populus* spp. Recorded from Tyne Watersmeet in 1980.

Procas granulicollis **M RDB1**

A weevil, endemic to Britain and found on Heddon Common from 1990-92. Possibly associated with climbing corydalis *Ceratocapnos claviculata.*

SPECIES ACTION PLAN REQUIRED.

Grypus equiseti **Scarce**

Medium sized weevil, associated with horsetails *Equisetum* spp. Widespread in the county.

Orthochaetes setiger **Scarce**

Small spiny polyphagous ground-feeding weevil, found in well-draining soils. Recorded from the Spetchels in 1994.

Coeliodes erythroleucos **Scarce**

A small weevil living on oak *Quercus* spp. Recorded from Newburn Marsh in 1981.

Trichosirocalus rufulus **Rare**

A weevil of disturbed ground, more often found on the coast. Recorded from Close House in 1983.

Ceutorhynchus punctiger **Scarce**

A small weevil found on herbaceous vegetation. Recorded from the Spetchels in 1994.

Litodactylus leucogaster **Scarce**

A weevil feeding on water milfoils *Myriophyllum* spp. and possibly other aquatic plants in ponds and marshy areas. Recorded from Rothley Lake in 1981.

Anthonomus brunnipennis **NR**
Loc

A weevil feeding on the leaves of marsh cinquefoil *Potentilla palustris* and possibly other *Potentilla* spp. Recorded from Arcot Hall in 1981.

A. ulmi **Scarce**

A weevil developing in leaf and flower buds of the English elm *Ulmus procera*. Threatened by the spread of Dutch elm disease. Recorded from Tyne Watersmeet in 1977.

Curculio nucum **NR**
Reg

A large nut weevil; the larvae are found in hazel *Corylus avellana* nuts. Recorded from Park Wood in 1978.

C. villosus **Scarce**

A smallish grey nut weevil; the larvae develop in oak *Quercus* spp. galls. Recorded from Ned's Whin in 1995.

Ellescus bipunctatus **Scarce**

A small yellowish weevil found in damp woodland. Recorded from Holystone in 1984.

Rhynchaenus foliorum **Rare**

A small black and white jumping weevil found on willows *Salix* spp. Recorded from Ned's Whin in 1994.

Scolytidae (Bark beetles)

Dryocoetes autographus **NR**
Loc

A bark beetle found in conifer plantations. Recently recorded from a few sites, including five in Kielder Forest in 1997. Easily overlooked, and possibly increasing.

Xyloterus domesticus **NR**
Loc

A bark beetle, boring into the unhealthy wood of most species of broadleaved tree. Recorded from Bothal and Nelly's Moss Lakes in 1986.

BEES, WASPS AND ANTS (HYMENOPTERA)

The bees, wasps and ants have not aroused as much interest as the Lepidoptera in the northern counties and are very much a neglected group as a whole; positive identification in the field is often not easy. The available observations have mostly been made in the course of recording for other species.

Species with fewer than ten records in the county have been selected using the Invertebrate Site Register (ISR) with additional bumble bee (Apidae) records and information supplied by H Eales.

Species Action Plans have been proposed for the two species on the middle list of the *UK Steering Group Report* (1995).

Tenthredinidae (Sawflies)

Strongylogaster filicis **NR**

Extinct in the county. Last seen: on The Cheviot in 1873.

Pontania vesicator **NR**
pRDB3

Probably extinct in the county. Last seen: Wylam in 1922.

Chrysidinae (Ruby-tailed wasps)

Hedychridium ardens **NR**
Loc

A wasp, parasitic on a sand wasp. Recorded from Ross Links in 1985.

Formicidae (Ants)

Myrmica lobicornis **NR**
Loc

Recorded from various sites.

Formica lugubris **NR**
Loc M

A wood ant which makes large twig and pine-needle nests. Found in woodlands, including conifer woods. Recorded from Bothal in 1986.

SPECIES ACTION PLAN REQUIRED.

Lasius flavus **NR**
Loc

A meadow ant, recorded from various sites.

Pompilidae (Spider-hunting wasps)

Pompilus cinereus **NR**
Loc

A spider-hunting wasp found in sandy areas, especially coastal. Recorded from Ross Links in 1985.

Arachnospila anceps **NR**
Loc

A spider-hunting wasp which preys on ground-dwelling spiders in sandy places. Recorded from Ross Links in 1985.

Evagetes crassicornis **NR**
Loc

A spider-hunting wasp which is a parasite in the nest of other species in the same family. Recorded from Ross Links in 1985.

Vespidae (Social wasps)

Vespula austriaca **NR**
Reg

A cuckoo wasp, inquiline in the nests of a red wasp. Recorded from Muckle Moss in 1980.

Sphecidae (Digger wasps)

Tachysphex pompiliformis **NR**
Loc

A solitary wasp nesting in sandy soil; predatory on grasshopper nymphs. Recorded from Ross Links in 1985.

Crossocerus leucostoma **NR**
Rare

Probably extinct in the county. Last seen: Brownsbog Wood in 1918.

Ectemnius ruficornis **NR**
Scarce

A solitary wasp nesting in hollow plant stems or dead wood, mainly in woodland. Recorded from Newham Fen in 1985.

Psen spooneri **NR**
RDB3

Extinct in the county. Last seen: Gosforth Park in 1870.

Pemphredon wesmaeli

NR
RDB3

Probably extinct in the county. Last seen: Dipton Woods in 1927.

Passaloecus monilicornis

NR
Loc

A solitary wasp which nests in dead wood. Recorded from Newham Fen in 1985.

Gorytes quadrifasciatus

NR
Reg

A digger wasp which nests in soil and preys on froghoppers (Cercopidae). Recorded from Close House in 1975.

G. tumidus

NR
Loc

A solitary wasp nesting in sandy places. Recorded from the River Breamish in 1976 and Close House in 1977.

Andrenidae (Mining bees)

Andrena alfkenella

NR
RDB3

A solitary bee occurring in sandy places on heathland and the coast; possibly vagrant. Recorded from Gosforth Park in 1980.

A. labiata

NR
Rare

Probably extinct in the county. Last seen: Ovingham in 1927.

A. nana

NR
RDB1

Probably extinct in the county. Last seen: Brownsbog Wood in 1911.

A. pubescens

NR
Reg

A solitary bee, recorded from Alnmouth in 1949 and Park Wood in 1978.

A. ruficrus

NR
RDB3

A solitary bee, recorded from Barhough in 1972.

Halictidae (Mining bees)

Halictus confusus **NR**
RDB3

A solitary bee of the South recorded from Close House in 1976; possibly a vagrant.

Lasioglossum villosulum **NR**
Reg

A solitary bee of sandy places, recorded from various sites.

Megachilidae

Coelioxys rufescens **NR**
Reg

A solitary bee, recorded from Close House in 1972.

Anthophoridae (Cuckoo bees)

Nomada hirtipes **NR**
RDB3

A cuckoo bee recorded from the Warks Burn in 1975.

Apidae (Bumble bees)

Bombus distinguendus **NR**
M Scarce

A bumble bee nesting mainly below ground. Recorded from Ford Moss in 1963 and Steng Moss in 1970; possibly extinct in Northumberland.

SPECIES ACTION PLAN REQUIRED.

B. humilis **NR**
Loc M

Extinct in the county. Last seen: Middleton Wood in 1876.

B. jonellus **NR**

Mainly confined to the Border Mires and other wet moorland sites, occasionally found in afforested moorland sites.

B. magnus **NR**
U

A species of bogs and other moorland, found in the county only since 1970.

B. ruderarius **NR**
Reg

Extinct in the county. Last seen: Wooler in 1890.

B. ruderatus **NR**
M Scarce

Extinct in the county. Last verified record: Whitley Bay in 1870.

B. soroeensis **NR**
Reg

Recorded from Blyth Dunes in 1961 and from at least five sites in the county since 1970, including Devil's Water in 1973 and Lewis Burn in 1988.

B. sylvarum **NR**
S Scarce

Extinct in the county. Last seen: Wooler in 1890.

Psithyrus vestalis **NR**
Reg

Reaches the northern limit of its British range just north of the River Tyne.

P. rupestris **NR**
L Scarce

Probably extinct in the county. Last seen: Hexham in 1924.

FLIES (DIPTERA)

Unless otherwise stated, records and information have been taken from the Invertebrate Site Register, with additional records supplied by G Simpson. A catalogue of Diptera collected in Northumberland in the 1920s will be found in Fordham (1945).

Species with ten or fewer ISR records for the county were selected for inclusion, though in some instances this may reflect the paucity of observers. English names of families are given where they are in common use. Species Action Plans have not been proposed for any species of fly.

Species **Criteria/status**

Tipulidae (Craneflies)

Nephrotoma analis **NR**
Reg

A cranefly found on shady river banks. Recorded from Beltingham Gravels in 1982.

N. dorsalis **NR**
Scarce

Found on sandy, wooded river banks. Recorded from Beltingham Gravels in 1982.

N. submaculosa **NR**
Loc

A cranefly often abundant in sand dunes but which also occurs occasionally inland. Recorded from various sites around the county.

Tipula couckei **NR**
Reg

Found beside streams and rivers. Recorded from Beltingham in 1982.

T. czizeki **NR**
Loc

Cranefly of damp pasture. Recorded from various sites around the county.

T. nubeculosa **NR**
Scarce

Found in deciduous woods in upland areas. Recorded from Chartner's Lough in 1980.

T. obsoleta **NR**
Reg

Recorded from Close House and Tranwell Woods in 1975. A cranefly found in rough grassland and margins of pasture.

T. pseudovariipennis **NR**
Scarce

Found mainly in calcareous woodlands. Recorded from Close House in 1977.

T. signata **NR**
Reg

A cranefly of wet woodland, wooded stream gullies, heathland and carr. Recorded from Tranwell Woods in 1975.

Diogma glabrata **NR**
Scarce

Found in damp woodlands, generally in the lowlands. Recorded from Oakpool in 1975.

Limonia dilutior **NR**
Loc

A cranefly that seems to have an association with gorse *Ulex* sp. and broom *Cytisus* sp. Recorded from Close House in 1975.

L. trivittata **NR**
Scarce

A cranefly generally found in wet woodland on calcareous soils, especially near rivers; but recorded from the Farne Islands in 1955 and 1956.

Dactylolabis transversa **NR**
Scarce

A cranefly found in a variety of habitats, especially sheltered valley woods in non-limestone areas. The larvae develop in moss and fern roots on damp rocks. Recorded from Whittle Dene in 1977.

Limnophila phaeostigma **NR**
Loc

A cranefly on moorland flushes. Recorded from the Holystone Valley in 1985.

Molophilus curvatus **NR**
Loc

Found beside small streams in the lowlands. Recorded from Beltingham Gravels in 1982.

Culicidae (Mosquitoes)

Culiseta fumipennis **NR**
Loc

Recorded from Hadrian Park Pond in 1985.

Bibionidae (St Mark's flies)

Bibio anglicus **NR**
Reg

Usually found in early spring when males swarm to the lee of bushes. Recorded from Beltingham Gravels in 1982.

B. ferruginatus **NR**
Reg

Usually found in early spring when males swarm to the lee of bushes. Recorded from Happy Valley in 1977.

Mycetophilidae (Fungus gnats)

Orfelia nigricornis **NR**
Reg

Recorded from Close House in 1981.

Stratiomyidae (Soldier flies)

Beris morrisii **NR**
Reg

Found on woodland edges and hedgerows in late May-June. Recorded from Close House in 1977.

Nemotelus nigrinus **NR**
Loc

A soldier fly of marshy places where larvae probably live in detritus. Recorded from Close House in 1984.

N. notatus **NR**
Loc

Found on coastal saltmarshes where the larvae live in brackish pools. Recorded from various coastal sites.

N. uliginosus **NR**
Loc

A soldier fly of coastal reedbeds and saltmarshes. Recorded from various coastal sites.

Oxycera dives **NR**
pRDB3

A soldier fly; the larvae feed on algae in wet moss beside streams. Recorded from Harwood Head in 1986.

Odontomyia viridula **NR**
Loc

A soldier fly of marshes and pond margins, with aquatic larvae. Recorded from Newham Fen in 1984.

Stratiomys potamida **NR**
Scarce

A soldier fly; the larvae develop in shallow water. Recorded from Close House in 1980 and Newham Fen in 1985.

Xylophagidae (Soldier flies)

Xylophagus ater **NR**
Reg

The larvae breed in soft, rotting wood. Recorded from various sites around the county.

Rhagionidae (Snipe flies)

Symphoromyia crassicornis **NR**
Loc

A snipe fly frequenting damp meadows and marshy ground. Recorded from Close House between 1981 and 1983.

Atherix ibis **NR**
Loc

Breeds in flowing water. Recorded from various sites across the county.

Rhagio notatus **NR**
Loc

A snipe fly predatory on soft-bodied invertebrates, usually found in bushy places and woodland edge. Recorded from various sites around the county.

Tabanidae (Horse flies)

Hybomitra distinguenda **NR**
Loc

Recorded from Slaley Forest.

H. montana **NR**
Reg

An upland horsefly. Recorded from Belling Burn and Kielder in 1985.

Tabanus cordiger **NR**
Scarce

Recorded from Harwood Forest.

T. sudeticus **NR**
Reg

A horsefly, recorded from the bank of the Tyne at Ovingham in 1976.

Asilidae (Robber flies)

Machimus atricapillus **NR**
Reg

An assassin fly usually found in dry grassy places, especially on chalk or limestone. Recorded from Ross Links in 1978 and Morralee Wood in 1986.

Philonicus albiceps **NR**
Loc

A robber fly of dunes. Recorded from various coastal sites.

Therevidae (Stiletto flies)

Thereva annulata **NR**
Reg

Found on bare sand in dunes. Recorded from various coastal sites.

Bombyliidae (Bee flies)

Phthiria pulicaria **NR**
Scarce

A tiny bee fly found on coastal sand hills. The adults feed on the flowers of Compositae. Recorded from Holy Island in 1985.

Empididae (Dance flies)

Chersodromia incana **NR**
Reg

Found on dry sand in fore-dunes and at the top of the shore where it feeds on other shore flies. Recorded from Bamburgh/Seahouses in 1957.

Platypalpus cothurnatus **NR**
Loc

Found on low vegetation and bushes. Recorded from Close House in 1982.

P. pictitarsis **NR**
Reg

The adults are found on hedges and bushes. Recorded from Close House in 1982.

P. politus **NR**
Loc

The adults are found in hedges and on rough pasture. Recorded from Close House in 1984.

P. pulicarius **NR**
pRDB3

Found on low vegetation and bushes. Recorded from Close House in 1967.

Euthyneura halidayi **NR**
Loc

Recorded from Close House in 1984.

Ragas unica **NR**
Loc

The adults are found on the trunks of trees. Recorded from Close House in 1969.

Rhamphomyia albipennis **NR**
Loc

The males swarm in the lee of bushes. Recorded from the Holystone Valley in 1984.

R. albitarsis **NR**
Scarce

Found in birch *Betula* sp. in marshy places. Recorded from Close House in 1982.

R. hybotina **NR**
Loc

Elsewhere may be abundant in bankside vegetation of upland rivers and streams. Recorded from Close House in 1969.

R. nitidula **NR**
Loc

The males swarm around sallow and birch bushes in boggy places. Recorded from the Holystone Valley in 1984.

R. spinipes **NR**
Loc

The larvae have been found in garden soil rich in organic matter. Recorded from the Harthope Valley in 1985.

R. tibialis **NR**
Loc

A predatory fly in the vicinity of bushes. Recorded from the Holystone Valley in 1983.

R. umbripennis **NR**
Loc

Found swarming around bushes. Recorded from the Holystone Valley in 1984.

Empis opaca **NR**
Loc

Found in early summer in upland valleys. Recorded from various sites around the county.

E. planetica **NR**
Reg

A woodland species. Recorded from Close House in 1981.

E. rufiventris **NR**
Loc

A woodland species. Recorded from West Dipton Burn in 1977.

E. scotica **NR**
Reg

Found in upland valleys, swarming in the lee of trees. Recorded from the College and Harthope Valleys in 1985.

Hilara clypeata **NR**
Loc

The males fly over shaded streams. Recorded from Close House in 1982.

H. cornicula **NR**
Reg

The males fly over shaded pools and streams. Recorded from Close House between 1978 and 1984.

H. galactoptera **NR**
Reg

The males swarm over small woodland streams in early summer. Recorded from Close House between 1981 and 1984.

H. lundbecki **NR**
Reg

A predatory fly, often found visiting flowers near the shore. Recorded from various coastal sites around the county.

H. monedula **NR**
Reg

The males fly over shaded streams and pools. Recorded from Close House in 1983.

Chelipoda vocatoria **NR**
Reg

Found in damp situations where the adults sit on vegetation in wait for prey. Recorded from Lilburn in 1977.

Chelifera subangusta **NR**
Loc

Usually found on trees and bushes. Recorded from Close House in 1982.

Wiedemannia rhynchops **NR**
Reg

Lives on stones submerged in running water. Recorded from Linbriggs in 1985.

Dolichopodidae

Dolichopus clavipes **NR**
Reg

Found in damp meadows and near water. Recorded from various coastal sites.

D. diadema **NR**
Reg

Lives on the surface of pools in salt-marshes and mudflats. Recorded from Holy Island in 1984.

D. latelimbatus **NR**
Loc

Recorded from Close House in 1984.

D. lepidus **NR**
Reg

Found in muddy places. Recorded from the Holystone Valley in 1985.

Hercostomus assimilis **NR**
Reg

Recorded from Close House in 1981.

Hypophyllus crinipes **NR**
Loc

Found in wet places. Recorded from Close House in 1984.

Hydrophorus litoreus **NR**
Reg

A predatory fly, usually found resting on the surface of the water near the muddy edges of ponds. Recorded from Close House in 1984 and Arcot Hall in 1986.

H. oceanus **NR**
Loc

Abundant on the surface of wet mud in saltmarshes, and occasionally inland. Recorded from Holy Island and Newton Links in 1984.

Liancalus virens **NR**
Loc

Lives on rocks in fast flowing streams. Recorded from Warks Burn in 1983.

Aphrosylus celtiber **NR**
Reg

A fly of rocky shores where the larvae are predatory on barnacles and possibly limpets. Recorded from St Mary's Island in 1981.

Medetera abstrusa **NR**
Reg

A predatory fly found on vertical surfaces such as tree trunks. Recorded from Close House in 1983.

M. dendrobaena **NR**
Reg

A predatory fly found on vertical surfaces such as tree trunks. Recorded from Gosforth Park in 1978 and Close House in 1983.

M. micacea **NR**
Loc

A predatory fly found on vertical surfaces such as tree trunks. Recorded from Close House in 1980.

Rhaphium commune **NR**
Reg

Recorded from Close House in 1981.

R. consobrinum **NR**
Reg

Recorded from Beltingham Gravels in 1983.

Syntormon pumilis **NR**
Loc

Found in damp, well vegetated places. Recorded from the Farne Islands in 1955-56 and Close House in 1981.

Machaerium maritimae **NR**
Reg

Found in or near salt marshes. Recorded from Holy Island in 1985.

Chrysotus cupreus **NR**
Reg

Recorded from Close House in 1981.

Argyra argentella **NR**
Reg

The males fly over ponds or muddy patches in woods. Recorded from Close House between 1980 and 1984.

A. confinis **NR**
Reg

The males fly over ponds or muddy patches in woods. Recorded from Newham Fen in 1983 and Close House in 1984.

A. elongata **NR**
Loc

The males fly over ponds or muddy patches in woods. Recorded from Close House in 1980.

Campsicnemus armatus **NR**
Reg

Found on the surface of mud at the edges of ponds and ditches and also in fields on ground poached by cattle. Recorded from Holy Island in 1983.

Lonchopteridae

Lonchoptera meijeri **NR**
Scarce

Most often found near rivers and streams in upland and northern Britain. Recorded from Close House in 1976.

L. tristis **NR**
Loc

Found on the surface of muddy, shady places. Recorded from Bothal in 1977.

Platypezidae

Atelestus pulicarius **NR**
Reg

The larvae are found in fungi and the adults usually nearby. Recorded from Close House in 1984.

Pipunculidae

Chalarus pughi **NR**
Reg

Parasitic upon leaf hoppers. Recorded from Close House in 1981.

Pipunculus varipes **NR**
Reg

Parasitic upon leaf hoppers. Recorded from Close House in 1981.

Syrphidae (Hoverflies)

G Simpson and J D Parrack

As with many groups of invertebrates, the recording of hoverflies in the county has not been systematic although each 10km square has been visited at least once. The distribution of species mirrors, to some extent, the distribution of the recorders and may be skewed towards particular habitats. Species were selected for inclusion if there are ten or fewer records for the county.

Species accounts are brief, concentrating on the location of records. Some of the 1988 records originate from the report of a survey made by the Institute of Terrestrial Ecology (ITE) in the Kielder Forest district (Good, Williams *et al.* 1988)

Species Action Plans have not been suggested for any of the hoverflies as there is inadequate information about the life cycles of most species. However, general conservation measures for hoverflies include providing adequate flower-rich, sunny glades in all types of woodland; preserving flower-rich, wet meadows, pastures and ditches; maintaining aphid-bearing and other specific plant species; and postponing the removal of over-mature standing or fallen timber.

Epistrophe eligans **NR**

One near Kielder Water in 1988 and one in Kielder Forest in 1991, but it may be relatively widespread.

Metasyrphus latifasciatus **NR**
Loc

Records at Whittle Dene, 1977; Lewis Burn, 1985; Slaley Forest, 1987; Kielder Forest, 1990; and several other sites, mainly western. There are two records in the ITE report.

M. nielseni **NR**
Scarce

One at Holystone Burn in 1985.

Scaeva selenitica **NR**
Loc

Two records, at Kielder in July 1987 and Plashetts Burn in 1988. Usually regarded as immigrant but may be resident.

Dasysyrphus albostriatus **NR**
Loc

Three records, at Haydon Bridge, 1987; Slaley Forest, 1989; and near Longframlington, 1990.

D. friuliensis **NR**
Loc

Four records, at Nelly's Moss Lakes, 1986; Blanchland, 1987; Holystone, 1990 and Butteryhaugh in 1992.

Leucozona laternarius **NR**

Two records at Bakethin Reservoir in 1992.

Eriozona syrphoides **NR**
Loc

This species favours stands of devil's-bit scabious *Succisa pratensis*. Very rare but may be overlooked. First recorded in Britain in 1957. There are six records for Northumberland: in Kielder Forest in 1991-92 and two at Kidland Forest in 1991.

Melangyna arctica **NR**
Loc

There are records at Holystone Valley in 1985; Slaley Forest and near Blanchland in 1987; Kielder Forest in 1990, and various other upland and western sites. Localised but probably not in particular danger.

M. cincta **NR**
Loc

Prefers mainly broadleaved woodland areas. There are records at Haydon Spa in 1987; Forest Burn in 1992 and Kielder Viaduct in 1992.

M. labiatarum **NR**
Reg

One in Slaley Forest and one at Arcot Hall in 1986.

M. triangulifera **NR**
Scarce

One record, at Holystone Burn in 1985.

M. umbellatarum **NR**
Reg

Two records in different parts of Kielder Forest, both in 1987.

Parasyrphus lineolus **NR**
Reg

Found at College Valley and Lewis Burn in 1985; possibly more than ten sites.

P. mallinellus **NR**
Reg

Records at Slaley Forest in 1987 and Kielder Forest in 1990.

P. punctulatus **NR**

Records at Slaley Forest and Blanchland in 1987; North Yardhope in 1990; Kielder Forest in 1992; and one in the ITE report.

P. vittiger **NR**
Loc

Holystone Valley in 1985; possibly there are more than ten sites.

Didea alneti **NR**
L RDB1

One recorded in Slaley Forest in 1989; the first English record since 1948.

D. fasciata **NR**
Scarce

There are at least seven records for Northumberland.

D. intermedia **NR**
Scarce

One at the eastern edge of Wark Forest in 1991.

Megasyrphus annulipes **NR**
Scarce

There are records at Morralee Wood in 1986 and Kielder Forest in 1991; and also at Butteryhaugh, Gowanburn and Bakethin Reservoir. Possibly it is on the increase, or it may be irruptive.

Meliscaeva auricollis **NR**
Reg

There are records at Slaley Forest, Blanchland Moor and Wark Forest; and at Kielder Viaduct in 1992.

Sphaerophoria philanthus **NR**
Reg

Probably overlooked; there are eight records, mainly in the Kielder Forest area between 1985 and 1992; also one at Arcot Hall in 1988.

S. virgata **NR**
Scarce

Recorded at Holystone Burn in 1985.

Chrysotoxum festivum **NR**
Reg

One record only, at Ninebanks in 1995.

Xanthandrus comtus **NR**
Scarce

Recorded at the western edge of Kielder Forest in 1997. A southern species occasionally recorded in the North.

Platycheirus ambiguus **NR**
Reg

One record only, at Arcot Hall, in 1986.

P. fulviventris **NR**
Loc

Records at Arcot Hall in 1987 and Lewis Burn Forks in 1988.

P. immarginatus **NR**
Scarce

Recorded on the Farne Islands in 1955/56 and at Warkworth salt-marsh in 1990.

P. occultus **NR**
Loc

A newly separated species; there is only one county record, at Butteryhaugh in 1992.

P. podagratus **NR**
Scarce

One site only, in the Swineshaw/March Burn area, in 1991.

P. scambus **NR**
Loc

Two records in different parts of Slaley Forest in 1987 and two in the ITE report. Possibly there are more than ten records.

Pyrophaena rosarum **NR**
Loc

There are records at Burnstones and Park Burnfoot in 1984, Coanwood in 1986, Arcot Hall in 1980 and 1987, and Redesmouth in 1995.

Paragus haemorrhous **NR**
Loc

One record, at Belling Burn in 1992.

Pipiza austriaca **NR**
Reg

Records at Close House, 1984; Powburn Woods and Holystone Valley, 1985; North Yardhope, 1990; Staward, 1992 and Bolam Lake Country Park, 1992. Possibly it is overlooked.

P. noctiluca **NR**
Loc

Records at Whittle Dene, 1977; Holystone Burn, 1985; Arcot Hall, 1986; Haydon Bridge, 1987; Holywell Pond and Forest Burn, 1992.

Pipizella varipes **NR**
Reg

One record only, at Belling Burn in 1992.

Cheilosia antiqua **NR**
Reg

A mainly western species. Recorded at Tyne Watersmeet, 1977; Deadwater, Kielder, 1992; and the Kingswood Burn area, 1987.

C. bergenstammi **NR**
Loc

This species may be overlooked as it flies early. There are two records only, near Kingswood Burn in 1987 and Henshaw Common in 1996.

C. fraterna **NR**
Reg

Found at Arcot Hall and Pawston Lake in 1986. It may be more widespread in the county.

C. impressa **NR**
Reg

There are three records: at Tyne Watersmeet, 1978; Beltingham Gravels, 1983 and Arcot Hall, 1987.

C. pagana **NR**

There are three records: near Low Cranecleugh, Kielder, 1988; Lewis Burn area, 1990; and Harwood Forest, 1995. Thinly but widely distributed in the west of the county.

C. praecox **NR**
Reg

One record only, at Arcot Hall in 1986.

C. pubera **NR**
Scarce

Found at West Dipton Burn and Holystone Valley in 1984 and Lewis Burn in 1985.

C. variabilis **NR**

Two records, one near Plenmeller in 1986 and one in Dipton Wood in 1972.

Portevinia maculata **NR**
Loc

Found in most places where ramsons *Allium ursinum* occurs. Various sites were recorded between 1978 and 1980. There may be more than ten records for the county.

Ferdinandea cuprea **NR**
Loc

There are four widespread records including Close House in 1981 and Beltingham in 1983.

Chrysogaster chalybeata **NR**
Reg

Found in gravels at Beltingham in 1983 and by the River Breamish in 1984.

C. hirtella **NR**

Species probably overlooked. One was in the Slaley Forest area in 1988, and one each at Butteryhaugh and Belling Burn in 1992.

C. virescens **NR**
Reg

Five records: at Holystone Burn in 1983, Holystone Valley and North Wood in 1985, Burnstones in 1987, and at North Yardhope in 1990.

Lejogaster splendida **NR**
Scarce

One record, for Holy Island in 1984.

Orthonevra geniculata **NR**
Scarce

Records at Holystone Burn in 1984 and 1985.

O. nobilis **NR**
Loc

Records at Kielder Burn Fork in 1992 and Rothley West Plantation in 1995.

Neoascia meticulosa **NR**
Loc

Records at Holy Island in 1984 and Kielder Viaduct in 1992.

N. tenur/dispar **NR**
Loc

These two similar low-flying species of marshy grassland are likely to be overlooked, and are difficult to distinguish. There are three records, at Arcot Hall in 1988, and at Belling Burn and Kielder Viaduct in 1992.

Arctophila fulva **NR**
Loc

There are five records: Hexhamshire Common in 1975, College Valley in 1985, Wark Forest in 1990, Sidwood, near Greenhaugh in 1991, and Belling Burn, Kielder in 1995.

Xylota florum **NR**
Scarce

One record only, at Callaly Castle in 1992 – the northernmost record for this species.

X. sylvarum **NR**
Loc

Six widely distributed records between 1981 and 1987.

Brachypalpoides lenta **NR**
Loc

Two records only, North Yardhope in 1990 and Forest Burn in 1992.

Chalcosyrphus nemorum **NR**
Reg

One record only, at Arcot Hall in 1987.

Tropidia scita **NR**
Loc

Newham Fen, 1984.

Criorhina asilica **NR**
Scarce

Recorded on the gravels at Beltingham in 1982 and 1983.

C. berberina **NR**
Loc

There are five records: Close House in 1978, Newham Fen in 1984, Slaley Forest, North Yardhope in 1990, and Cupola Bridge in 1992.

C. floccosa **NR**
Loc

One record only, at Roughtinglinn in 1992.

Helophilus hybridus **NR**
Loc

Five records: at Slaley Forest in 1987, Arcot Hall in 1988, Druridge Pools in 1992, and two records in the 1988 ITE report.

H. trivittatus **NR**
Reg

One Northumberland record only, for the Swineshaw/March Burn area, in 1991.

Anasimyia contracta **NR**
Loc

One record, for Arcot Hall in 1988.

A. lineata **NR**
Reg

One record, for Arcot Hall in 1988.

Eristalis abusivus **NR**
Loc

Records at North Yardhope in 1990, Chevington Burn in 1992 and Slaley Forest in 1987.

E. rupium **NR**
Scarce

Probably overlooked; there are seven widely distributed records between 1985 and 1991.

Eristalinus aeneus **NR**
Reg

Found on the Farne Islands in 1955-56, at Newton Links in 1976 and Holy Island in 1984.

E. sepulchralis **NR**
Loc

Three records, at Arcot Hall in 1987 and 1988 and Chevington Burn in 1992.

Other Diptera

(continued – from the Invertebrate Site Register)

Conopidae

Conops flavipes **NR**
Loc

A wasp-like fly with larvae parasitic on bees and wasps. Recorded from Close House in 1984.

C. quadrifasciata **NR**
Loc

Two records, Rothley in 1984, and Slaley Forest.

Leopoldius signatus **NR**
Scarce

Recorded from Close House in 1981. Thought to be associated with ivy flowers *Hedera helix.*

Sicus ferrugineus **NR**
Reg

A parasitic fly, with larvae in the nests of bumble bees. Recorded from various sites.

Tephritidae (Gall flies)

Dithryca guttularis **NR**
Reg

A gall fly; the larvae form a spindle-shaped gall in yarrow *Achillea millefolium.* Recorded from Close House in 1983.

Paroxyna plantaginis **NR**
Reg

A gall fly, breeding in sea aster *Aster tripolium*, which is often abundant in saltmarshes. Recorded from Holy Island in 1984.

Micropezidae (Stilt-legged flies)

Micropeza corrigiolata **NR**
Loc

The larvae are believed to live in rotting wood and decaying vegetable matter. Recorded from Close House in 1984.

Megamerinidae

Megamerina dolium **NR**
Scarce

This fly resembles an ichneumon wasp; it breeds in dead wood. Recorded from Close House in 1980.

Psilidae

Loxocera sylvatica **NR**
Reg

This too resembles an ichneumon wasp; the larvae are probably root or stem borers. Recorded from Close House in 1980.

Psila gracilis **NR**
Reg

Recorded from Horsleyhope Ravine in 1978 and Close House in 1980.

Chyliza scutellata **NR**
Reg

Recorded from Close House in 1981.

Helcomyzidae

Helcomyza ustulata **NR**
Loc

A fly found on fore dunes and the top of the shore where it breeds in small strings of dry seaweed. Recorded from various coastal sites around the county.

Heterocheila buccata **NR**
Loc

Found on fore dunes and the strand line where it breeds in rotting seaweed. Recorded from various coastal sites around the county.

Lauxaniidae

Minettia fasciata **NR**
Reg

Usually found in woods: the larvae probably develop in decaying vegetable matter. Recorded from Newton Links in 1984.

Calliopum geniculatum **NR**
Reg

The larvae probably develop in decaying vegetable matter. Recorded from Gosforth Park in 1978 and Close House in 1980.

Coelopidae (Kelp flies)

Coelopa pilipes **NR**
Loc

A wrack-breeding fly. Recorded from St Mary's Island in 1955-56.

Heleomyzidae

Suillia affinis **NR**
Reg

A woodland fly, recorded from various sites around the county.

S. humilis **NR**
Reg

A woodland fly, recorded from Darden Lough and Monk Wood in 1977.

Tephrochlamys oraria **NR**
Reg

Recorded from the Farne Islands in 1955-56 and Newton Links in 1984.

T. tarsalis **NR**
Reg

The larvae live in birds' nests. Recorded from Gosforth Park in 1977.

Scoliocentra villosa **NR**
Reg

Associated with dung and the dwellings of mammals. Recorded from Close House in 1982.

Trixoscelis obscurella **NR**
Reg

Found on the surface of sand in dunes and occasionally in dry sandy places inland. Recorded from Holy Island in 1983.

Sepsidae

Orygma luctuosum **NR**
Reg

Found on the drift line breeding in rotting seaweed. Recorded from various coastal sites.

Themira germanica **NR**
Scarce

Probably breeds in mud beside streams or ponds. Recorded from Kimmer Lough in 1985.

T. leachi **NR**
Reg

Probably breeds in dung and compost. Recorded from the Farne Islands in 1955-56 and Close House in 1980-84.

T. pusilla **NR**
Reg

Probably breeds in the mud beside streams and ponds. Recorded from Warkworth Dunes and Kimmer Lough in 1985.

Sepsis neocynipsea **NR**
Loc

A dung fly recorded from Close House between 1976 and 1985.

Sciomyzidae (Snail-killing flies)

Colobaea bifasciella **NR**
Scarce

A snail-killing fly of base-rich marshlands. Recorded from Newton Links in 1984.

Pherbellia ventralis **NR**
Reg

A snail-killing fly found in various damp habitats. Recorded from Close House and Whittle Dene in 1984.

Dichetophora finlandica **NR**
pRDB3

A rare snail-killing fly found in long grass and herbage near marshes and along wet woodland edges. Recorded from Newham Fen in 1985.

Elgiva cucularia **NR**
Reg

A snail-killing fly found in freshwater habitats, especially near smaller pools in marshes. Recorded from Newham Fen in 1985.

Sphaeroceridae (Dung flies)

Sphaerocera denticulata **NR**
Reg

A dung fly recorded from Close House in 1984.

S. monilis **NR**
Reg

A dung fly recorded from Close House in 1984.

S. paracrenata **NR**
Reg

Recorded from Close House in 1980.

Leptocera brachystoma **NR**
Reg

A coastal fly associated with large masses of rotting seaweed in which the larvae feed. Recorded from the Farne Islands in 1955-56.

L. limosa **NR**
Reg

Recorded from Close House in 1985.

L. zosterae **NR**
Reg

Found in piles of rotting seaweed. Recorded from various sites around the coast.

Piophilidae

Piophila foveolata **NR**
Reg

Usually found in association with decaying carrion. Recorded from Close House in 1980.

Opomyzidae

Opomyza punctella **NR**
pRDB3

Seems to prefer rough, dry grassland. Recorded from Ross Links in 1985.

Drosophilidae (Fruit flies)

Scaptomyza flava **NR**
Reg

A fruit fly, the larvae of which are leaf miners. Recorded from Close House in 1984.

Gasterophilidae

Gasterophilus intestinalis **NR**
Scarce

The larvae are parasites within the gut of horses; the adults lay eggs around the legs of horses, which are then ingested. Recorded from Close House in 1983.

Scathophagidae

Cordilura ciliata **NR**
Reg

Found in marshland, developing in the leaf sheaths of sedges *Carex* spp. and rushes *Juncus* spp. Recorded from Holywell Pond in 1984.

Ernoneura argus **NR**
RDB2

Found on stony lake shores. Recorded from Harbottle Moors in 1980.

Scathophaga litorea **NR**
Loc

A coastal fly found in estuaries and at the drift line. Recorded from the Farne Islands in 1955-56.

S. scybalaria **NR**
Scarce

A dung fly recorded from the College Valley in 1985.

S. taeniopa **NR**
Reg

A dung fly recorded from Close House between 1981 and 1982.

Ceratinostoma ostiorum **NR**
Loc

Found on sheltered, rocky coastal areas and estuarine breakwaters where rotting seaweed forms suitable breeding areas. Recorded from Bamburgh and Beadnell in 1984.

Fanniidae

Piezura graminicola **NR**
Reg

Recorded from Close House in 1976.

Fannia difficilis **NR**
Reg

The larvae have been found in sap runs and the fly has been bred from a fungus. Recorded from Close House in 1983.

F. monilis **NR**
Reg

The larvae have been found in rotten bracket fungi and the fly has been bred from excrement. Recorded from Close House in 1983.

F. norvegica **NR**
Scarce

Recorded from Close House in 1981.

F. umbrosa **NR**
Reg

Has been bred from wood debris from oak. Recorded from Close House in 1981.

Muscidae

Azelia gibbera **NR**
Reg

A dung breeding fly. Recorded from Close House in 1983.

A. trigonica **NR**
Loc

A dung breeding fly. Recorded from Close House in 1980.

Ophyra leucostoma **NR**
Loc

The larvae probably develop in dung and carrion. Recorded from Close House in 1986.

Hydrotaea capensis **NR**
Loc

Breeds on carrion. Recorded from Close House in 1984.

H. cinerea **NR**
Scarce

Recorded from Close House and Harbottle Moors in 1982.

H. pilipes **NR**
Scarce

A woodland fly with larvae possibly in dung or the soil beneath. Recorded from Close House between 1976 and 1983.

Phaonia cincta

NR
Reg

Larvae found in sap runs in elm *Ulmus* spp. and horse chestnut *Aesculus hippocastanum*. Recorded from Close House in 1980.

P. pratensis

NR
Scarce

Larvae found in sap runs in birch *Betula* sp. Recorded from Close House in 1981.

P. zugmayeriae

NR
Scarce

Found in moss beneath butterbur *Petasites* sp. Recorded from Beltingham Gravels in 1982.

Helina maculipennis

NR
Reg

Recorded from Beltingham Gravels in 1982.

Mydaea ancilla

NR
Loc

Recorded from Close House and West Dipton Burn in 1981.

M. nebulosa

NR
Reg

Recorded from Close House in 1980 and Newham Fen in 1984.

Spilogona baltica

NR
Scarce

Recorded from Holy Island in 1985.

Lispe pygmaea

NR
Reg

Found in wetland habitats such as the muddy margins of ponds. Recorded from Arcot Hall in 1986.

Dexiopsis lacteipennis

NR
Reg

Found mainly in sand dunes. Recorded from Holy Island in 1985.

Coenosia femoralis

NR
Reg

Recorded from Briarwood Banks in 1979.

CRUSTACEANS

As with many groups of invertebrates, there is little recent information about the crustaceans of Northumberland; Norman and Brady (1908) published a catalogue, but the only species listed in the Invertebrate Site Register is the fresh water crayfish. The **codes** are defined under Insects on page 101.

Austropotambius pallipes White-clawed crayfish **NR**
H Loc S Wp

Recorded from various clean, stony rivers and streams in Northumberland, including the Aln and the Wansbeck. Recent survey work has been carried out by the Environment Agency. The species is threatened by the spread of crayfish plague (Sutton 1993), a fungal infection introduced into this country with non-native crayfish which were commercially farmed and escaped into river systems. The non-native crayfish may also competitively exclude the native animal.

SPECIES ACTION PLAN REQUIRED.

ARACHNIDS

Records for the arachnids have been taken from the Invertebrate Site Register (1987) with additional records from J D Parrack, S Rushton and G Simpson. Species have been selected for inclusion if there are ten or fewer records for the county but, after consultation with Dr Rushton and Dr Parrack, the more obviously common species have been deleted. Nevertheless the list reflects the sampling which has taken place in the county rather than straightforward rarity and should be treated with caution; in addition taxa such as *Centromerus* and *Porrhomma* spp. are extremely difficult to identify and records for these species should not be assumed to be reliable. Historical records will be found in Hull (1896, 1908) and Jackson (1904).

The spiders most likely to be of conservation interest are the mountain species such as *Latithorax faustus* and the Tyne river-gravel species such as *Cavephantes saxetorum* and *Diplocephalus connatus.* They are potentially threatened by loss of habitat (S Rushton, pers. comm.).

Species accounts summarise only habitat and local distribution. Species Action Plans have not been suggested for any species. The **codes** used are defined under Insects on page 101.

Opiliones (Harvestmen)

Nelima gothica **NR**
Loc

Found in low vegetation and under logs and stones. Recorded from Holy Island in 1983.

Araneae (Spiders)

Zelotes pusillus **NR**
Reg

Found in damp places. Recorded from Holy Island in 1983 and Cresswell Pond in 1985.

Z. electus **NR**
Loc

Lives in silk cells under stones or among lichens in short grass in sandy areas. Recorded from Holy Island in 1983 and various coastal sites in 1990.

Xysticus ulmi **NR**
Loc

A crab spider found in swampy localities. Recorded from Newham Fen in 1986.

Oxyptila brevipes **NR**
Loc

A crab spider with no apparent habitat specificity. Recorded from Cresswell Pond in 1985, Newham Fen in 1986 and Bamburgh Dunes in 1990.

Thanatus striatus **NR**
Loc

Crab spider of low vegetation in damp places. Recorded from Newham Fen in 1986.

Sitticus pubescens **NR**
Loc

Probably extinct in the county. Last seen: Farne Islands in 1931.

Alopecosa accentuata **NR**
Reg

Recorded in the Slaley Forest area and Plashetts Burn in 1991.

Araneus marmoreus **NR**
Loc

An orb web spider, recorded from Holy Island in 1986, and from Greenlee and Stewartshiels in 1994.

A. sturmi **NR**
Loc

Found at Holystone on pine.

Walckenaeria monoceros **NR**
Loc

Found under stones and in detritus on sand dunes. Recorded from Holy Island until 1950, and from Druridge and Newbiggin in 1990.

Entelecara errata **NR**
Scarce

Probably extinct in the county. Last seen: on The Cheviot in 1916.

Dismodicus elevatus **NR**
Rare

A small spider found on low pine boughs and on juniper *Juniperus communis*. Recorded in the Holystone Valley until 1953.

Pelecopsis mediocris **NR**
Loc

Probably extinct in the county. Last seen: near Bamburgh in 1931.

Silometopus incurvatus **NR**
Rare

A coastal spider recorded from Holy Island until 1950.

S. ambiguus **NR**
Reg

Restricted to saltmarshes and sand dunes. Recorded from Holy Island until 1950, at Cresswell Pond in 1985 and the Warkworth salt-marsh in 1990.

S. reussi **NR**
Loc

Found in straw and thick undergrowth. Recorded from Close House in 1986.

Diplocephalus connatus **NR**
RDB2

Found on riverside gravels. Recorded from Staward Woods in 1967.

Erigone psychrophila **NR**
Rare

Recorded on The Cheviot summit from 1966 onwards.

E. longipalpis **NR**
Loc

Found on the coast and occasionally at wet sites inland. Recorded from Holy Island in 1986 and the Warkworth salt-marsh in 1990.

Latithorax faustus **NR**
Loc

A mountain species found at Kielder in 1988.

Semljicola caliginosa **NR**
Scarce

Found in wet moss and grass in the uplands. Recorded from Coom Rigg Moss, date unknown, Little Watch Moss and Stowerhill Moss in 1992, and Deadwater Fell in 1994.

Halorates reprobus **NR**
Loc

Probably extinct in the county. Last seen: Farne Islands in 1931.

Caviphantes saxetorum **NR**
Rare

A small spider found under stones on the sandy banks of rivers. Recorded from Staward Woods in 1967.

Jacksonella falconeri **NR**
Loc

Found amongst pine needles and in stony places. Recorded from Staward Woods in 1967 and Kielder Forest in 1988.

Porrhomma egeria **NR**
Loc

Found in subterranean places such as caves and cellars and occasionally under stones and bark. Recorded from Close House in 1985.

P. errans **NR**
Scarce

Found on fence posts and under bark. Recorded from Close House in 1985.

P. microphthalmum **NR**
Loc

Found under stones and in litter. Recorded from Close House in 1985.

Maro lepidus **NR**
L RDB3

A small spider, often found in wet *Sphagnum*. Recorded from Staward Woods in 1967.

Centromerus persimilis **NR**
RDBk

Found under stones. Recorded from Staward Woods in 1967.

C. tantulus **NR**

Recorded from Staward Woods in 1967.

Taranucnus setosus **NR**
Loc

Probably extinct in the county. Last seen: Newham Fen in 1916.

Pityohyphantes phrygianus **NR**
Rare

Found in Redesdale Forest and Shiellow Crags in 1991 and Kielder Forest in 1993.

MARINE INVERTEBRATES

J L Foster-Smith

As they are for many groups, the available survey data for marine invertebrates are uneven and some species may be under-recorded. Revision of *The Marine Fauna of the Cullercoats District* is currently being undertaken by the Dove Marine Laboratory, part of the University of Newcastle upon Tyne. Until this work is complete, the species list below should be considered provisional.

Species were selected for inclusion according to their national and local rarity or scarcity. Nationally rare species (**Rare**) are those known to occur in eight or fewer of the 10km squares of the Ordnance Survey national grid containing sea within the three mile territorial limit for Great Britain. Nationally scarce (**Scarce**) species are those known to occur in fifty-five squares or fewer. All species are rare or scarce in Northumberland (**NR**). Information on the status of species is taken from Sanderson (1995), except in the case of *Xylophaga praestans* which is taken from Kingston (in preparation).

Species accounts consist of notes on habitat and distribution, with any additional relevant information.

Species Action Plans have not been suggested for marine invertebrates as there is insufficient information at the present time on which to base a decision.

Bugula purpurotincta A bryozoan **NR Rare**

Habitat: low water to shallow sublittoral zone, on shells and hydroids.

Recorded off Dunstanburgh. A species of northern distribution.

Escharoides mamillata A bryozoan **NR Rare**

Habitat: on shells and other calcareous material, offshore.

Found at Druridge Bay. Its apparent rarity may be due to its relative inaccessibility as an offshore species.

Xylophaga praestans A bivalve mollusc **NR Rare**

Habitat: submerged wood.

In Britain, known only from coastal waters, from Northumberland to Yorkshire.

Baldia johnstoni A polychaete worm **NR Rare**

Habitat: clean sand of the low shore.

Recorded only from north-east England. Found at Fenham Flats, near Shoreston Rocks and at Druridge Bay.

Its apparent rarity may be due to lack of taxonomic expertise in distinguishing it from closely related species.

Molgula oculata A tunicate **NR Scarce**

Habitat: sublittoral sediments, partially protruding.

Recorded off Seaton Sluice and Tynemouth.

VASCULAR PLANTS

A G Lunn

Taxa have been selected either:

(i) as being nationally (or internationally) notable species, or

(ii) as having a restricted distribution in Northumberland, or

(iii) as having a significant proportion of their national populations in Northumberland.

The respective criteria, with codes, are as follows (for many taxa, two or more of the criteria codes apply):

Nationally or internationally notable

D	rapid decline in population and/or range in UK: by more than 25% in the last 25 years. Source: *UK Steering Group Report* (1995) and other information
End	endemic to UK
L	listed in *UK Steering Group Report* long list
M	listed in *UK Steering Group Report* middle list
pRDB	candidate national RDB taxon
RDB	listed in national Red Data Book (Perring and Farrell 1983) as occurring in fifteen or fewer 10km squares from 1930 onwards or as being very rare and threatened in Europe as a whole
S	listed in *UK Steering Group Report* short list
Sc	nationally scarce (listed in Stewart *et al.* 1994) as occurring in 16-100 10km squares from 1970 onwards

Restricted distribution in Northumberland

NR	scarce in Northumberland (occurring in eight or fewer 5km squares in the county: source Swan (1993) and subsequent *pers. com.*)

A significant proportion of the national population in Northumberland

Pop	nationally important populations in Northumberland, from inspection of distribution maps in Perring and Walters (1962)

Additional information on the conservation status of the selected taxa:

G	globally threatened. Source: *UK Steering Group Report*
Ii	internationally important populations in UK (more than 25% of the global population, apart from endemics). Source: *UK Steering Group Report* and other information
W	listed in Schedule 8 (as varied) of *Wildlife & Countryside Act* (1981)

[No Northumberland vascular plant species are listed in Annexes II or IV of the EU *Habitats Directive* (EEC 1992)]

Applying the above criteria, 205 taxa qualify for the Northumberland *Red Data Book* (25.1% of the native taxa); 126 taxa qualify only on scarcity in Northumberland (code **NR** alone: 15.4% of the native flora and 61.5% of the red list) and 79 taxa qualify on other criteria (codes other than **NR**: 9.7% of the flora and 38.5% of the list).

Taxa have been selected for Species Action Plans using the standard criteria of (1) their being internationally/nationally notable, (2) the degree of threat to these notable taxa in Northumberland and (3) the opportunity to make a difference. Additionally, where a taxon features in the *Red Data Book* only because of its scarcity in Northumberland, it merits an Action Plan if it is in severe local decline (and the opportunity exists to make a difference). Finally, where a taxon is not a nationally notable species but nonetheless Northumberland has a high share of the national population, it is selected (again if the opportunity exists to make a difference). Forty-eight taxa have been selected on these criteria.

The information given for each species varies but always includes its scientific and common names and a code indicating both the criteria under which it was selected and any additional conservation status. The following information may be included: the geographical element (see Glossary) to which the plant belongs; its British and Northumberland distributions (including number of Northumberland squares/sites); its habitat; any trends in local abundance and range; any conservation action accomplished or required.

Notes

1. The basic data source is Swan (1993) *Flora of Northumberland.* Professor Swan's judgements as to native status and whether the plant survives in the county are accepted. He has kindly supplied subsequent records and information.

2. The database of Northumberland's native flora (derived from Swan), from which the red data list was selected, included all extant native Northumberland full species. Subspecies, where more than one occurs in the county, were aggregated. *Erophila verna* segregates were aggregated. Segregates of *Alchemilla, Euphrasia, Hieracium, Rubus* and *Taraxacum* were omitted, with this exception: three *Alchemilla* species and one species and two subspecies of *Euphrasia* were added to the database, and to the list below, because they appeared in either Perring and Farrell (1983) or Stewart *et al.* (1994). Additionally, (a) *Epipactis leptochila* var. *dunensis* was added because it appeared in Perring and Farrell, and (b) three well-established stable hybrids were added (two of which – *Equisetum* × *trachyodon* and *Nuphar lutea* × *pumila* – qualified for the present list). This group of taxa (*Alchemilla* spp., *Euphrasia* spp. and subspp., the *Epipactis* and the two hybrids) appears in the main sequence of species, but are distinguished by square brackets.

3. The total of 818 taxa recorded on the database did not correspond to Swan's (1993) sum of 848 native species (excluding the microspecies), partly because of these adjustments and post-1993 information but mainly because his sum included extinct, extinct as native and probably extinct taxa.

4. It is not in every case possible to determine from information in Swan's *Flora* the relationship between 'sites' and 5km squares. However, with rare exceptions, it is unlikely that there will be more squares (a criterion for inclusion in this list) than sites for a taxon. The species accounts use either 'site' or 'square' depending on the information available. Professor Swan has kindly resolved many of these difficulties.

5. References to 'northern' or 'southern' limits in the accounts refer to distributions in Great Britain.

Lycopodiaceae

Diphasiastrum complanatum morphotype ***decipiens*** Yellow cypress clubmoss **NR pRDB**

A single recently discovered locality on high moorland in the Kielder Forest area is the only English station. This remote site is managed as part of Forest Enterprise's Kielderhead Conservation Area. There is still some doubt as to the taxonomic status of this clubmoss.

Equisetaceae

[*Equisetum* × *trachyodon* Mackay's horsetail **NR**

Hybrid of *E. hyemale* and *E. variegatum.* One site in Northumberland, on Chirdon Burn downstream of Allerybank. Known in only one other locality in England.]

Equisetum variegatum Variegated horsetail **NR Sc**

A Northern Montane species of dune slacks, and of sandy flood-plains in the west of the county. Some of the slack populations are in Lindisfarne NNR.

E. pratense Shady horsetail **NR Sc**

A single lowland site on the flood-plain of River Coquet near Felton, where it perhaps survives vegetatively; lost from lower down the river. At the southern edge of its British range .

SPECIES ACTION PLAN REQUIRED.

Hymenophyllaceae

Hymenophyllum tunbrigense Tunbridge filmy fern **L NR** Ii G

There are two remaining sites for this Oceanic Southern species, in sandstone fissures in moorland in North Tynedale and near Chillingham. Another site has recently been destroyed.

Hymenophyllum wilsonii Wilson's filmy fern **L NR** Ii G

An Oceanic West European species, with four sites in sandstone fissures, in western and central moorlands. Extinct at two other central sites.

Aspleniaceae

Asplenium marinum Sea spleenwort **NR**

Another Oceanic West European species, on sandstone sea-cliffs at four localities: Seaton Sluice, Cullernose Point, Holy Island and north of Berwick.

A. septentrionale Forked spleenwort **NR Sc**

A single site on a moorland sandstone crag in the south-west of the county near Blanchland, associated with lead-mining. The fern is probably extinct on a whin site (Kyloe) in the north of the county, but would be worth looking for. The large south-western colony was

substantially destroyed by the construction of a pumping engine and by Victorian collecting. Forked spleenwort is considered to be one of the suite of heavy-metal tolerant species in Northumberland.

Ceterach officinarum Rustyback **NR**

Occurs in seven squares, largely clustered in the Warkworth-Craster area, where it grows on mortared walls. It may have increased this century. A south-western species in the British Isles, here near its northern limit.

Dryopteridaceae

Polystichum setiferum Soft shield-fern **NR**

Five sites on wooded stream banks in lowlands, mainly in the far north-east of the county; more widespread last century. Also a south-west British species, here near its northern limit.

Dryopteris expansa Northern buckler-fern **NR**

Six sites; north-facing hill slopes in shade: Deadwater Fell, upper Coquetdale, in cirques and elsewhere on northern slopes of The Cheviot, and near Alnwick.

Pinaceae

Pinus sylvestris Scots pine **NR Sc**

Intriguingly this Continental Northern tree may be present as a native. The best-known group of possibly native trees is in William's Cleugh, in the Kielderhead Moors (managed as part of Forest Enterprise's Kielderhead Conservation Area). Here goats and deer have been fenced out, to encourage regeneration, and young trees have been planted out after growing on from local seed. The other four sites are scattered around the uplands. Pollen, sub-peat timber, place-name and documentary evidence indicate the former widespread occurrence, and relatively late survival of, pine forests in the county; however, the truly native status of the above populations awaits proof.

SPECIES ACTION PLAN REQUIRED.

Salicaceae

Salix triandra Almond willow **NR**

Given by Swan as native and hortal, having been used as osier for basket-making, so that the status of the tree at its few mainly lowland stream-side sites is doubtful. Many trees are old. The species is probably decreasing in the county.

S. herbacea Dwarf willow **NR**

A single locality for this Arctic-Alpine species on Deadwater Fell; only a female plant seen recently. It is common in the Scottish Highlands.

Populus nigra Black poplar **NR**

Recently recognised, one very old tree, near Humshaugh. This is the most northerly native site known in Britain.

SPECIES ACTION PLAN REQUIRED.

Betulaceae

Betula nana Dwarf birch **NR Sc**

Another Arctic-Alpine species, again with a single locality, on Emblehope Moor between North Tynedale and Redesdale, where there is a flourishing stand. This is one of only two English sites.

Polygonaceae

Polygonum oxyspermum subsp. ***raii*** Ray's knotgrass **D NR**

A coastal Oceanic Southern species which is a back-beach ruderal, occurring at a few sites, erratic from year to year and decreasing in Britain. This is the only British subspecies.

SPECIES ACTION PLAN REQUIRED.

Persicaria minor Small water-pepper **NR**

A Continental ruderal species, occurring only on the shores of Broomlee and Greenlee Loughs, the latter a NNR.

P. laxiflora Tasteless water-pepper **NR Sc**

Two sites on marshy ground, in Redesdale and near Belford. A Continental species, at the northern limit of its British range.

SPECIES ACTION PLAN REQUIRED.

P. vivipara Alpine bistort **NR**

An Arctic-Alpine plant, very localised on the grassy flood-plain of the upper South Tyne (where it is perhaps replenished from Cumbrian populations) and in meadows by the Beldon Burn. The hay meadow populations are at risk from changed agricultural practices, although some sites are in the Pennine Dales Environmentally Sensitive Area.

Rumex maritimus Golden dock **NR**

Only three native sites, on a pond margin and by the Rivers Till and Tweed, in the far north of the county, although once a more widespread ballast species. This annual plant has a southern distribution in Britain.

Chenopodiaceae

Beta vulgaris subsp. ***maritima*** Sea beet **NR**

A halophyte, occurring probably only at two sites at the mouth of the Tweed. Formerly also present on the coalfield coast of the county, probably as a ballast introduction. Most British records are for coasts further south, and the plant belongs to the Oceanic Southern element. This is the only native subspecies.

Atriplex longipes Long-stalked orache **NR RDB**

An annual species growing under tall salt-marsh vegetation, only relatively recently recognised as occurring in Great Britain. In Northumberland it has three localities from Alnmouth northwards (its northernmost east coast stations), associated either with *Phragmites* or *Bolboschoenus maritimus* (sea club-rush). One site is in a NNR.

SPECIES ACTION PLAN REQUIRED.

A. praecox Early orache **NR Sc**

An annual species of very fine shingle at the high tide mark, with four Northumberland localities from the River Coquet northwards. It featured in the first edition of the *Red Data Book* (Perring and Farrell 1977) but is now known from more than fifteen 10km squares. It occurs in Lindisfarne NNR.

SPECIES ACTION PLAN REQUIRED.

Salicornia ramosissima Purple glasswort **NR**

An Oceanic West European species, scattered along the coast on upper salt-marshes, mainly north of the River Coquet, including in Lindisfarne NNR. This and the following two species are the rarest of the five Northumberland glassworts.

S. fragilis Yellow glasswort **NR**

Salt-marshes between Blyth and Holy Island.

S. nitens Shiny glasswort **NR**

Upper salt-marsh at Alnmouth and Holy Island.

Caryophyllaceae

Minuartia verna Spring sandwort **Pop Sc**

Virtually confined to the North Pennines and the South Tyne and its tributaries in the south-west of the county, this Arctic-Alpine metallophyte is abundant on heavy-metal contaminated sites, whether river alluvium or mine spoil. All of its Northumberland sites are believed to be thus contaminated. It is the most abundant of the metallophytes and occurs as far down the River Tyne as Close House. Three of the alluvial sites are nature reserves of the Northumberland Wildlife Trust.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Moenchia erecta Upright chickweed **NR**

In north Northumberland, in whin turf near the coast. This Continental species has a southern distribution in Britain and is here at its northern limit. It has apparently declined considerably during this century, probably as a result of changing agricultural practices.

SPECIES ACTION PLAN REQUIRED.

Dianthus deltoides Maiden pink **Pop Sc**

Another Continental species, this nationally scarce plant is locally plentiful in Northumberland in basic grassland and on basic rocky sites. Substrates include the Whin Sill, Cheviot andesites, river shingles and sand dunes (where however it may be a garden escape).

Nymphaeaceae

Nymphaea alba White water-lily **NR**

Believed to have been native in Greenlee, Broomlee and Grindon Loughs and in a pond near to Walltown Crags but it is doubtful whether it is surviving; otherwise hortal.

[***Nuphar lutea* × *pumila*** Hybrid water-lily **NR**

An aquatic hybrid occurring only at Chartners Lough, a small peaty lake in heather moorland in the centre of the county, and the only English site (the plant otherwise occurs in Scotland). It is assumed to have arisen when the parents co-existed in the vicinity, perhaps in early post-glacial times, and to have been perpetuated vegetatively. *N. pumila* occurs now mainly in Scottish Highland lochs.]

Ceratophyllaceae

Ceratophyllum demersum Rigid hornwort **NR**

Found in three lowland ponds, from Ponteland to Cornhill on Tweed. *Ceratophyllum* has a largely southern distribution in Britain.

Ranunculaceae

Helleborus foetidus Stinking hellebore **NR Sc**

A single population which might have a claim to be native on a wooded bank by the South Tyne at Warden. This is a species of southern distribution in Britain, and has been observed to be vulnerable to winter cold at Warden. Its status is questionable.

Ranunculus hederaceus Ivy-leaved crowfoot **D L**
G Ii

An Oceanic West European species, still common in Northumberland, on mud and in shallow water, except in the eastern area of intensive agriculture.

R. penicillatus subsp. ***pseudofluitans*** — Stream water-crowfoot — **L** Ii

Frequent in rivers and streams, especially in the north-west of the county; present in forty-one squares. Only this subspecies occurs in the county.

R. circinatus — Fan-leaved water-crowfoot — **NR**

A species of south-eastern distribution in Britain; it has a single locality in Northumberland in a pool by the Bowmont Water in the far north. The plant is extinct at a few other sites.

R. fluitans — River water-crowfoot — **D L** G Ii

Frequent where it occurs, in fast-flowing rivers of the northern part of the county. However some of the records may be of hybrids.

Myosurus minimus — Mousetail — **NR**

A single site on Newcastle Town Moor, but not certainly native there. The plant belongs to the Continental element of the flora and occurs mainly in south-eastern England; it may have been a ballast introduction.

Thalictrum flavum — Common meadow-rue — **NR**

A southern and eastern plant in England, with a single Northumberland locality on the North Tyne flood-plain, although there were formerly two other sites.

Papaveraceae

Fumaria capreolata subsp. ***babingtonii*** — White ramping-fumitory — **End NR**

Four confirmed sites for this ruderal endemic, in the Tyne Valley, by the River Coquet, at Spindlestone and on Holy Island. This is the only British subspecies.

SPECIES ACTION PLAN REQUIRED.

F. purpurea — Purple ramping-fumitory — **End M NR Sc** G

Another ruderal endemic, with a single locality in Embleton quarry, but it may have been destroyed by tipping.

SPECIES ACTION PLAN REQUIRED.

F. densiflora — Dense-flowered fumitory — **Sc**

Another ruderal, present in eleven squares, mainly in the lowland north-east of the county.

Cruciferae

Cochlearia anglica English scurvygrass **NR**

Three scattered coastal and estuarine sites, from the Tweed to the Tyne. This Oceanic Northern plant has had an unfortunate history in the county, with known sites being destroyed by the construction respectively of a marina and a causeway, and by *Spartina* invasion.

Thlaspi caerulescens Alpine penny-cress **Pop Sc**

This Arctic plant has a very similar Northumberland distribution to *Minuartia verna* and is also a metallophyte, occurring only on heavy-metal contaminated spoil and especially alluvium, where it can be very abundant. Unlike *Minuartia*, *Thlaspi* appears to be entirely confined to lead- or zinc-rich soils in Britain. It is protected on three Northumberland Wildlife Trust reserves.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Lepidium latifolium Dittander **NR Sc**

A single locality of this mainly maritime species at Scremerston. Formerly cultivated for use as a condiment, it is not certainly native.

Droseraceae

Drosera longifolia Great sundew **NR**

Three sites in *Sphagnum* bogs in the west of the county for this Continental Northern species, extinct at several other sites. All sites are Border Mires reserves.

SPECIES ACTION PLAN REQUIRED.

Crassulaceae

Sedum anglicum English stonecrop **NR**
subsp. ***anglicum***

A single site on the Whin Sill on Holy Island for this Oceanic West European species. This is the only British subspecies.

S. villosum Hairy stonecrop **Sc**

A Continental Northern species, occurring on immature soils on the dip slope of the Whin Sill, and in upland flushes and on stream-sides. The plant is more abundant in the Cheviot Hills than at other sites in the county.

S. rosea Roseroot **NR**

A single native site for this Arctic-Alpine species at about 645m in the Hen Hole corrie in the Cheviots, where it is decreasing.

Saxifragaceae

Saxifraga tridactylites Rue-leaved saxifrage **NR**

In six squares, on shallow calcareous or whin soils, in the east and south-west.

S. aizoides Yellow saxifrage **NR**

An Arctic-Alpine species of wet rocks and fine scree, with two sites by the River Irthing in the far west.

S. hypnoides Mossy saxifrage **NR**

Two sites in the Cheviots, in the Bizzle and Hen Hole corries. This Northern Montane species was formerly more widespread, including casually on South Tyne gravels where it was washed down from Cumbria.

Grossulariaceae

Ribes spicatum Downy currant **Pop Sc**

Not infrequent by the banks of rivers and streams (especially the North Tyne and Coquet and their tributaries), in the southern half of the county.

SPECIES ACTION PLAN REQUIRED.

Rosaceae

Filipendula vulgaris Dropwort **NR**

Five sites, two in lower North Tynedale and three in the north of the county, mainly on whin. There are at least three extinct sites. The main threat appears to be whinstone quarrying.

Rosa arvensis Field-rose **NR**

Present in two squares, in hedges and woods, in the east of the county. This rose is at its northern limit and is probably decreasing.

R. tomentosa Harsh downy-rose **NR**

A southern species with a single site at Alnmouth.

R. micrantha Small-flowered sweet-briar **NR**

A southern species with a single site by the River Coquet.

Potentilla neumanniana Spring cinquefoil **NR Sc**

A single site on whin at Spindlestone, extremely threatened by plantation shade.

SPECIES ACTION PLAN REQUIRED.

[*Alchemilla acutiloba* A lady's-mantle **NR RDB**

One site for this Northern Montane species, in grassland in the upper Derwent Valley, is the only British site outside Teesdale.]

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

[*A. gracilis* A lady's-mantle **NR Pop RDB**

Another Northern Montane species and in the British Isles known only in Northumberland. It occurs in four adjacent localities in the lower North Tyne area, in basic grassland. The formerly most important site is part of an SSSI; however the plant has been all but extinguished there, probably by rabbits, and the site is also at risk from a quarry extension.]

SPECIES ACTION PLAN REQUIRED.

[*A. glomerulans* A lady's-mantle **NR Sc**

An Arctic-Alpine with one site on a damp, acidic, rock ledge in the Cheviots.]

Sorbus rupicola Rock whitebeam **NR Sc**

A single site (with a single tree) on the South Tyne river bank, on limestone.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Leguminosae

Ulex gallii Western gorse **L NR**
Ii

In only four squares, but this Oceanic West European species is fairly plentiful on moorland in the eastern Cheviots.

Astragalus glycyphyllos Wild liquorice **NR**

This formerly much more widespread Continental plant now has a single site on the banks of the River Tyne, near Hexham.

Vicia tetrasperma Smooth tare **NR**

A ruderal confined to the south-east of the county, where there are two or three sites, and probably at its northern limit as a native there.

SPECIES ACTION PLAN REQUIRED

Lathyrus japonicus Sea pea **D NR Sc**
subsp. *maritimus*

An Oceanic Northern species with a single site on a sand dune near Warkworth. The plant may now be extinct in the county owing to recent dune erosion. This is the only British subspecies.

Trifolium micranthum Slender trefoil **NR**

An Oceanic Southern species, more or less restricted to short whin grassland in the north-east of the county; locally plentiful.

T. scabrum Rough clover **NR**

A Continental Southern species, confined to near-coastal whin, with three sites in the north of the county.

Ornithopus perpusillus Bird's-foot **NR**

With a single site on glaciofluvial deposits near Ingram, this ruderal species may now be extinct owing to sand and gravel extraction.

Geraniaceae

Geranium columbinum Long-stalked crane's-bill **NR**

In eight squares on whin and limestone grassland, mainly in the southern half of the county. It has recently spread along a forest road near Smales.

Linaceae

Radiola linoides Allseed **NR**

A single site in damp grassland on Ross Links, where it is much reduced owing to reclamation for agriculture and has not recently been found.

Euphorbiaceae

Euphorbia exigua Dwarf spurge **NR**

In two eastern squares, this ruderal occurs in an arable field and on the dip slope of the Whin Sill. It was formerly more widespread as an arable weed.

Balsaminaceae

Impatiens noli-tangere Touch-me-not balsam **NR Sc**

A single site in a wet wood near Bolam merits consideration as being native.

Tiliaceae

Tilia cordata Small-leaved lime **NR**

As a native, at its northern limit in woods in the Tyne Valley and probably not now reproducing from seed.

SPECIES ACTION PLAN REQUIRED.

Elaeagnaceae

Hippophae rhamnoides Sea-buckthorn **NR Sc**

As a probable native, confined to the coast north of the River Coquet, including on cliffs. Thriving as an introduced species up and down the coast.

Violaceae

Viola reichenbachiana Early dog-violet **NR**

Three sites in neutral and limestone scrub, in the Devil's Water and Dipton area and in lower North Tynedale. The species is at its northern limit.

Cucurbitaceae

Bryonia dioica White bryony **NR**

Two or three native sites, in a Tyne Valley hedge and on coastal dunes at and north of Warkworth. This Continental Southern species is at its northern limit.

Onagraceae

Epilobium tetragonum Square-stalked willowherb **NR**
subsp. ***tetragonum***

Two native sites, near Hexham and near Rothbury, both at pond/lake margins. This is a strongly southern species in Britain.

E. anagallidifolium Alpine willowherb **NR**

An Arctic-Alpine species occurring in springs, flushes and at stream-sides in three squares high in the Cheviots.

E. alsinifolium Chickweed willowherb **NR**

Another Arctic-Alpine species, in similar habitats, but somewhat more widespread (four squares) in the Cheviots than the preceding species, and also present (two squares) in the North Pennines (including as casual on river gravels).

Haloragaceae

Myriophyllum verticillatum Whorled water-milfoil **NR Sc**

Now only a single site, the northernmost in Britain, Throckley Pond in the south of the county – a Northumberland Wildlife Trust reserve.

SPECIES ACTION PLAN REQUIRED.

Cornaceae

Cornus suecica Dwarf cornel **NR**

An Arctic-Subarctic species, very rare in England, on moorland (usually with bilberry), on Fell Sandstone and high in the Cheviots.

Umbelliferae

Eryngium maritimum Sea-holly **NR**

An Oceanic Southern species, with one or two localities on sand dunes north of the River Coquet, not recently confirmed.

Oenanthe fistulosa Tubular water-dropwort **NR**

Three sites in the lowland south of the county: Prestwick Carr, a pond near Hexham, and Gosforth Park. It has evidently decreased greatly.

SPECIES ACTION PLAN REQUIRED.

O. aquatica Fine-leaved water-dropwort **NR**

A Continental species near its northern limit, in ponds near Gilsland, Lilburn and Rothbury (and possibly surviving at other sites).

Meum athamanticum Spignel **NR Sc**

A Continental Northern species, abundant at a single site (Thockrington) on whin, with no certain record of extinct localities.

Apium graveolens Wild celery **NR**

In four sites on damp brackish ground, between the tidal limit of the Tyne and Beadnell Bay, but formerly more widespread. It is on its northern limit.

Ligusticum scoticum Scots lovage **NR**

An Arctic-Subarctic species of back-beach sand and shingle, here perhaps at its only English sites, in five squares. It is increasing and occurs as far south as Bamburgh.

Torilis nodosa Knotted hedge-parsley **NR**

A Continental Southern species, in five squares, all north of the River Coquet, in sandy grassland near the sea. The plant is decreasing.

Pyrolaceae

Pyrola media Intermediate wintergreen **NR Sc**

A Continental Northern species with four sites and in various habitats: Cawfield Crags (Whin Sill), and in the valleys of the Darden Burn, Beldon Burn and Derwent. Other *Pyrola* populations may be this species, but it is impossible to identify non-flowering specimens to species.

P. rotundifolia subsp. ***rotundifolia*** Round-leaved wintergreen **NR Sc**

Another Continental Northern species, with three north-east Northumberland sites, in Newham Fen and in dune-slacks on Holy Island. A population on Ross Links may also be this species. This is the only Northumberland subspecies.

Orthilia secunda Serrated wintergreen **NR**

Another Continental Northern species, with a single site on Yeavering Bell, in the Cheviots, where a healthy population grows on a steep slope, facing north-east, with bilberry, heather and great wood-rush.

Monotropa hypopitys Yellow bird's nest **NR**

Thought to be extinct but has recently been recorded on spoil near the Honeycrook Burn, north of Chesterwood.

Ericaceae

Arctostaphylos uva-ursi Bearberry **NR**

An Arctic-Alpine plant on two moorland sites, Blanchland Moor and near Darden Burn.

Andromeda polifolia Bog-rosemary **Pop**

Just escapes **Sc** status but Northumberland contains a high proportion of the British population of the species. This Continental Northern plant is abundant in the many raised bogs and lower-altitude blanket bogs, in the west and to a lesser degree in the centre of the county, which have completely or partially escaped drainage or afforestation. Many of these sites in Kielder Forest are now nature reserves. A very isolated and depauperate population on the long-drained raised bog at Prestwick Carr is worthy of conservation action.

Vaccinium microcarpum Small cranberry **NR Sc**

Three widely scattered bog sites for this Scottish Highland taxon, which is closely related to *V. oxycoccos*.

V. uliginosum Bog bilberry **NR**

An Arctic-Alpine species near its southern limit; it has declined from several to one or two sites. It may be extinct at its Baron House Bog (Gilsland) site, but a population survives on The Cheviot on eroding blanket bog.

Primulaceae

Primula farinosa Bird's-eye primrose **NR Sc**

There is a long-known flush site above the Tyne Valley, together with casual records on South Tyne gravels, where propagules of this Northern Montane species are washed down from Cumbria. The flush population has been artificially strengthened by collecting seed, growing on the seedlings and transplanting.

SPECIES ACTION PLAN REQUIRED.

Lysimachia nummularia Creeping-Jenny **NR**

Populations mainly in the south of the county, by streams or rivers, are probably native.

Anagallis minima Chaffweed **NR**

A Continental ruderal, at two or three sites in the north-east of the county. Its Spindlestone Crags site (whin) is overgrown by gorse and action may be appropriate. Otherwise it has been found in a Holy Island dune slack and on the whin at Cullernose.

Samolus valerandi Brookweed **NR**

Now in five squares, all north of the River Coquet, but formerly more widespread. Its habitats include dune slacks.

Plumbaginaceae

Limonium vulgare Common sea-lavender **NR**

A single Holy Island locality for this Oceanic Southern species, on St Cuthbert's Isle, a whin dyke islet.

Gentianaceae

Blackstonia perfoliata Yellow-wort **NR**

A Continental Southern annual on its northern limit, with a single native site on cliffs north of Berwick. However it has spread rapidly in recent years in south-east Northumberland, normally on disturbed soils, and possibly but not certainly through deliberate introduction.

Centaurium littorale Seaside centaury **NR Sc**
subsp. ***littorale***

Locally plentiful in dunes, slacks and on wet cliffs, on the coast north of the River Coquet. This Oceanic Northern plant is at its southern east-coast limit. It is the only British subspecies.

C. pulchellum Lesser centaury **NR**

Four coastal sites in slacks and flushes scattered between Hadston and Budle Bay; at its northern limit.

Polemoniaceae

Polemonium caeruleum Jacob's-ladder **L NR RDB**

A Northern Montane species with two native sites on andesite in the southern Cheviots, both with some measure of protection in the MoD's Otterburn Training Area. Elsewhere in Britain it occurs only on the limestones of the Pennines.

SPECIES ACTION PLAN REQUIRED.

Convolvulaceae

Calystegia soldanella Sea bindweed **NR**

Four coastal sand dune sites; near its northern east-coast limit.

Boraginaceae

Myosotis stolonifera Pale forget-me-not **Pop Sc**

Plentiful in two disjunct upland areas, the North Pennines and the Cheviots, where it occurs by somewhat base-poor springs and rills. The plant's British range is restricted to northern England and southern Scotland.

Callitrichaceae

Callitriche obtusangula Blunt-fruited water-starwort **NR**

An Oceanic Southern species, in four squares in clear, slow lowland streams, and near its northern limit.

Labiatae

Scutellaria minor Lesser skullcap **NR**

An Oceanic West European species with only two upper Coquetdale sites, on stream banks on acidic peaty soils.

Lamium hybridum Cut-leaved dead-nettle **NR**

A ruderal, of arable fields and other disturbed ground in four squares in the north-east of the county.

Clinopodium acinos Basil thyme **NR**

Another ruderal, at a single site (an old railway) in the extreme north of the county, but formerly more widespread.

Lycopus europaeus Gipsywort **NR**

Formerly more widespread, but now only at four scattered sites (Chevington Wood, Pawston, Norham and Wallsend), on wet ground.

Salvia verbeneca Wild clary **NR**

Two native sites for this Continental Southern species, on Magnesian Limestone at Tynemouth and on Seahouses dunes.

Solanaceae

Hyoscyamus niger Henbane **NR**

In seven mainly coastal squares, all north of the River Coquet, on sandy or disturbed ground where the plant, although plentiful, is fugitive. Formerly much more common.

Scrophulariaceae

Scrophularia umbrosa Green figwort **Pop**

In eleven squares mainly on damp, shady riverbanks. It is found only in the far north, mainly on the banks of the Tweed.

SPECIES ACTION PLAN REQUIRED.

Veronica catenata Pink water-speedwell **NR**

An aquatic with four sites (where it is plentiful), mainly in the north-east.

[*Euphrasia rostkoviana* An eyebright **Sc**
subsp. ***montana***

In eleven squares, in old upland hay meadows and similar habitats, mainly in the North Pennines and upper North Tynedale/upper Redesdale/upper Coquetdale.]

[*E. rostkoviana* An eyebright **NR Sc**
subsp. ***rostkoviana***

In seven squares, in habitats similar to the last species but absent in the North Pennines and with two north Northumberland sites.]

[*E. frigida* An eyebright **NR Sc**

An arctic species, occurring only in the Hen Hole and Bizzle (in the Cheviots), on damp ledges and by streams.]

Orobanchaceae

Orobanche rapum-genistae Greater broomrape **D L NR Sc**

In scrub, and much reduced in the county since the last century. It is known in four squares and at six sites in the Hexhamshire and lower South Tyne area, and is near its northern limit.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Lentibulariaceae

Utricularia vulgaris Greater bladderwort **NR**

An aquatic with perhaps only a single surviving locality, Greenlee Lough. It was, however, still present at Newham Fen in 1963. Both sites are NNRs.

Caprifoliaceae

Linnaea borealis Twinflower **D M NR Sc**

Two surviving sites in woodland in the North Pennines, at one of which (Beldon Burn) the plant urgently requires action to re-establish appropriate conditions. The Slaley colony is healthy. A Northern Montane plant, at its southern limit.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Valerianaceae

Valerianella dentata Narrow-fruited cornsalad **D L NR**

An arable ruderal, now with only a single locality, on the dip slope of the Whin Sill near Craster.

SPECIES ACTION PLAN REQUIRED.

Campanulaceae

Campanula glomerata Clustered bellflower **NR**

On basic soils in the south of the county in the Tyne and North Tyne valleys.

Legousia hybrida Venus's-looking-glass **NR**

A Continental Southern ruderal with a single site, as for *Valerianella dentata.*

SPECIES ACTION PLAN REQUIRED.

Compositae

Erigeron acer Blue fleabane **NR**

In six squares, in coastal dunes and at Low Prudhoe on the lime heap, more or less at its northern limit.

Gnaphalium sylvaticum Heath cudweed **D L**

A ruderal in twelve squares scattered through the county, on acidic and often sandy soils at the edges of woods.

SPECIES ACTION PLAN REQUIRED.

Pulicaria dysenterica Common fleabane **NR**

In marshes and old damp pastures, mainly in the south-east and almost at its northern limit.

Bidens tripartita Trifid bur-marigold **NR**

Now only at Holywell Pond in the south-east of the county, a coal-mining subsidence pond and a Northumberland Wildlife Trust reserve.

B. cernua Nodding bur-marigold **NR**

Now only at Barelees Bog, on the pond margin, near Cornhill on Tweed.

Seriphidium maritimum Sea wormwood **NR**

An Oceanic Northern species with two surviving sites, in salt-marsh in Beadnell Bay and near Bamburgh.

Saussurea alpina Alpine saw-wort **NR**

An Arctic-Alpine species with a single locality, on damp ledges high in the Cheviots.

Serratula tinctoria Saw-wort **NR**

In at least three squares, in old lowland neutral grassland in the south-east, and gullies by the sea near Craster. The county is at the species' northern limit.

SPECIES ACTION PLAN REQUIRED.

Picris echiodes Bristly oxtongue **NR**

An arable ruderal, but not seen at its last Low Hauxley site for some years. The plant is near its northern limit.

Lactuca virosa Great lettuce **NR**

A Continental Southern species now mainly restricted to steep banks of the rivers Tweed and Till, where it is not uncommon in two or three squares.

Crepis mollis Northern hawk's-beard **Pop Sc**

A Continental species whose British range is mainly confined to northern England. The plant is still plentiful locally, especially in upland hay meadows (particularly in the North Pennines) and along adjacent roads.

Alismataceae

Baldellia ranunculoides Lesser water-plantain **NR**

In two base-rich coastal ponds/pools, north of the River Coquet.

Hydrocharitaceae

Hydrocharis morsus-ranae Frogbit **NR**

Plentiful at a single native site, a mining subsidence pond near Morpeth, from where the plant was successfully introduced into the newly created Hauxley Reserve pond of the Northumberland Wildlife Trust.

Potamogetonaceae

Potamogeton coloratus Fen pondweed **NR Sc**

In two base-rich pools, Newham Fen (NNR) and near Dunstanburgh (with *Baldellia*).

P. lucens Shining pondweed **NR**

In six squares, in lakes or slow-flowing rivers, including the River Tweed and Broomlee Lough.

P. praelongus Long-stalked pondweed **NR**

Only two recent records for this Continental Northern species, in Crag and Halleypike Loughs in the Hadrian's Wall area.

P. filiformis Slender-leaved pondweed **NR Sc**

The only English site is Rayburn Lake in the centre of the county, otherwise this Continental Northern species is confined to Scotland.

Groenlandia densa Opposite-leaved pondweed **NR**

Two sites, on the lower Coquet and in Caistron Ponds (restored Coquet river gravel workings, managed as a nature reserve).

Ruppiaceae

Ruppia maritima Beaked tasselweed **NR**

Four sites in saline and brackish habitats, and locally plentiful. One site is the Northumberland Wildlife Trust's Hauxley reserve.

Zosteraceae

Zostera marina Eelgrass **D L NR Sc**

Plentiful at Holy Island, its only site, where it grows on sand in rock pools.

Z. angustifolia Narrow-leaved eelgrass **NR Sc**

An Oceanic Northern species of coastal mud flats; in six squares centred around Holy Island, where there are locally extensive beds. An important food plant for herbivorous sea birds, and threatened by the spread of *Spartina anglica.*

Z. noltii Dwarf eelgrass **NR Sc**

Possibly now only in four squares centred on Holy Island but with extensive beds, in habitats similar to *Z. angustifolia.*

Liliaceae

Gagea lutea Yellow star-of-Bethlehem **NR**

A Continental species in five squares in the south of Northumberland, in woods and by rivers, formerly more widely distributed. One site, Tony's Patch, is a Northumberland Wildlife Trust reserve.

Scilla verna Spring squill **NR**

An Oceanic West European species in short grassland on immature soils over coastal whin. There are four extant sites within six kilometres between Cullernose Point and Dunstanburgh. This is predominantly a west-coast species, here at its southernmost east-coast localities.

SPECIES ACTION PLAN REQUIRED.

Hyacinthoides non-scripta Bluebell **L**
Ii

Another Oceanic West European species, and one where Britain has a high proportion of the global population. Dominates the field layer in many ancient woodlands and also forms extensive stands on the lower moorlands.

Allium schoenoprasum Chives **NR Sc**

Only on whin, on immature soils on the dip slope, at three sites: Walltown, Great Bavington and Spindlestone.

SPECIES ACTION PLAN REQUIRED.

A. oleraceum Field garlic **NR**

In eight squares in the east, in dry grassland on whin and other habitats.

A. scorodoprasum Sand leek **NR**

In the north in four squares, on river banks and road verges, and in plantations.

Polygonatum odoratum Angular Solomon's-seal **NR Sc**

A single site on the whin at Kyloe, at its northern limit.

SPECIES ACTION PLAN REQUIRED.

Juncaceae

Juncus subnodulosus Blunt-flowered rush **NR**

Plentiful at a site in marshy ground near Cornhill on Tweed, growing with *Dactylorhiza incarnata* and *Eriophorum latifolium*, and near its northern limit. The Cornhill site is without specific protection and is vulnerable. The plant also occurs at Newton-by-the-Sea.

SPECIES ACTION PLAN REQUIRED.

Gramineae

Festuca arenaria Rush-leaved fescue **NR Sc**

An Oceanic West European species, only at Bamburgh and at Newton Links, on coastal dunes.

SPECIES ACTION PLAN REQUIRED.

F. vivipara Viviparous sheep's-fescue **NR**

A montane species occurring mainly high in the Cheviots and North Pennines in five or six squares, in various habitats.

Vulpia fasciculata Dune fescue **NR Sc**

A single site in a dry dune hollow near Seahouses, now possibly the most northerly in the world for this Oceanic Southern species. The grass, an annual of bare sand, is suffering from competition but was still holding its own in 1996.

SPECIES ACTION PLAN REQUIRED.

Catapodium marinum Sea fern-grass **NR**

A Mediterranean species in five squares from Tynemouth to Holy Island, on coastal sand and shingle.

Poa compressa Flattened meadow-grass **NR**

In eight squares scattered across the county. This perennial grass occurs on old walls and dry banks.

Catabrosa aquatica Whorl-grass **NR**

In seven squares, on muddy margins of ponds, streams or ditches, or on wet sand, mostly near the sea. From Newbiggin-by-the-Sea to the mainland opposite Holy Island.

Sesleria caerulea Blue moor-grass **NR Sc**

In three sites on limestone, two near Elsdon, and at Ratcheugh Crag (near Longhoughton). One of the Elsdon sites is in a Northumberland Wildlife Trust reserve. The Northumberland localities are outliers of the main British range of the species on the limestones of Cumbria and North Yorkshire.

SPECIES ACTION PLAN REQUIRED.

Brachypodium pinnatum Tor-grass **NR**

Near its northern limit, in five scattered sites in calcareous grassland. The plant is abundant on chalk further south.

Elytrigia atherica Sea couch **NR**

An Oceanic Southern species, at its northern limit and in three squares on coastal dunes from Blyth to Alnmouth.

Hordelymus europaeus Wood barley **NR Sc**

Another grass at its northern limit, in three woodland sites in the south of the county. It has decreased owing to the loss of native woodlands. One of its sites, Whittle Dene, is a Woodland Trust reserve.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Calamagrostis canescens Purple small-reed **NR**

A single marshy site, planted with conifers, where the grass may survive at the edge of the plantation but is at severe risk from drying out. The site, Canno Mill Bog, is in the north of the county.

SPECIES ACTION PLAN REQUIRED.

Phleum arenarium Sand cat's-tail **NR**

An Oceanic Southern sand-dune species in six, mainly northern, coastal squares. The plant is locally plentiful.

Alopecurus borealis Alpine foxtail **NR RDB**

An Arctic-Subarctic species occurring at a single montane site in the Cheviots. Its habitats, probably encompassed by a late snowbank, are a cold spring community and nearby grassland.

Parapholis incurva Curved hard-grass **NR Sc**

Another coastal Oceanic Southern grass, with a single site (its northern limit) in gravel just above the salt-marsh at Warkworth.

P. strigosa Hard-grass **NR**

Yet another coastal Oceanic Southern grass, but this time in eight squares from south of Blyth to Holy Island. It occurs in salt-marshes.

Sparganiaceae

Sparganium angustifolium Floating bur-reed **NR**

An Arctic-Alpine aquatic in a single 19th century lake in the grounds of Cragside, Rothbury, growing with *S. emersum* and their hybrids.

S. natans Least bur-reed **NR**

In eight squares mainly in the west of the county (near Hadrian's Wall), in lakes and streams.

Typhaceae

Typha angustifolia Lesser bulrush **NR**

Only in the Northumberland Wildlife Trust's Holywell Pond reserve (a coal-mining subsidence pond in the south-east of the county). The plant has declined in Northumberland owing to pollution and pond drainage, and is near its northern limit. Its hybrid with *T. latifolia* grows with it.

Cyperaceae

Blysmus rufus Saltmarsh flat-sedge **NR**

An Oceanic Northern species of salt-marshes, occurring only north of the River Coquet in four coastal squares, but formerly more frequent in the same area.

Eleocharis acicularis Needle spike-rush **NR**

Abundant at the margins of four reservoirs, subject to draw-down, in the southern half of the county.

E. austriaca Northern spike-rush **Pop RDB**

Concentrated in twelve squares, entirely in upper North Tynedale and immediately adjacent areas. This is a fugitive plant of river banks and backwaters and is locally plentiful. Elsewhere in Britain it is known only in Yorkshire, Cumbria and Selkirkshire. Some sites were drowned by Kielder Water.

E. uniglumis Slender spike-rush **NR**

In seven extremely scattered squares in salt- or base-rich marshes.

E. multicaulis Many-stalked spike-rush **NR**

A Continental Northern species with a single site in a peat bog in the Kyloe Hills.

Rhynchospora alba White beak-sedge **NR**

Four sites in bogs, three in the west and Holburn Moss in the north, although it has not been seen recently at Holburn. All are nature reserves or subject to a management agreement.

Schoenus nigricans Black bog-rush **NR**

In eight lowland squares, mainly in the north-east of the county, in various base-rich wetland sites including coastal ones. One site is in Lindisfarne NNR.

Carex diandra Lesser tussock-sedge **NR**

A Continental Northern species occurring in three sites in fens and a basic flush. Newham Fen is a NNR, Crag Lough a National Trust site and the Wilkwood site is protected by the Ministry of Defence.

C. spicata Spiked sedge **NR**

Near its northern limit, with two field-margin sites in the southern half of the county.

C. divisa Divided sedge **NR Sc**

A Continental Southern species with a single coastal site on Holy Island, its northern limit. It grows in damp grassland in the NNR.

C. maritima Curved sedge **NR Sc**

An Arctic-Alpine species occurring nevertheless in dune slacks in Lindisfarne NNR, its southernmost east-coast station.

C. lasiocarpa Slender sedge **NR**

A Continental Northern species with three sites in fens. Crag Lough is owned by the National Trust, Gowany Knowe Moss is a Northumberland Wildlife Trust reserve and Newham Fen a NNR.

C. extensa Long-bracted sedge **NR**

An Oceanic Southern species in four squares in salt-marshes in the north of the county. It is plentiful on and near Holy Island.

C. limosa Bog-sedge **NR**

A Continental Northern species in six squares in very wet parts of *Sphagnum* bogs in the west, formerly more widespread. Some sites are in nature reserves.

C. magellanica subsp. ***irrigua*** Tall bog-sedge **Pop Sc**

A Northern Montane species of wet *Sphagnum* bogs, almost entirely in the west. Several of the sites are in nature reserves. It is the only British subspecies.

C. aquatilis Water sedge **NR**

An Arctic-Subarctic species with two sites by the River Irthing, otherwise occurring mainly in Scotland and Wales.

C. bigelowii subsp. ***bigelowii*** Stiff sedge **NR**

An Arctic-Alpine species of montane habitats: ranker soils on hill summits or rocky ledges. Found in seven squares and abundant where it occurs, including Forest Enterprise's Kielderhead Conservation Area. This is the only British subspecies.

C. pauciflora Few-flowered sedge **NR**

A Northern Montane wet bog species in six squares, mainly in the west.

Orchidaceae

Epipactis palustris Marsh helleborine **NR**

A Continental species present in four squares, in dune slacks and a fen. Abundant in Lindisfarne NNR but appears to be decreasing in Newham Fen NNR, and Swan (1993) notes evidence that the preferred habitat may have changed from fen to slack.

E. leptochila Narrow-lipped helleborine **Pop Sc**

Another metallophyte of the South Tyne/Tyne system; several of the populations are within nature reserves. The coastal *E. dunensis* (*q.v.*), however, is now regarded as a variety of this, and some individuals in inland populations are indistinguishable from var. *dunensis.*

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

[***E. leptochila*** var. ***dunensis*** Dune helleborine **End L NR RDB G**

This taxon – formerly considered as a British endemic – occurs in two habitats, on metalliferous alluvium along the South Tyne/Tyne system and in dune slacks on Holy Island. In both habitats it is protected on nature reserves, including Lindisfarne NNR. Since the publication of Perring and Farrell (1983), *E. dunensis* has ceased to be regarded as a full species and is now considered to be a variety of *E. leptochila*, *q.v.*

SPECIES ACTION PLAN REQUIRED.]

E. phyllanthes Green-flowered helleborine **NR Sc**

At two sites in the southern half of the county under hazel and beech respectively, one metalliferous and the other not, and the northernmost sites in the UK. One site is subject to an informal management agreement.

SPECIES ACTION PLAN REQUIRED.

E. youngiana Young's helleborine **End NR Pop RDB S G W**

This species features in the short list of the *UK Steering Group Report*, the only Northumberland plant to do so, and therefore has a written Species Action Plan. It may have arisen in Northumberland as a hybrid between *E. helleborine* and *E. phyllanthes* and was first discovered here, but is now known from elsewhere in Britain. The plant occurs in woodland at three scattered sites in the south of the county, on various soils including metalliferous ones. It is extinct at two former sites.

SPECIES ACTION PLAN REQUIRED.

Goodyera repens Creeping lady's-tresses **NR Sc**

A Northern Montane species of old pinewoods, present in six squares, possibly introduced at the time of tree-planting. It has a scattered distribution and may be spreading in the county .

Platanthera bifolia Lesser butterfly-orchid **NR**

In eight squares mainly in the lowland east, in a variety of casually-managed habitats. One of the sites is Newham Fen NNR and another Longhorsley Moor SSSI.

Pseudorchis albida Small-white orchid **NR**

A Northern Montane species of old upland meadows or similar rough grassland in the south-west of the county. It has declined greatly with its meadow habitat, and one of the three recent sites noted in Swan (1993) had by then also been damaged despite being an SSSI. It has, however, recently reappeared in this location.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Dactylorhiza traunsteineri Narrow-leaved marsh-orchid **NR Sc**

Only in Newham Fen NNR.

Ophrys apifera Bee orchid **NR**

A Continental Southern species with two sites, in rough grassland in Wallsend Dene and on a reclaimed pit heap. These are recent records and may represent colonisation from County Durham where the plant is locally abundant on the Magnesian Limestone. The orchid is at its northern limit.

SPECIES ACTION PLAN REQUIRED

Corallorrhiza trifida Coralroot orchid **NR Sc**

A Continental Northern species in six eastern squares, in damp woods, fen and dune slacks. Its sites include Gosforth Park nature reserve, and Newham Fen and Lindisfarne NNRs.

SPECIES ACTION PLAN REQUIRED.

Hammarbya paludosa Bog orchid **D L NR RDB Sc G Ii**

Another Continental Northern species occurring in acidic *Sphagnum*-dominated soligenous mires, in five western squares. Two of the sites, Crane Moss and Bucklake Sike, are in SSSIs, but the other three are unprotected. The plant has not been seen recently at two of these sites.

SPECIES ACTION PLAN REQUIRED.

North Pennines target species

Extinct Species

Source: Swan (1993). Swan, on page 76, gives a list of twenty-three native species considered to be extinct. Additionally, in his species accounts, another twelve native species are noted as probably extinct, or extinct as natives, or possible erroneous records. Of these thirty-five species, the following seven, which are not in the above accounts (and are not in the calculations), seem to have become extinct since 1945:

Lepidium campestre	Field pepperwort
Pilularia globulifera	Pillwort
Utricularia minor	Lesser bladderwort
Jasione montana	Sheep's-bit
Eleogiton fluitans	Floating club-rush
Orchis morio	Green-winged orchid
Hordeum secalinum	Meadow barley

Additionally, the following eleven species, which *are* included in the above accounts, have not been seen recently:

Equisetum pratense	*Clinopodium acinos*
Fumaria purpurea	*Utricularia vulgaris*
Ornithopus perpusillus	*Polygonatum odoratum*
Radiola linoides	*Calamagrostis canescens*
Eryngium maritinum	*Eleocharis multicaulis*
Anagallis minima	

For those species on this list for which a Species Action Plan is to be prepared, a priority will be to seek to confirm the continued existence of the plant in Northumberland.

A number of species featuring in the *UK Steering Group Report* (1995) long list used to occur in the wild in Northumberland, many of them as ballast or other introductions, but are long extinct or probably long extinct. They are not in the present lists.

BRYOPHYTES

D N Mitchell, A Pickering and A J Richards

As a result of their small size and taxonomic difficulty, bryophytes have generally been overlooked and under-recorded in Northumberland, as they have elsewhere in the UK. Since the work of Duncan (1950), only a few classic locations such as The Cheviot, Muckle Moss, Ross Links and Holy Island (Lindisfarne) have been recorded in any detail, and many of the species selected for this *Red Data Book* have been listed in these localities by a very small number of bryologists. Large areas of the county have not been subject to such intensive bryophyte survey work, and no recent comprehensive bryophyte flora of Northumberland is available. In these circumstances, liverworts and mosses have been selected for the Northumberland *Red Data Book* from the most recent national atlases (Hill, Preston and Smith 1991, 1992, 1994) according to the following criteria:

(i) the species has been recorded in any of the Northumberland Ordnance Survey 10km squares since 1950 (assessed by using a transparent overlay of the county on the national distribution maps for each species), and

(ii) it is nationally or internationally notable according to the selection criteria given in the key below.

In addition to the national atlases, recent records made during the British Bryological Society's 1995 excursion to several Northumberland sites and internal records, held by English Nature for National Nature Reserves and Sites of Special Scientific Interest in the county, were also consulted. Any bryophytes satisfying the defined selection criteria were included in the *Red Data Book*.

Key to selection criteria for bryophytes

H	Protected under the EU *Habitats Directive* (EEC 1992)
L	Listed in the *UK Steering Group Report* (1995) long list
M	Listed in the *UK Steering Group Report* middle list
R	Nationally rare (15 or fewer 10km squares since 1950)
S	Listed in the *UK Steering Group Report* short list
Sc	Nationally scarce (16-100 10km squares since 1950)
W	Listed on Schedule 8 of the *Wildlife and Countryside Act* 1981.

Applying these selection criteria to the data sources used, one hundred bryophyte species (thirty liverworts and seventy mosses) qualify for the Northumberland *Red Data Book* (approximately 10% of the native taxa in the British Isles). Some of these species may well be more widespread in the county than the records suggest, but until further survey work clarifies their true status all selected species merit inclusion in the *Red Data Book*. Under the species accounts, notes have been included where it is likely that a species has been overlooked and under-recorded. The nomenclature and order of species follows that of the national atlases (Hill, Preston and Smith 1991, 1992, 1994).

With reference to liverworts, twenty-one species qualify on scarcity in the British Isles (i.e. occurring in 16-100 10km squares), with a further four species, *Barbilophozia kunzeana*, *Fossombronia fimbriata, Leiocolea gillmanii* and *Riccia huebeneriana*, qualifying on national rarity (i.e. occurring in 1-15 10km squares). In addition, *Petalophyllum ralfsii* is listed on the *UK Steering Group Report* short list, is covered by a species action plan and is also listed in Schedule 8 of the *Wildlife and Countryside Act* (1981) and the European Habitats Directive. Of the selected rare and scarce species *Fossombronia fimbriata, Riccia huebeneriana*,

Plagiochila britannica and *Haplomitrium hookeri* are included on the *UK Steering Group Report* long list. A further four species, *Lepidozia pearsonii*, *Gymnomitrium crenulatum*, *Plagiochila spinulosa* and *Lejeunea lamacerina*, not satisfying any of the other selection criteria but with important European populations in the British Isles, also appear on the *UK Steering Group Report* long list.

For mosses, sixty-one species qualify on scarcity in the British Isles, and nine other species qualify as nationally rare (*Sphagnum balticum*, *S. majus*, *S. riparium*, *Ditrichum plumbicola*, *Dicranum leioneuron*, *Seligeria carniolica*, *Cynodontium polycarpon*, *Bryum stirtonii* and *B. knowltonii*). Of these, *Ditrichum plumbicola* and *Seligeria carniolica* are included in the *UK Steering Group Report* middle list and *Sphagnum balticum* appears on the long list and is covered in the 1981 *Wildlife and Countryside Act*. Of the sixty-one scarce species, *Weissia rostellata* and *Orthotrichum sprucei* appear on the Steering Group middle list and *Brachydontium trichodes*, *Campylostelium saxicola* and *Ephemerum sessile* appear on the long list.

From the species selected it is apparent that Northumberland is characterised by the presence of several distinct groups of important bryophytes:

(i) Species presumed to be endemic to the British Isles and therefore of global importance (liverworts: *Plagiochila britannica*, *Fossombronia fimbriata*; moss: *Ditrichum plumbicola*).

(ii) Arctic-alpine species of restricted distribution in the British Isles, recorded from upland habitats in the Cheviots and North Pennines (e.g. liverworts: *Tetralophozia setiformis*, *Barbilophozia kunzeana*, *Barbilophozia lycopodioides*, *Lophozia obtusa*, *Marsupella sprucei*, *Scapania cuspiduligera*; mosses: *Bryum stirtonii*, *Pterigynandrum filiforme*, *Amphidium lapponicum*, *Pohlia ludwigii*, *Kiaeria blyttii*).

(iii) Atlantic species of restricted distribution in Europe with a predominantly western distribution in the British Isles, recorded as outliers in various habitats in Northumberland (e.g. liverworts: *Lepidozia pearsonii*, *Gymnomitrium crenulatum*, *Plagiochila spinulosa*, *Lejeunea lamacerina*; mosses: *Rhabdoweisia crenulata*, *Pottia crinita*).

(iv) Species restricted to important wetland habitats in Northumberland:

Acid mires and bogs in the Cheviots, Border Mires and North Pennines (e.g. liverworts: *Kurzia sylvatica*, *Calypogeia azurea*, *Cephalozia macrostachya*, *Cephaloziella spinigera*; mosses: *Sphagum majus*, *S. balticum*, *S. riparium*, *Dicranum leioneuron*, *Hypnum imponens*).

Calcareous dune slacks at Holy Island and Ross Links (e.g. liverworts: *Petalophyllum ralfsii*, *Moerckia hibernica*, *Leiocolea gillmannii*, *Riccardia incurvata*; mosses: *Bryum knowltonii*, *Catascopium nigritum*, *Campylium elodes*, *Drepanocladus sendtneri*, *D. lycopodioides*).

Calcareous flushes, springs and tufa in upland areas (e.g. mosses: *Pseudobryum cinclidioides*, *Meesia uliginosa*).

Exposed mud at the edge of inland water bodies (e.g. liverworts: *Riccia cavernosa*, *Riccia huebeneriana*; mosses: *Weissia rostellata*).

In and by streams and rivers (e.g. mosses: *Hygrohypnum diliatatum*, *Fissidens rufulus*, *Campylostelium saxicola*).

(v) Species restricted to particular shady situations in ravine woodlands and sheltered gullies, etc. (e.g. liverworts: *Barbilophozia atlantica*, *Cololejeunea rossettiana*; mosses: *Cynodontium polycarpon*, *C. jenneri*, *Oedipodium griffithianum*, *Amblystegium compactum*).

(vi) Localised ephemeral species colonising a variety of bare substrates (e.g. mosses: *Dicranella crispa*, *Pterygoneurum ovatum*, *Pottia starkeana*, *P. crinita*, *Ephemerum sessile*).

(vii) Species at the northern or southern limit of their national distribution in Northumberland (e.g. mosses: *Barbula nicholsonii*, *Dicranodontium asperulum*).

(viii) Species with their only UK stations in Northumberland (moss: *Seligeria carniolica*).

Note: the abbreviations NT, NU, NY and NZ used within the species accounts refer to the Ordnance Survey 100km squares which cover Northumberland. The intersection point falls just west of Rothbury with NT being north-west Northumberland, NU north-east, NY south-west and NZ south-east.

Species Action Plans have been proposed only for species listed on the *UK Steering Group Report* (1995) short or middle list.

Liverworts

Species **Criteria/status**

Haplomitrium hookeri **L Sc**

Recorded from one 10km square in NT (Cheviots). A northern species recorded mainly from Scotland. Occurs on slightly basic or sandy substrates by streams, tracks, etc.

Kurzia sylvatica **Sc**

Recorded from two 10km grid squares in NU (sandstone moorlands). A Suboceanic species with scattered records throughout the British Isles. Occurs on moist organic soil in moorland, damp heaths and bogs.

Lepidozia pearsonii **L**

Recorded from one 10km square in NT (Cheviots) and several squares in NY (Border Mires). The species occurs mainly in western areas and, outside the British Isles, is known only from Norway. It is found mainly in shaded localities in submontane areas on rocky slopes, boulder screes, banks and ledges.

Calypogeia integristipula **Sc**

Recorded from several 10km squares in NY, NZ, NT and NU. Widepread and scattered in the British Isles on sandstone outcrops and boulders or sandy or peaty banks, usually in woodland.

C. azurea **Sc**

Recorded from two 10km squares in NU and NZ; with two recently added records from NY (Hogswood and Emblehope Moors). Scattered in the British Isles on wet peaty or sandy soil on moorland, including blanket bog.

Cephalozia catenulata **Sc**

Recorded from several 10km squares in NY and NU. Widespread and scattered in the British Isles on peaty soil and banks and in woodlands.

C. macrostachya **Sc**

Recorded from two 10km squares in NT and NU. Widespread and scattered in the British Isles, where it is largely confined to mires and wet heaths, often growing amongst *Sphagnum* mosses.

Cephaloziella spinigera **Sc**

Recorded from one 10km square in NY (North Pennines). Scattered in the British Isles, where it is usually found growing amongst *Sphagnum* and other mosses in bogs.

Tetralophozia setiformis **Sc**

Recorded from one 10km square in NT (Cheviots), its only known station outside Scotland. An Arctic-Alpine species which forms mats on granite rocks, scree and on soil.

Barbilophozia kunzeana **R**

Recorded from two 10km squares in NT (Cheviots). Also recorded in NY (Kielder Forest) during 1995 British Bryological Society excursion. A nationally rare Arctic-Alpine species recorded from only ten 10km squares. Occurs in damp or waterlogged habitats such as streamsides, mires and wet moorland hollows.

B. atlantica **Sc**

Recorded from several 10km squares in NT and NY. Scattered in the British Isles on shady crags, river gorges, etc.

B. lycopodioides **Sc**

Recorded from one 10km square in NT (Cheviots). An Arctic-Alpine species almost exclusively confined to Scotland. Occurs on base-rich rocks at high altitudes.

Lophozia obtusa **Sc**

Recorded from two 10km squares in NY (North Pennines). An Arctic-Alpine species, occurring mainly in Scotland on mountains, but in Northumberland it forms relatively pure stands on river detritus.

Leiocolea heterocolpos **Sc**

Recorded from one 10km square in NT (Cheviots). A Subalpine species growing usually on damp calcareous rock outcrops in ravines and streamsides.

L. gillmannii **R**

Recently recorded in NU (Ross Back Sands). An Arctic-Alpine species, almost exclusively restricted to base rich flushes on mountains in Scotland with occasional records from damp dune slacks. A nationally rare species recorded from only thirteen 10km squares in the UK.

Jungermannia subelliptica **Sc**

Recorded from one 10km square in NY (North Pennines). Scattered throughout the British Isles in damp, base-rich situations on rocky substrates.

Marsupella sprucei **Sc**

Recorded from two 10km squares in NT (Cheviots) and one square in NY (North Pennines). An Arctic-Alpine species which grows on siliceous stones and boulders.

Gymnomitrium crenulatum **L**

Recorded from one 10km square in NT (Cheviots). A north Atlantic species endemic to Europe which occurs mainly in western areas of the British Isles, usually as a pioneer of exposed sites, such as rocky gullies and screes.

Scapania cuspiduligera **Sc**

Recorded from one 10km square in NY (North Pennines). An Arctic-Alpine species which grows in small whitish-green patches on damp calcareous rocks in shady ravines and by streamsides.

S. aequiloba **Sc**

Recorded from several 10km squares in NT and NY. An alpine species which favours well drained, calcareous substrates in exposed situations, such as cliff ledges and boulders.

Plagiochila britannica **L Sc**

Recorded from one 10km square in NY (North Pennines). A recently recognised endemic species, so far known only from the British Isles. It occurs on old stone walls and rocky banks in sheltered situations.

P. spinulosa **L**

Recorded from several 10km squares in NT (Cheviots). An Atlantic species, very rare in Europe except in the British Isles. Occurs as tufts or cushions on boulders, banks and tree trunks in the uplands.

Lejeunea lamacerina **L**

Recorded from one 10km square in NY (North Pennines). Occurs in damp, shaded situations on wet boulders and tree trunks in wooded valleys and streams, mainly in western areas of the British Isles.

Cololejeunea rossettiana **Sc**

Recorded from one 10km square in NY (North Pennines). Occurs on shaded, basic rocks in gorges, streams and woods.

Fossombronia fimbriata **L R**

A nationally rare species recorded from one 10km square in NT (Cheviots). A possible British endemic, this species was first discovered in 1967 in Scotland and has been recorded in only ten 10km squares in the British Isles, although it may have been overlooked. It occurs as scattered plants on damp gravelly and sandy soil.

Petalophyllum ralfsii Petalwort **H S Sc W**

Recorded from two 10km squares in NU (Holy Island and Ross Links), where it has been regularly monitored since 1963 and 1965 respectively, though Duncan (1950) had found it at Ross Links. Four colonies are known in one dune slack totalling approximately forty-nine individuals, most of which are restricted to gentle ESE and SW slopes (recent monitoring by English Nature). The species is rare and declining in Europe and the UK may now be its stronghold. It has been recorded in only eighteen 10km squares in the British Isles, most of these in calcareous dune slacks on the west coast, with very few records on the east coast.

SPECIES ACTION PLAN REQUIRED.

Moerckia hibernica **Sc**

Recorded from two 10km squares in NU (Holy Island and Ross Links). Occurs in calcareous dune slacks with *Petalophyllum ralfsii*.

Riccardia incurvata **Sc**

Recently recorded in NU (Ross Back Sands and Holy Island). Scattered throughout the UK on moist sandy substrates in open situations that are only sparsely colonised by higher plants, including dune slacks. Probably under-recorded due to its small size.

Riccia cavernosa **Sc**

Recorded from two 10km squares in NY and NZ. Widespread but scattered in the British Isles in seasonally flooded habitats, such as recently exposed mud at the edge of open water bodies.

R. huebeneriana **L R**

A nationally rare species recorded from one 10km square in NY. It has been recorded in only fourteen 10km squares nationally and is usually found as a colonist of recently exposed mud at the edge of large open water bodies.

Mosses

Species **Criteria/status**

Sphagnum imbricatum **Sc**

Recorded from three 10km grid squares in NY (Border Mires and Raechester). Widespread in Scotland but rare in England and Wales, generally on very wet and deep ombrotrophic bogs. It has suffered widespread decline since the Middle Ages.

S. molle **Sc**

Recorded from two 10km squares in NT (Cheviots) and one square in NY. An Oceanic species which is widespread and scattered in the UK in shallow blanket bogs and damp peaty streamsides. Probably under-recorded, although it has not been found recently in its known Northumberland sites.

S. majus **R**

Recorded from one 10km grid square in NY (Muckle Moss). A northern species, recorded from only two other sites in Scotland. First found in Britain in 1947, the species may have been overlooked. In Northumberland it grows with *Sphagnum balticum* and *S. recurvum* in wet depressions in the marginal zone of the valley bog at Muckle Moss.

S. balticum **L R W**

Recorded from one 10km grid square in NY (Muckle Moss). Only male specimens have been seen at Muckle Moss, where the species occurs with *Sphagnum majus* in the marginal zone of the valley bog. An endangered circumpolar species, it has been recorded from only five sites in the UK.

S. pulchrum **Sc**

Recorded from two 10km squares in NY, including Muckle Moss; and recently also from Kielderhead. A Suboceanic species which has been recorded from only twenty-six 10km

squares in the UK, it occurs in waterlogged depressions in ombrotrophic and valley mires, often with *Sphagnum cuspidatum*.

S. riparium **R**

Recorded from one 10km square in NY (Muckle Moss) although found recently elsewhere in NY (Colt Crag Reservoir). This species has been recorded from only fifteen 10km squares nationally, mainly in Scotland, with only four extant English sites. Occurs in the marginal zone of the valley bog at Muckle Moss.

Buxbaumia aphylla **Sc**

Recorded from two 10km squares in NZ (south-east Northumberland) and NY (Kielder Forest). Widespread but scattered in the UK, recorded from only twenty-five 10km squares. An ephemeral species with no means of vegetative dispersal, it is found on stabilised colliery shale debris and planted coniferous woodland.

Ditrichum zonatum **Sc**

Recorded from one 10km square in NT (The Cheviot). This species is scattered in Scotland but rare in England, with only four extant sites. It occurs on acidic soils, rocks and scree in corries and gullies and is highly characteristic of the communities of late-snow beds and flushes with north and east aspects.

D. plumbicola **M R**

Recorded in one 10km square in NY (North Pennine dales). Endemic to the UK and recorded from only twelve 10km squares nationally. It is restricted to lead mine spoil that is largely devoid of vascular plants. Fertile plants are unknown; the main method of dispersal is presumably by stem fragmentation.

SPECIES ACTION PLAN REQUIRED.

Distichium inclinatum **Sc**

Recorded from two 10km squares in NU (Holy Island and Ross Links) and one square in NT (the Cheviots). This species is scattered in the UK, with both coastal and inland populations. On the coast it occurs in calcareous dune-slacks and inland on base-rich rock ledges.

Brachydontium trichodes **L Sc**

Recorded from four 10km squares in NT (Cheviots) and one square in NU. A Subatlantic species, scattered throughout the UK on vertical, soft siliceous rocks in hill country and shaded sandstone in the lowlands.

Seligeria donniana **Sc**

Recorded in one 10km square in NY (North Pennines); also recorded during the 1995 British Bryological Society visit to Hareshaw Dene, near Bellingham (NY). A Boreal-Montane species scattered throughout the UK on shaded limestone rocks.

S. pusilla **Sc**

Recorded from two 10km squares in NY (North Pennines). Also recorded during the 1995 British Bryological Society visit to Hareshaw Dene. Scattered throughout the UK on shaded basic rocks, usually on vertical and overhanging surfaces.

S. carniolica **M R**

An internationally threatened species with its only known UK station in Northumberland. Here it is confined to damp calcareous sandstone rocks beside two streams. Outside Britain it is confined to a very few localities in the Alps and Scandinavia.

SPECIES ACTION PLAN REQUIRED.

Rhabdoweisia crenulata **Sc**

Recorded from two 10km squares in NT (Cheviots). This species is very rare outside the UK and is generally restricted to western areas of the country, the Northumberland records being its most easterly locations.

Cynodontium polycarpon **R**

Occurs in one 10km square in NT (Cheviots). This species is very rare nationally, with only four extant sites in the UK. It occurs on sheltered or shaded upland rock faces and screes.

C. jenneri **Sc**

Recorded in three 10km squares in NT (Cheviots) and one square in NU. Mainly confined to Scotland, with four of its five English sites in Northumberland. It occurs on sheltered or shaded acidic rocks and sandy soils.

Dicranella crispa **Sc**

Recorded from one 10km square in NU. This species is scattered in the UK, where it has been recorded from only twenty-eight 10km squares, usually on disturbed open soils or sandstone rocks.

Kiaeria blyttii **Sc**

Recorded from two 10km squares in NT (Cheviots). An Arctic-Alpine species restricted to the mountain areas of Scotland, northern England and Wales. It is usually found on boulders in scree and in streams or detrital gravel on summit ridges.

Dicranum leioneuron **R**

Recorded from two 10km squares in NY (North Pennines and Muckle Moss). A very rare species which has been recorded from only nine UK sites. It occurs on *Sphagnum* hummocks in raised mires, where it may have been overlooked due to its resemblance to the common *Dicranum scoparium.*

D. undulatum **Sc**

Recorded from one 10km square in NY (Border Mires). A very localised species, recorded from only sixteen 10km squares in the UK. It is confined to bogs, typically raised bogs.

D. spurium **Sc**

Recorded from one 10km square in NU (Fell Sandstone moorlands). A Boreal species, scattered throughout the UK on heathland and other moorland.

Dicranodontium asperulum **Sc**

Recorded from NT (moorland near Kielder Forest) during 1995 British Bryological Society visit. This represents its first English record, the species being almost exclusively confined to the Scottish highlands. It typically occurs in sheltered, moist sites among rocks.

Fissidens rufulus **Sc**

Recorded from three 10km squares in NT (Cheviots). Scattered in upland areas of Scotland, northern England and Wales, this species occurs on rocks at or below normal water level in fast-flowing unpolluted streams.

Encalypta ciliata **Sc**

Recorded from two 10km squares in NT (Cheviots). Scattered in upland areas of the UK, this species occurs in shaded crevices on cliff faces.

Pterygoneurum ovatum **Sc**

Recorded from two 10km squares in NY (North Pennines). Scattered throughout the UK in open disturbed habitats.

Pottia starkeana **Sc**

Recorded from one 10km square in NU (Holy Island). This is an annual species, scattered throughout the UK, usually in coastal habitats on disturbed open substrates.

P. crinita **Sc**

Recorded from one 10km square in NU (Northumberland coast). This species occurs mainly in coastal areas of south-west England and there are very few east coast records. It is a Mediterranean-Atlantic annual species of open habitats in coastal areas.

Hennediella macrophylla **Sc**

Recorded from four 10km squares in NT (River Tweed). This species has an unusual distribution in the UK, being restricted to small areas in south-east England and the Tweed Valley, where it occurs on shaded ground on river banks. It is probably an introduction from New Zealand.

Barbula nicholsonii **Sc**

Recorded from four 10km squares in NT and three squares in NU. This species occurs mainly in southern England and is at the northern limit of its national distribution in Northumberland. It occurs on stones and tree roots in areas subject to periodic flooding by streams. Probably under-recorded.

Weissia rostellata **M Sc**

Recorded from one 10km square in NT and one square in NY. This species is of very local occurrence in the UK, recorded from only seventeen 10km squares. It is an ephemeral species of moist bare ground on the margins of reservoirs, rivers, etc.

SPECIES ACTION PLAN REQUIRED.

Grimmia affinis **Sc**

Recorded from one 10km square in NT, its only English station. A continental species almost exlusively confined to Scotland, recorded from only seventeen 10km squares and apparently declining. It forms tufts or cushions on dry rocks.

G. incurva **Sc**

Recorded from two 10km squares in NT (Cheviots). This species is very localised in the UK, recorded from only sixteen 10km squares. It occurs on dry, exposed acidic rocks and boulder scree.

G. orbicularis **Sc**

Recorded from one 10km square in NY (North Pennines). Scattered in western and southern areas of the UK, but decreasing due to atmospheric pollution. It occurs on exposed dry rocks and walls and also on rocks with high heavy-metal content.

G. decipiens **Sc**

Recorded from one 10km square in NT (Cheviots). Scattered in the UK on sunny or slightly sheltered basic rocks, other than limestone. This species appears to be declining nationally.

Racomitrium heterostichum **Sc**

Recorded from one 10km square in NT (Cheviots) and one square in NY (North Pennines); and recently also from Kielderhead. Scattered throughout the UK on dry acidic rock surfaces.

R. elongatum **Sc**

Recorded from one 10km square in NT (Cheviots) and one square in NY (North Pennines). Scattered throughout the UK in a wide range of situations on sandy or gritty soils.

Campylostelium saxicola **L Sc**

Recorded from one 10km square in NT (Cheviots). Localised in the UK, recorded from only twenty-five 10km squares. It occurs on periodically flushed rocks in shaded situations and may be declining as a result of eutrophication of rivers.

Discelium nudum **Sc**

Recorded from two 10km squares in NY (North Pennines). This species is concentrated mainly in the Pennines, with outliers in the North York Moors and Wales. It is a colonist of bare mud and acidic clayey banks.

Ephemerum sessile **L Sc**

Recorded from one 10km square in NT (Border hills), its northernmost UK station. This species is very localised in the UK, recorded from only sixteen 10km squares in England and Wales. It is an ephemeral species of woodland rides, the edges of reservoirs and damp moorland.

Oedipodium griffithianum **Sc**

Recorded from one 10km square in NT (Cheviots). This species occurs at high altitudes in Wales, the Lake District and Scotland on moist humus-rich soil in shady rock crevices and block scree.

Splachnum vasculosum **Sc**

Recorded from one 10km square in NT (Cheviots). Recorded from only nineteen 10km squares in the UK, mainly in Scotland with few records for England. It occurs on dung in springs and flushes at high altitude.

Pohlia filum **Sc**

Recorded from three 10km squares in NY (Kielder Forest area). This species is found mainly in Scotland, with only four English stations and one in Wales. It is almost exclusively confined to soils of very low organic content on tracksides and by streams.

P. ludwigii **Sc**

Recorded from two 10km squares in NT (Cheviots). Found mainly on Scottish mountains with outliers in the Cheviots, the Lake District and Wales. It grows on moist sandy or gritty soils on banks and by streams. It is particularly characteristic of late snow-bed bryophyte-dominated vegetation.

Bryum weigelii **Sc**

Recorded from one 10km square in NT (Cheviots). This species is scattered in upland areas of Scotland, northern England, the Lake District and Wales in mountain springs and flushes.

B. intermedium **Sc**

Recorded from three 10km squares in NU (Northumberland coast), one square in NT (Cheviots) and one square in NY (Kielder Forest). It is scattered throughout lowland areas of the UK on bare damp soil in dune slacks, roadsides and waste ground.

B. stirtonii **R**

A nationally rare species, recorded from only three 10km squares in Scotland and one square in Northumberland in NT (Cheviots). It is a mountain plant and occurs on soil in springs and crevices.

B. pallescens **Sc**

Recorded from one 10km square in NY (North Pennines). It is scattered throughout the UK in a variety of habitats, including heavy-metal contaminated mine wastes.

B. dunense **Sc**

Recorded recently in NU (Ross Back Sands). It is scattered around coastal areas of the UK on open sandy ground. Almost certainly under-recorded.

B. knowltonii **R**

Recorded recently in NU (Holy Island). A circumpolar species recorded from only thirteen 10km squares in the UK, mainly in calcareous dune slacks.

Pseudobryum cinclidioides **Sc**

Recorded from two 10km squares in NT (Cheviots). Scattered in Scotland, the Lake District and Wales in marshes, flushes and springs in hill country.

Meesia uliginosa **Sc**

Recorded from one 10km square in NY (North Pennines). This species occurs in upland localities, mainly in Scotland and northern England, where there is seepage on rocks or gravel, and on tufa.

Amblyodon dealbatus **Sc**

Recorded from three 10km squares in NU (Northumberland coast, including Holy Island and Ross Links), two in NY (North Pennines) and one in NT (Cheviots); recently found also at Kielderhead. Scattered throughout the UK. Occurs in calcareous dune slacks at Holy Island and Ross Links and calcareous flushes in hill country.

Catascopium nigritum **Sc**

Recorded from one 10km square in NU (Holy Island). An Arctic-Alpine species, scattered in northern Britain on mountains and in coastal areas. At Holy Island it occurs in dune slacks in nutrient poor, calcareous situations.

Philonotis arnellii **Sc**

Recorded from three 10km squares in NT (Cheviots) and one square in NY. Scattered in the UK on non-calcareous soil and rock crevices that are intermittently flushed or subject to slippage.

P. caespitosa **Sc**

Recorded from two 10km squares in NT (Cheviots). Widespread but scattered in the UK on moist or wet non-calcareous soil and rocks, flushed with slightly calcareous water.

Amphidium lapponicum **Sc**

Recorded from two 10km squares in NT (Cheviots). An Arctic-Alpine species, scattered in upland areas of Scotland, the Lake District and Wales. It occurs on moist base-rich montane cliffs and crags.

Orthotrichum sprucei **M Sc**

Recorded from three 10km squares in NT (Cheviots) and two squares in NU. This species is endemic to western Europe and its main populations occur in the UK, where it is of scattered occurrence. It is confined to exposed roots, trunks and branches of trees and shrubs by streams and rivers.

SPECIES ACTION PLAN REQUIRED.

Pterigynandrum filiforme **Sc**

Recorded from one 10km square (Cheviots). This species is almost exclusively confined to mountains in Scotland with only two known English sites, one in the Lake District and the other in the Cheviots. It occurs in open rocky sites in mountain habitats.

Campylium elodes **Sc**

Recorded from three 10km squares in NU (Northumberland coast) and one square in NY. Scattered throughout the UK in wet, well illuminated situations such as coastal dune slacks and calcareous flushes inland.

C. calcareum **Sc**

Recorded from two 10km squares in NY. Scattered throughout the UK in a variety of lowland calcareous habitats.

Amblystegium compactum **Sc**

Recorded from two 10km squares in NT and one square in NY. This species is very localised in the UK, recorded from only twenty 10km squares. It occurs on calcareous substrata in deep shade.

Drepanocladus sendtneri **Sc**

Recorded from one 10km square in NU (Ross Links). A localised species in the UK, recorded from only thirty-six 10km squares. It is found in seasonally flooded calcareous dune slacks.

D. lycopodioides **Sc**

Recorded from one 10km square in NU (Ross Links). A localised species in the UK, recorded from only twenty-seven 10km squares. It occurs in seasonally flooded calcareous dune slacks.

Hygrohypnum diliatatum **Sc**

Recorded from one 10km square in NT (Cheviots). Very localised in the UK, recorded from only eighteen 10km grid squares. It is found on rocks in fast flowing streams, usually in montane areas.

Homalothecium nitens **Sc**

Recorded from three 10km squares in NY and one square in NU. This species is scattered throughout the UK in open calcareous mires, flushes and fens but appears to be declining.

Brachythecium mildeanum **Sc**

Recorded from one 10km square in NU (Holy Island). This species is scattered throughout lowland areas of the UK in damp, open calcareous situations, including dune slacks.

Plagiothecium laetum **Sc**

Recorded from two 10km squares in NY (North Pennines) and one square in NT (Cheviots). This species is scattered throughout the UK, mainly at low altitudes. It is a calcifuge found on tree bases stumps, rotten logs and boulders Probably under-recorded.

Pylaisia polyantha **Sc**

Recorded from four 10km squares in NT (lowland areas of north Northumberland) and one square in each of NY and NZ. An epiphyte of broad-leaved trees and shrubs in hedgerows and open woodland. This species has undoubtedly declined due to loss of hedgerows, loss of elms to Dutch Elm Disease and bark acidification as a result of air pollution.

Hypnum imponens **Sc**

Recorded from seven 10km squares in Northumberland (NT, NY, NZ, NU). This species is scattered in the UK but locally common in wet heaths and raised, valley or blanket bogs. It is probably overlooked due to its resemblance to the common *Hypnum jutlandicum.*

MARINE ALGAE

F G Hardy

The marine algae of Northumberland have been the subject of study for almost two hundred years (Hardy 1985, 1987; Hardy and Aspinall 1988; Hardy and Scott 1996). However, in keeping with other parts of the country, records are incomplete due to the very specialised knowledge which is required to identify many of the species, and the lack of appropriate amateur interest. Nationally it has been felt until very recently that there is insufficient information available to publish a marine algal red data book. However moves are now being made to prepare such a volume, in line with the British Phycological Society's Marine Algal Mapping Scheme which is due to reach completion at the end of the century.

The county represents the southern limit of a number of species which are northern in their distribution (such as *Odonthalia dentata* and *Ptilota gunneri*) and the northern limit of some species that require warmer temperatures and are thus more southern in their distribution (such as *Blidingia marginata, Halopteris scoparia* and *Rhodymenia pseudopalmata*). Especially difficult species to find or to identify, such as those which grow endophytically within the tissues of other species, tend to have been recorded only when the appropriate expert has been in the county to collect material for research or on visits by the British Phycological Society (Jones 1960a, 1960b; Norton 1976).

In addition to the species listed below, much interest has been generated by the presence of *Codium fragile* ssp. *atlanticum*, a non-native species which was first recorded in the county in 1949. Since then it has been recorded from several sites but is now believed to be restricted to two locations and it is generally being displaced by the more vigorous *C. fragile* ssp. *tomentosoides* which is already present in the adjoining county of Berwickshire.

Species Action Plans have not been suggested for any species of marine algae.

Key to criteria and status

L	Species included in the *UK Steering Group Report* (1995) long list.
NEnd	Species endemic to Northumberland
North	Southern species at their northern limit
NR	Species occurring in two or fewer localities in the county
Scarce	Nationally scarce species (Sanderson 1995)
South	Northern species at their southern limit

Species **Criteria/status**

Audouinella sanctae-mariae **NEnd**

This is the county's only endemic species and is recorded nowhere else in the world. It was discovered at St Mary's Island in 1910, growing endophytically within the tissues of *Himanthalia elongata*. The species has not been recorded since this date and there are no herbarium specimens, but it is still regarded as a valid taxon (Dixon and Irvine 1977).

Halymenia latifolia **L NR**

Drift specimens of this species were collected at Monks House, Seahouses and at Beadnell in 1959. No other records exist for it in Northumberland or the neighbouring counties.

Rhodymenia pseudopalmata **North**

A subtidal species reaching its northern limit in the British Isles, where it is not uncommon in the south and west. Recorded from the Farne Islands in 1963, although this record has been questioned.

Lithothamnion glaciale **South**

This species is near its southern limit in the area, being found as far south on the east coast as Scarborough.

Phymatolithon calcareum **L NR**

Recorded from Inner Farne in 1963, from where it was also recorded in the mid-nineteenth century.

Gelidium sesquipedale **L NR**

Recorded from Alnmouth in 1885. No further records.

Callophyllis cristata **Scarce South**

A circumpolar species, restricted to the north-east of the British Isles, from the Shetland Islands southwards into Northumberland. Recorded from the Farne Islands.

LICHENS

O L Gilbert and E C Smith

The international importance of the British lichen flora stems from Britain's position in the path of the North Atlantic Drift which brings warm, wet conditions to western areas. Britain also contains elements of the Mediterranean and Mediterranean-Atlantic floras in the extreme south, while in the north there are representatives of the Arctic-Alpine flora which characterises much of northern Scandinavia. Although Britain's vascular flora consists of only about 18% of the total European vascular flora, the figure for lichens is probably much higher and similar to that of the bryophytes – about 70% (Hodgetts 1992).

Northumberland is drier and cooler than central, northern and north-western England, the climate having more affinity with that of south-eastern Scotland. Hence many lichen species which are widespread in the south of England are rare and at the limit of their distribution or absent in Northumberland. However the county is rich in Boreal, Boreal-Alpine and Montane elements. Mean annual temperatures throughout the region are low and the eastern coastal strips and the main river valleys are the driest, warmest regions. Rainfall increases in a westerly direction to 1220-1520mm on the western high ground. Only in the extreme west of the county is the humidity high enough to support the growth of oceanic lichen species. The prevailing winds are westerlies; however, in spring and summer easterlies predominate and carry air pollution from the industrialised south-east of the county inland. The latter has severely limited the distribution of a large number of lichens in the south-east of the county (Gilbert 1980).

Particularly important elements in the Northumbrian lichen flora are:

Relict woodland. The presence of certain lichens which are indicators of relict ancient woodland may be used to calculate indices of ecological continuity. The original *Index of Ecological Continuity* has been revised for use in Northumberland by Gilbert (1980), and in Hodgetts (1992) where it is recommended that the East Scotland Index of Ecological Continuity is used for Northumberland. It should be noted that it is the presence of these species as assemblages rather than individually that is important. However data relating to their

presence in Northumberland have been included here. Of the thirty British species identified as being indicators of relict woodland, twenty-three have been recorded in Northumberland. To these a further nine species exhibiting a suitably narrow ecological amplitude have been added, to replace species which are predominantly southern in their distribution. The resulting list forms the Revised Index of Ecological Continuity (Gilbert 1980). The East Scotland Index of Ecological Continuity (Hodgetts 1992) comprises forty-two species and genera of which twenty-two occur in Northumberland. This is the most up to date index for assessing the ecological importance of woodlands in north-east England and eastern Scotland.

Sandstone outcrops. Those outcrops which occur in the west of the county, mainly within Kielder Forest, are particularly rich in a range of locally and nationally rare species.

The Cheviots. Shaded overhangs in the Hen Hole and Bizzle support a large number of terricolous and saxicolous species, including nationally rare species. The highest summits support climax lichen-rich heathland which has affinities with communities found in the Scottish Highlands.

Heavy metal soils. These areas may be dominated by lichens which are rare or absent in the surrounding countryside.

There are problems in both the construction and use of lists identifying locally and nationally rare lichens. Many species are inconspicuous, some require microscopic examination for their identification and most have only scientific names. The data on the distribution of some genera are inadequate. For the larger foliose and fruticose lichens, distributions are relatively well known and recording on a 10km square basis has been carried out for many of these species. However there are many small crustose species whose distribution remains very incompletely understood, and new species are being added to the list (Gilbert and McCutcheon 1998). Consequently it is often difficult to determine what is rare and what is not.

Detailed data for Northumberland, based on 10km squares, is not yet available although current surveys will provide this data.

The reasons for the rarity of some lichens include loss of habitat (especially old woodland), scarcity of habitat (especially limestone substrates) and, in south-east Northumberland, air pollution.

Key to selection criteria

Ii	Atlantic species, threatened in the European Union (Serisiaux 1989), but which are not in the categories **R** or **Sc**.
NR	Rare in Northumberland
R	Nationally rare species, of RDB status and recorded recently (since 1950) in only 1-15 10km squares in Great Britain
Sc	Nationally scarce species, recorded recently in 16-100 10km squares.

Key to conservation status

L	Species listed on long list of the *UK Steering Group Report* (1995)
M	Species listed on middle list of the *UK Steering Group Report*
RDB	Species listed in the RDB for British lichens (Church *et al.* 1996)
S	Species listed on short list of the *UK Steering Group Report*
W	Species protected under the 1981 *Wildlife and Countryside Act*.

Nomenclature follows Purvis *et al.* (1992), where authorities for the names will be found.

Species accounts give the codes for the criteria for selection and national conservation status and, where appropriate, the IUCN designations 'vulnerable', 'endangered' or 'critically endangered', derived from Church *et al.* (1996). Brief information on local status is based on

Gilbert (1980, 1985), Gilbert and McCutcheon (1988) and unpublished records (Smith 1991-1996). Further information about the habitat preferences and locations of species in Northumberland is contained in Gilbert (1980).

Species Action Plans have been suggested only for lichens included on the *UK Steering Group Report* (1995) short or middle list.

Species	Criteria/status

Acarospora atrata **NR Sc**

Two sites on coastal Whin Sill in the 1970s.

A. glaucocarpa **Sc**

Localised in limestone crevices, but locally abundant.

A. veronensis **NR Sc**

Locally rare; one coastal site, but may be overlooked.

Alectoria sarmentosa **Sc**

The only two English localities are in Northumberland, on Fell Sandstone.

A. sarmentosa subsp. ***vexillifera*** **Sc**

It occurs at the same sites as the typical form above.

Allantoparmelia alpicola **NR Sc**

Abundant at one upland site, on sandstone scree.

Anaptychia ciliaris **NR**

Rare and decreasing; sensitive to pollution. Four remaining sites noted in 1968-1979.

A. ciliaris subsp. ***mammillata*** **NR**

One coastal site in the 19th century. Possibly extinct.

Arthonia exilis **NR Sc**

Locally rare, or overlooked. One record by the Tarset Burn in 1976.

A. impolita **NR**

Three open woodland localities in south-west Northumberland.

A. lapidicola **NR Sc**

One coastal site in 1979.

Arthopyrenia cinereopruinosa **NR Sc**

Locally rare, but overlooked. Two sites in old woodland in 1978 and 1979.

Aspicilia flavida **NR**

Found on Holy Island in 1978 (Gilbert 1985).

A. laevata **Sc**

Occasional by streams and lake shores.

Bacidia beckhausii **NR**

Ancient woodland indicator. On ash *Fraxinus excelsior* by Warks Burn 1980 (Gilbert 1985).

B. carneoglauca **Sc**

Occasional. Known from one sheltered riverside site in 1979.

B. cuprea **NR Sc**

One site at Gunnerton in 1975.

B. epixanthoides **Sc**

Occasional. An ancient woodland indicator.

B. rubella **NR**

Locally rare and decreasing; pollution sensitive.

B. subfuscula **NR**

Rare, an Arctic-Maritime taxon. Recorded in the Outer Farnes in 1978, the second British record.

Bactrospora corticola **NR Sc**

One record for south Northumberland in 1979.

Baeomyces placophyllus **NR**

Rare; heavy-metal tolerant.

Bryoria bicolor **NR Sc**

Occasional on high ground on the Cheviots.

B. chalybeiformis **Sc**

Occasional in the uplands, usually on rock.

B. navordnikiana **NR**
R RDB Vulnerable

The only British records were made in Northumberland in 1970, at two sites in the west of the county.

Buellia pulverea **Sc**

Probably overlooked; one moorland record, on wood, in 1979.

B. schaereri **NR Sc**

Three widely separate sites recorded in the 1970s.

B. uberior **NR**

A nationally rare species. Recorded in the Harthope Valley in the 1970s.

Calicium corynellum **NR**
M RDB Critically endangered

Only British locality is in the county; saxicolous.

SPECIES ACTION PLAN REQUIRED.

Caloplaca aurantia **NR**

One locality on Holy Island in 1967 and 1979.

C. cerinella **NR Sc**

Occasional on ash trees *Fraxinus excelsior.*

C. ferruginea **NR**

Very rare; one site recorded in 1974.

C. flavorubescens **NR Sc**
RDB Endangered

Confined to parkland ash *Fraxinus excelsior;* only one twentieth century record.

C. lactea **NR**

One Holy Island site recorded in 1979.

C. lucifuga **NR**

On ancient elm *Ulmus* sp. at Hesleyside Hall, in 1969.

C. luteoalba **R**
RDB Vulnerable S W

Mainly on elms *Ulmus* spp.; now possibly extinct.

SPECIES ACTION PLAN REQUIRED.

C. obscurella **NR Sc**

A single record, in 1969.

C. ulcerosa **NR Sc**

Rarely recorded on trees in the 1970s.

C. verruculifera **Sc**

Locally abundant at colonies of nesting sea birds.

Candelariella medians **NR**

Rarely recorded on walls in the 1970s.

Catillaria atropurpurea **NR**

An ancient woodland indicator. One record for parkland in 1969.

C. biformigera **NR**

Rare on the Whin Sill at the coast.

C. chlorotiza **NR**

Two records, on mature trees, in the 1970s.

C. sphaeroides **NR**

An ancient woodland indicator. Eight sites recorded in the 1960s-70s.

Catinaria grossa **NR**

Possibly extinct. An ancient woodland indicator. Last seen near Wark in 1900.

Cetraria ericetorum **NR Sc**

One record, on Hedgehope Hill, in 1970.

C. hepatizon **NR Sc**

Rare on rock high in the Cheviots.

C. pinastri **NR**

Possibly extinct in the county; one record from a fence-post on Paddaburn Moor in 1966.

C. sepinicola **Ii**

Locally abundant in upland boggy sites on birch *Betula* sp.

Chaenotheca brunneola **NR**

A few records, on mature broadleaved trees.

C. chrysocephala **NR Sc**

On bark; one site recorded in 1979.

C. hispidula **Sc**

Occasional on trees.

Cladonia bacillaris **Sc**

Occasional; recorded on moorland, pitheaps and rotting wood.

C. bellidiflora **NR**

Several upland records from the Cheviots, Allendale and Knaresdale Common.

C. carneola **NR Sc**

A single record, on peat in the Cheviots in 1970; the first English record.

C. luteoalba **Ii**

Occasional on peat on stony ground. Eight records in the 1970s.

C. parasitica **NR**

Rare, but overlooked. An ancient woodland indicator. Four records in the 1970s.

C. rangiferina **NR**

Its only English site is on The Cheviot; first recorded there in about 1803.

Collema dichotomum **NR**
RDB Vulnerable

On submerged river boulders in the Tweed, Tyne and Coquet (1977).

C. limosum **NR**

Gilbert (1980) gives only two early 19th century records.

C. tuniforme **NR**

Recorded on The Cheviot and the Barhaugh Burn in the 1970s.

Coniocybe pallida **NR**

A woodland species recorded near Cupola Bridge in 1975.

Cyphelium inquinans **NR**

A southern species; recorded in Redesdale in 1976 and at Bamburgh in 1997.

Dermatocarpon meiophyllizum **NR**

On frequently submerged rocks at one site in the River North Tyne.

Diplotomma epipolium **NR Sc**

One record for Holy Island in 1979.

Enterographa crassa **NR**

On old trees in sheltered woodland. Nine records for the 1970s.

Ephebe lanata **NR**

Confined to the Whin Sill. Two modern records: at East Bog Farm in 1980, and by the Gilderdale Burn in 1981 (Gilbert 1985).

Gyalecta flotowii **NR**

Two sites in sheltered woodland recorded in the 1970s.

G. geoica **NR Sc**

One riverbank site in the Coquet, recorded in 1978.

G. truncigena **NR**

On mature trees at Chillingham in 1969 and in the College Valley in 1970.

G. ulmi **NR Sc**
RDB Endangered W

There were three mossy sites on elm trees and on a limestone cliff; Linbriggs in 1975, Featherstone in 1978 and Yew Crags in 1978. Only the third site now remains.

SPECIES ACTION PLAN REQUIRED.

Gyalidea lecideopsis **NR**

One site on the bank of the South Tyne, contaminated by heavy metals, in 1979. The first British record.

Haemotomma elatinum **NR**

An ancient woodland indicator. Five sites recorded in the 1970s.

Herteliana taylorii **NR Sc**

A single site in upper Coquetdale recorded in 1974.

Hymenelia prevostii **NR Sc**

A single record at Moss Kennels in 1971.

Hypocenomyce caradocensis **Sc**

Occasional, on bark.

Ionapsis epulotica **NR**

A single record at Yew Crags in 1978.

I. heteromorpha **NR R**

A single record from a limestone boulder in the Heatheryburn, in 1992.

Lasallia pustulata Rock tripe **NR**

Rare. Flourishing at a single locality where it was first reported in 1819.

Lecanactis premnia **NR**

A single record from sycamore *Acer pseudoplanatus* at Plankey Mill, in 1990.

L. umbrina **NR**

At a single site in the Cheviots, recorded in 1974; previously known in Britain only from two sites in Pembrokeshire.

Lecania aipospila **Sc**

Occasional on coastal rocks.

L. baeomma **NR Sc**

Possibly extinct; last seen near Berwick in 1900.

Lecanora epanora **NR Sc**

A single site on the Whin Sill near Haltwhistle in 1973.

L. farinaria **NR**

Recorded on upland willows *Salix* sp. in one locality on the Otterburn Training Area in 1975 (Gilbert 1985).

L. fugiens **NR**

Rare on coastal rocks. Two records in the 1970s.

L. grumosa **Sc**

Locally widespread on the Whin Sill.

L. piniperda **NR Sc**

A single record on Hedgehope Hill in 1974.

Lecidea aglaea **NR Sc**

A single site on the Whin Sill at Crag Lough in 1971.

L. fuliginosa **NR Sc**

One site in upper Coquetdale in 1974.

L. hypnorum **NR**

Three records: Caw Burn in 1975, Yew Crags in 1978 and Warks Burn in 1980.

L. immersa **NR**

On tufa in the Irthing Gorge in 1975.

L. insularis **NR Sc**

One modern record, near Hethpool in 1978.

L. lapicida **Sc**

Only one modern record, on the Whin Sill in 1971; possibly it is overlooked.

L. plana **NR Sc**

One record, on boulders in blanket bog, at Killhope Law in 1973.

L. pycnocarpa **NR Sc**

Locally rare, or overlooked; two upland sites in the 1970s.

L. speirea **Sc**

Occasional on intermediate/basic rocks. Gilbert (1980) gives five sites.

Lecidella anomaloides **Sc**

Probably overlooked; two modern records, in 1971 and 1978.

Leproplaca chrysodeta **NR**

Six sites on sheltered limestone reported in 1968-78.

Leptogium massiliense **NR**

One recorded site on submerged rocks in the North Tyne, in 1979.

L. plicatile **NR Sc**

Two modern records, on rocks in the North Tyne, in 1976 and 1979.

L. teretiusculum **NR**

Occurs in old woodland and on ground contaminated by heavy metals. Seven sites reported in the 1970s.

L. turgidum **Sc**

Occasional. One coastal site, on Holy Island, recorded in 1979.

Lobaria amplissima **Ii NR L**

Very rare, probably extinct. An ancient woodland indicator. Last recorded at Linshiels in 1934.

L. pulmonaria Lungwort **NR**

Very rare. An ancient woodland indicator. Nine sites were known in 1980, at least one of which had been lost by 1985 (Gilbert 1985).

L. scrobiculata **Ii NR**

Very rare, probably extinct. An ancient woodland indicator. Last recorded at Kielder Castle and near Langleeford in 1863.

L. virens **Ii NR L**

Very rare, probably extinct. An ancient woodland indicator. A single specimen was recorded on an ash tree *Fraxinus excelsior* in 1972 and 1978.

Micarea botryoides **NR**

Found on crags near Sweethope Loughs in 1983, the only county record; but it is probably overlooked.

M. cinerea **Sc**

Overlooked or rare. Recorded by Harthope Burn in 1974 and in the Irthing Gorge in 1975.

Microglaena muscorum **NR Sc**

Recorded by the lower Barhaugh Burn in 1979.

Mycoblastus affinis **Sc**

Occasional. Recorded on a sandstone crag in 1976.

Nephroma laevigatum **NR**

An ancient woodland indicator. The only modern records are from a tree by the Snope Burn in 1979, and from mossy rocks by the River Allen, Whitfield Park, in 1995.

N. parile **NR**

An ancient woodland indicator. Recorded from trees by the Snope Burn in 1978 and the Barhaugh Burn in 1979.

Normandina pulchella **NR**

An ancient woodland indicator. Recorded by the South Tyne in 1973 and by the Barhaugh Burn in 1979.

Opegrapha mougeotii **NR Sc**

Found only at Yew Crags, in 1978.

Orphiniospora atrata **NR**

On andesite in the Cheviots. One modern record, in 1974.

Pachyphiale cornea **NR**

An ancient woodland indicator. Recorded at five sites, including the Warks Burn in 1980 (Gilbert 1985).

Parmelia acetabulum **NR**

Rare, possibly extinct. The huge sycamore *Acer pseudoplanatus* tree in the Tweed Valley, which was its last known site, was felled in 1978.

P. caperata **NR**

Recorded from two woods in the northern Cheviots, and a few single trees, in 1967-1976.

P. discordans **Sc**

Found at six widely scattered sites in the 1970s.

P. elegantula **NR**

Three sites recorded in 1969-79; then thought to be spreading.

P. exasperatula **NR**

On trees and the walls etc. beneath them; six sites recorded in 1969-79.

P. perlata **NR**

Known from six sites, including three woods in the northern Cheviots.

P. revoluta **NR**

Four restricted sites, mainly boulders, recorded in 1969-74.

P. tiliacea **NR**

Known only from two trees in south-west Northumberland.

Parmeliella triptophylla **NR**

An ancient woodland indicator. Recorded from the Kingswood Burn in 1972 and Irthing Gorge in 1973.

Peltigera apthosa **NR**

On sheltered cliff sites on the Cheviots; there are four modern records.

P. canina **NR Sc**

One site, on sand dunes on Holy Island in 1979.

P. collina **NR**

Possibly extinct. An ancient woodland indicator. Last seen at Linbriggs in 1975.

P. leucophlebia **NR Sc**

Local on whin, limestone and heavy-metal contaminated gravels in the south of the county.

P. neckeri **NR**

On sand dunes at Bamburgh in 1997.

P. polydactyla **Sc**

Occasional by upland burns; may be overlooked.

P. venosa **NR**
RDB Vulnerable

One site on riverside gravel, Williamston Nature Reserve, in 1997.

Pertusaria flavicans **NR**

A few recorded sites, mainly on igneous rock.

P. hemisphaerica **NR**

Locally abundant. An ancient woodland indicator. Gilbert (1980) refers to fifteen sites.

P. pupillaris **NR**
Occasional. An ancient woodland indicator.

Phaeophyscia endophoenicea **NR**
Distribution uncertain. Gilbert (1980) records one site.

Physcia semipinnata **NR**
One site on Holy Island in 1969.

Physciopsis adglutinata **NR**
Recorded on a single elm *Ulmus* sp. at Carham Park in 1976.

Placopsis gelida **NR**
A few sites on well-irrigated rock, usually whinstone, 1971-80.

Placynthium subradiatum **NR**
One limestone site at Caw Burn in 1979.

Polyblastia albida **Sc**
Occasional on limestone or tufa.

P. deminuta **Sc**
Occasional on limestone or tufa.

P. dermatodes **NR Sc**
A single site on limestone at Caw Burn in 1975.

P. theleodes **NR Sc**
A single site by the River Irthing in 1975.

Polychidium muscicolum **NR Sc**
Scarce, on wet whinstone.

Porina borreri **NR Sc**
Two modern sites, on elms *Ulmus* sp., at Cornhill on Tweed in 1976 and Allen Banks in 1979.

Protoblastenia incrustans **Sc**
Occasional on limestone.

Psora lurida **NR Sc**
Rare on limestone. Four records 1968-78, including Gilderdale in 1977 (Gilbert 1985).

Psoroma hypnorum **NR Sc**
Rare, possibly extinct. Last seen by Broadstruther Burn in 1863.

Psorotichia schaereri **NR Sc**

A single site by the River Alwin in 1976.

Pyrenocollema strontianense **NR**

On submerged andesite in the River Coquet at Linbriggs in 1996.

Ramalina polymorpha **NR**

Only on the Farne Islands, on rocks enhanced by guano.

Rhizocarpon distinctum **Sc**

Occasional; found at Flodden in 1969 and on Holy Island in 1979.

R. riparium **NR Sc**

Little known; found at Housey Crags and on Hedgehope Hill in 1974.

R. umbilicatum **Sc**

Locally frequent, usually on limestone. Known from ten sites.

R. viridiatrum **NR Sc**

Possibly extinct. Last recorded from Hethpool Linn in 1863.

Rinodina bischoffi **NR Sc**

Two sites on limestone: Holy Island in 1970 and Gunnerton Crag in 1975.

R. conradii **NR**

One record, on turf at Holy Island, in 1991.

R. efflorescens **NR Sc**

Little known; one record in 1979.

R. oxydata **NR Sc**

No modern record; last seen near Bywell in 1879.

R. roboris **NR**

Possibly extinct. Not recorded since Winch (1831).

Schaereria cinerorufa **Sc**

Occasional on rocks on high ground; five sites recorded in the 1970s.

Solenopsora candicans **NR**

Four modern records, on coastal limestone in the 1970s.

Solorina saccata **NR**

Recorded at Wellhope Burn in 1969, Moss Kennels in 1971 and Yew Crags in 1979.

Sphaerophorus melanocarpus **NR**

Uncommon on peaty upland crags.

Staurothele* cf. *bacilligera **NR**

Rare on limestone or tufa.

S. rupigraga **NR**

Recorded from a limestone quarry at Walltown.

Stereocaulon pileatum **NR**

Rare on damp whinstone and lead spoilheaps.

Sticta fuliginosa **Ii NR**

Probably extinct. An ancient woodland indicator. Last reported in 1872.

S. limbata **Ii NR**

Very rare. An ancient woodland indicator. Recorded from three sites in the Cheviots, including the College Valley in 1968 and Roddam Dene in 1974.

S. sylvatica **Ii NR**

Probably extinct. An ancient woodland indicator. Last reported in 1863.

Thelidium papulare **NR Sc**

Recorded from Gunnerton Crags in 1975.

T. pyrenophorum **NR Sc**

Two sites in 1975, Gunnerton Crags and Caw Burn.

Thelotrema lepadinum **NR**

An ancient woodland indicator. Gilbert (1980) reports more than twenty sites.

Thrombium epigaeum **NR Sc**

The only modern record is from Wark Forest in 1977.

Toninia caeruleonigricans **NR**

Three limestone sites: Newton Point in 1971, Fourstones in 1978, and Holy Island in 1979.

T. lobulata **Sc**

Occasional, usually on limestone. Gilbert (1980) gives three sites in the 1970s.

T. tumidula **NR**

Nationally rare. One record from 1879, on the Whin Sill at Gunnerton (Gilbert 1985). Possibly extinct.

Trapelia corticola **NR**

Recently described; one woodland record at Snope Burn in 1979 (Gilbert 1985).

Trapeliopsis glaucolepidea **NR**

One record, on peat at Paddaburn Moor in 1981 (Gilbert 1985).

Umbilicaria deusta **NR Sc**

Two records on well irrigated rock, near Crag Lough in 1971 and on The Cheviot in 1974.

U. proboscidea **NR**

Very rare. Found only on the Cheviots; one modern record.

Usnea flammea **NR Sc**

Found on a sheltered coastal cliff in 1975.

Verrucaria amphibia **Sc**

Common on rocky shores.

V. coerulea **Sc**

Locally abundant on limesone outcrops.

V. duforii **Sc**

Overlooked. Several records, on limestone or tufa.

V. internigrescens **Sc**

Occasional on coastal rocks.

V. margacea **Sc**

Overlooked. Recorded on rocks in streams.

V. murina **NR Sc**

One limestone site, at Caw Burn in 1975.

V. prominula **NR Sc**

On limestone pebbles on Holy Island in 1970.

V. simplex **NR**

On a fragment of mortar, in Morpeth in 1980.

Xanthoria fallax **NR**

Rare or overlooked. Two records, on sycamores *Acer pseudoplatanus* in the valleys of the Tweed and the Tyne.

FUNGI

G Beakes

The fungi have been relatively poorly mapped and recorded in Northumberland. Indeed in Britain as a whole we have a rather poor understanding of the distribution and abundance of fungi, and statements as to their abundance and distribution in most field guides are often not reliable. There are several reasons for this, including:

1 The visible fruiting bodies, the mushrooms and toadstools, are erratic in formation and mostly ephemeral; therefore a single foray often reveals only a small proportion of the total species present,

2 In some seasons fruiting may be entirely suppressed or greatly reduced; the absence of fruiting specimens does not necessarily indicate that the species has disappeared or declined,

3 Many species are associated with specific species of tree or other host and their distribution or abundance will be correlated with that of the host,

4 Fungi are a large and diverse group (an estimate of over 5000 species of large fungi occur in Britain) many of which require specialist literature and keys to identify; there is limited amateur and professional expertise in many important and difficult genera,

5 Certain sought after edible fungi, notably *Cantharellus cibarius* and *Boletus edulis*, ought to be monitored, as increasing collecting pressure may have adverse effects on their distribution and status; the former has been very scarce in recent years but in the 1980s was widely collected in sites such as Allen Banks, Holystone North Wood and Plessey; *Boletus edulis* is very common throughout Northumberland in a variety of woodlands.

As far as the author is aware, there has been no attempt at a systematic compilation of the mycological flora of Northumberland since Winch's *Flora* of 1831 which listed some 544 species for the two counties of Northumberland and Durham, with many site records for each county. A week-long foray by members of the British Mycological Society (28 May-4th June 1988) covering twenty-four sites in the county provided records for 487 species (summarised by Beakes 1989). The very limited available data on truffles was reviewed by Legg (1994) and additional records were supplied by Ellis (1995) and G Simpson. A few keen amateurs have kept good records but these tend to be of the more obvious species and the rare or critical species have often not been keyed out. This makes it extremely difficult to make specific recommendations for 'red data' status.

However, a number of sites in the area can be highlighted as being very good for fungi, and their importance in this respect needs to be taken into account in future decisions about their conservation. They include the following:

Allen Banks, Plankey Mill and Briarwood Banks – Mature beech, oak and conifer woodland with some pasture along the banks of the South Tyne. In addition to the species in the list below, this site has many interesting *Cortinarius, Lactarius* and *Russula* spp., very few of which have been critically keyed out. Undoubtedly this is one of the most important sites in the North East for macro fungi.

Bolam Lake Country Park – Again a well visited and recorded site. Good for wood rotting and bog fungi and myxomycete fungi (slime moulds) as well as the more usual woodland species.

Holystone North Wood – Regularly visited, with a good variety of species. The old oak trees have many interesting wood-rotting species.

Kielder Castle/Forest – The more varied woodland around the castle yields a good range of species.

Gosforth Park – A number of rare and unusual species are found here.

Plessey Woods Country Park – A well collected woodland.

Other good sites are the Rothbury area including Cragside, Thrunton Wood and Simonside Forest, and Harwood Forest.

Species have been selected for the list because of their apparent rarity in the county (**NR**). The national conservation status of the fungus species is given where known, obtained from RECORDER and from the provisional British red data list (Ing 1992). Fungi on the latter list are coded pRDB, and are stated to be endangered or vulnerable. The one county species on the *UK Steering Group Report* (1995) middle list is proposed for a Species Action Plan.

Species		**Criteria/status**
Glomus microcarpum		**NR**
A pea truffle. Kew herbarium specimen from Cornhill on Tweed in 1955.		
Elaphomyces granulatus		**NR**
A truffle. Kew herbarium specimen from near Newcastle in 1909.		
Morchella elata		**NR**
Found at Harwood Forest.		
Morchella esculenta		**NR**
Found at Plessey Woods.		
Gyromitra esculenta	Turban fungus	**NR**
Found at Allen Banks.		
Sarcoscypha coccinea	Scarlet elf cap	**NR**
Found at Allen Banks.		
Sarcodon imbricatum		**NR** Vulnerable
Found in the Rothbury area.		
Tyromyces gloeostidiatus		**NR**
Found at Harwood Forest.		
Cantharellus cornucopioides	Horn of plenty	**R**
Found at Allen Banks and Plessey Woods.		
Hygrocybe calyptraeformis		**NR** M pRDB Vulnerable
Found at Bolam Lake.		

SPECIES ACTION PLAN REQUIRED.

Spathularia flava **NR**
pRDB vulnerable

Found at Holystone North Wood.

Mycena rosella **NR**
pRDB Vulnerable

Found at Harwood Forest.

Amanita pantherina Panther cap **NR**

A very local fungus in the UK. Found at Allen Banks.

Amanita phalloides Death cap **NR**

A very local fungus in the North East. Found at Allen Banks and, in 1993, at a farm between Morpeth and Pegswood.

Cortinarius triumphans **NR**

Found at Kielder Castle.

C. purpurascens **NR**

Found at Kielder Castle.

Gomphideus roseus **NR**

Found at Allen Banks.

Boletinus cavipes **NR**
pRDB Endangered

Found at Thrunton Wood/Simonside Forest.

Boletus luridus **NR**

Found at Allen Banks.

Hymenogaster vulgaris **NR**

A truffle. Kew herbarium specimen from Gosforth Park in 1955.

Geastrum triplex **NR**

Found at Bolam Lake.

Tricharina cretea **NR**

Found at Rabbit Crags, Kielder in August 1997.

GLOSSARY

Bog: an ombrotrophic mire; see below.

Brachypterous: of beetles; with wings reduced or absent, and so unable to disperse by flight.

Crustose: of lichens; forming a crust closely adherent to the substrate.

Dystrophic: of waters; containing organic matter, e.g. peat, but very acidic and depleted in calcium, so with a limited but often highly adapted range of species.

Ectoparasitic: parasitic on the body surface of the host.

Elytra: of beetles; the hardened front wings, forming wing cases, sometimes brightly coloured as in ladybirds.

Endophytic: of plants; one species living within the tissues of another.

Environmentally Sensitive Area: an area officially designated under EU legislation, where farmers entering a scheme for environmentally friendly farming are financially rewarded.

Eutrophic: of waters and soils; nutrient-rich, either naturally or by pollution.

Foliose: of lichens; flattened and leaf-like.

Fruticose: of lichens; shrubby in form.

Geographical Element: of British plants; a classification according to their distribution outside the British Isles, e.g. Northern Montane etc. See Swan (1993) page 14.

Homozygous: having both genes of a pair identical. Loosely applied to a population of organisms, it implies longstanding inbreeding.

Hortal: a garden plant or other cultivated alien, sometimes naturalised in the wild.

Imago: the adult form of an insect.

Inquiline: an animal which lives in the nest, burrow etc. of another.

Macropterous: of beetles; with wings fully developed, hence potentially able to disperse by flight.

Metallophyte: a plant tolerant of, and closely associated with, heavy-metal contaminated soils.

Mire: peatland.

NNR: National Nature Reserve; managed by, or by agreement with, English Nature.

Oligotrophic: of waters and soils; nutrient-poor, e.g. clear waters in rocky places, often with a limited but highly adapted range of species.

Ombrogenous: of mires; forming in areas of high rainfall.

Ombrotrophic: of mires; supplied with nutrients only by the rain (in contrast to soligenous).

Phase 1 Survey: a type of basic habitat assessment in which an area (often an administrative district) is systematically surveyed and its habitats mapped.

Raised bog: a type of ombrogenous mire where peat accumulation has raised the surface above its surroundings.

Ruderal: of plants; adapted to disturbed ground.

Saxicolous: of lichens; growing on rock.

Set-aside land: land temporarily taken out of agricultural use, under the EU Common Agricultural Policy, to reduce production.

Soligenous: of mires; fed by slowly percolating water, generally from a spring.

SSSI: Site of Special Scientific Interest; as notified by English Nature under the *Wildlife and Countyside Act* 1981.

Synanthropic: of animals; closely associated with human activity or settlement.

Terricolous: of lichens; growing on soil.

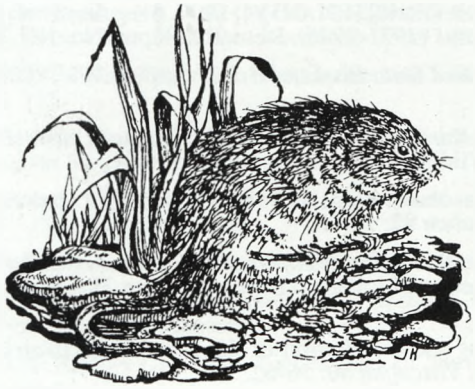
Topogenous: of mires; forming in still water in topographical depressions.

Tufa: a deposit of calcium carbonate formed around a spring or other source of calcareous water.

Whin: of whinstone (quartz-dolerite); see page 55.

Wing-dimorphic: of some species of beetles; occurring in two genetically determined forms, brachypterous and macropterous, which may be selected for by environmental conditions. For example, high winds may scatter winged individuals, advantaging the brachypterous form.

Wing-polymorphic: as above, but with genetically determined intermediate forms.



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GAZETTEER

A E Wilson and H Weatherill

In compiling this gazetteer, the following principles have been followed:

(i) Only places in Northumberland, Durham, Cumbria and The Borders have been included.

(ii) Spelling follows the O S map when this differs from local custom (Monks House, not Monks' House; Roughtinglinn, not Roughtinlinn) but for names not on the map, local spellings are followed (Haydon Dene, Roddam Dean).

(iii) Sites which are general in nature and/or cover a wide area such as south-east Northumberland etc. have been omitted.

(iv) Four figure grid references have been given for each site. The majority of these have been taken from *The Ordnance Survey Gazetteer of Great Britain .... 1:50,000 Landranger Map Series* published by Macmillan 1987. However, where there was doubt, or if the place was not named, the reference was obtained from the current series of Landranger 1:50,000 O S maps or from the original contributor.

(v) Grid references indicate where the name is written on the O S map, which may not be exactly where the species was observed.

(vi) For longer rivers and burns more than one grid reference is given. Again, these correspond to where the name occurs on the map, and may also be loosely correlated to the upper, middle and lower parts.

(vii) If a valley is mentioned, then the grid reference is for the river/burn flowing through that valley.

Abberwick	NU 1213
Acomb	NY 9366
Acklington	NU 2201
Aid Moss	NY 9283
Allen Banks	NY 7963
Allendale	NY 8455
Allendale Common	NY 8245
Allenheads	NY8645
Allerwash Hall	NY 8666
Allerwash	NY 8767
Allerybank	NY 7381
Aln River estuary	NU 2410
Alnmouth	NU 2410
Alnwick	NU 1813
Alwin River	NT 9206
Alwinton	NT 9206
Arcot Hall	NZ 2475
Bakethin Reservoir	NY 6391
Bamburgh	NU 1734
Bardon Mill	NY 7864
Barelees Bog	NT 8738
Barhaugh Burn	NY 7052
Barhough	NY 6851
Baron House Bog	NY 6467
Beadnell	NU 2329
Beadnell Bay	NU 2327
Bedlington Station	NZ 2782
Beldon Burn	NY 9249
Belford	NU 1033
Belling Burn	NY 6990
Bellingham	NY 8483
Belsay	NZ 1078
Beltingham	NY 7863
Beltingham Gravels	NY 7863
Berwick	NU 0052
Big Waters	NZ 2273
Billsmoor Park	NY 9496
Bizzle	NT 8922
Blagdon	NZ 2177
Blanchland	NY 9550
Blanchland Moor	NY 9553
Blaydon	NZ 1762
Blyth	NZ 3081
Blyth Dunes	NZ 3279
Blyth, River	NZ 2379 - NZ 2781

INDEX

Scientific names are entered only under genus. English names are generally entered as they are written, for instance 'Red grouse', not 'Grouse, red', but names which include the definite article are indexed under the noun: 'Saxon, the', not 'The saxon'. Species which appear incidentally in the text, such as food plants or other associated species, have generally not been indexed.

Books! 'tis a dull and endless strife:
Come, hear the woodland linnet,
How sweet his music! on my life
There's more of wisdom in it.
And hark! how blithe the throstle sings!
He too is no mean preacher:
Come forth into the light of things,
Let Nature be your Teacher.

William Wordsworth
Lyrical Ballads, 1798

Trans. Nat. Hist. Soc. Northumbria **58**, 323- 345 (1998)

BIRDS ON THE FARNE ISLANDS in 1997

compiled by

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INTRODUCTION

Calm seas on 22 March provided a relatively pleasant crossing for the wardening teams who took up residence on Inner Farne and Brownsman, the former island being occupied until 8 December and Brownsman until 2 December. Twenty-five species bred with the total population estimated to be in excess of 73,500 pairs – a new record. Whilst this is some degree of success it cannot hide the fact that 1997 was an appalling year when measured by the breeding fortunes of a number of species. In early June forty-eight hours of torrential rain flooded a number of puffin burrows and caused mudslides which carried kittiwake nests off the rock faces, and this was merely a foretaste of what was to come. The final week of June was a non-stop barrage of north-easterly gales, stormy seas and torrential rain. A one day respite was followed by more gales and 40mm of rain in just ten hours. The result was that 62% of puffin burrows were flooded with an estimated loss of 21,500 eggs and young, 60% of kittiwake nests were deserted or washed away with the loss of 7,000+ eggs and young, and about 5,500 guillemot eggs and young were lost from the outer group of islands. Eider productivity was much reduced as ducks deserted their nests, and shags and razorbills also suffered with eggs and young lost. The terns, conversely, sailed through with little additional mortality. Elsie, the lesser-crested tern, was present for her fourteenth season and fledged one hybrid chick. Three pairs of roseate terns fledged five young.

Passage birds were represented by 152 species. The only addition to the island list does not really count: a long-tailed rosefinch, found on Brownsman, was assumed to have escaped from somewhere closer to the islands than its home in southern Siberia. Second, third and fourth appearances were made by white-fronted geese, third appearances by red-throated pipit and marsh warbler, and dusky warbler and magpie were recorded for the fourth time. A good run of Sabine's gulls provided the fifth to ninth records, coal tit made a sixth appearance and quail arrived for the seventh time. A Mediterranean gull was recorded for the eighth time with long-tailed tits making their ninth and tenth visits. Other birds of note included Mediterranean shearwater, Leach's petrel (possibly as many as twenty-one), turtle dove, cuckoo, wryneck, shorelark, bluethroat, icterine warbler (a record year with eleven birds), barred warbler, yellow-browed warbler, treecreeper, red-backed shrike, crossbill, common rosefinch, ortolan bunting and little bunting.

Thanks go to the 1997 wardening team of Steven Bloomfield, Juan Brown, Stephen Ernst, Leigh Marshall, Michael Maher, Dante Munns, Iain Thistlethwaite, Colin (alias Nick) Williams and Andrew Upton, as well as to various boatmen, for supplying the records which make up this report.

Details of all the birds are given in the following list: this follows the order and scientific nomenclature of Professor Dr K H Voous' list of recent holarctic species (1977), except for the shearwaters and gannet which adopt the new changes recommended by *Ibis* **133**, p438. Where appropriate, the figures for 1996 breeding birds are included, for comparison, in brackets.

SYSTEMATIC LIST

Red-throated diver *Gavia stellata*

One to nine were recorded regularly from 22 March until 6 May. A total of forty-three birds moving north on 22 April was the largest spring count. 1-7 were recorded regularly from 9 September until the end of the season.

Black-throated diver *G. arctica*

Singles flying north on 20 and 22 April were the only spring records. 1-2 were seen on seven days from 20 September-30 November.

Great northern diver *G. immer*

One flying north through Staple Sound on 20 April was the only spring record. 1-3 were noted on nine days from 5 October-30 November.

Great crested grebe *Podiceps cristatus*

Singles flew north through Inner Sound on 12 July and 6 November.

Red-necked grebe *P. grisegena*

One to seven were recorded on nineteen days from 20 September-2 December.

Slavonian grebe *P. auritus*

An immature bird was on the sea just off Brownsman on 14 September and was watched for twenty minutes. What was probably the same bird was reported by various boatmen some days before and after this record.

Fulmar *Fulmarus glacialis*

Birds were present on their nest sites on 21 March with the first eggs located on 17 May on Knoxes Reef and 18 May on Brownsman, and the first young on 5 July on Inner Farne and 8 July on North Wamses. 266 (257) pairs nested as follows: Inner Farne 46 (37), Knoxes Reef 22 (29), West Wideopens 13 (15), East Wideopens 15 (13), Skeney Scar 2 (1), Staple Island 38 (39), Brownsman 68 (56), North Wamses 28 (25), South Wamses 28 (35), Big Harcar 3 (3), Northern Hares 3 (3), Longstone End 0 (1). The first young fledged from Inner Farne on 25 August with the last on 9 September from Brownsman. A blue phase bird was on the sea off Staple Island on 14 May. Heavy passage was noted on 19 September when 791 flew north past Crumstone in thirty minutes. Scarce from late September onwards with *ca* sixty around the islands from mid-November.

Sooty shearwater *Puffinus griseus*

One flying north past Crumstone on 14 August was the first record, followed by 1-90 on thirty days between 15 August and 19 November.

Manx shearwater *P. puffinus*

Recorded regularly from 26 April-23 October with the bulk of records from mid-August

onwards. Day counts were of 1-131, with a new record of 545 on 10 September – 239 north past Crumstone in early morning, 250 rafting off Crumstone in mid-afternoon and a further fifty-six flying north in the early evening.

Mediterranean shearwater *P. yelkouan*

Three records: one flew north past Crumstone on 12 September, one was in the same area on 16 September and one flew north through Staple Sound on 13 October.

Leach's petrel *Oceanodroma leucorrhoa*

A seawatch from the south end of Brownsman between 18.50 and 20.00 on 9 September recorded twenty-one petrels. Only three of these were close enough for specific identification as Leach's, but it is likely that all the birds were of this species. There were large numbers of Leach's reported from Norfolk and north-eastern coastal sites that day and no storm petrels were recorded. One flew north past Crumstone on 19 September. These were the seventh and eighth records for the islands; it was last recorded in 1995.

Gannet *Morus bassanus*

Recorded almost daily throughout the season although becoming scarce from mid-November onwards. The largest spring passage occurred on 6 May when 1,638 flew north in the late afternoon. In the autumn 1,067 were recorded moving north past Crumstone in one hour on 9 September.

Cormorant *Phalacrocorax carbo*

Birds were present on the islands when the wardens arrived, with nest building already in progress. Eggs and laying dates are unknown but many nests contained young by 15 May. 227 (195) pairs nested as follows: East Wideopens 118 (96), North Wamses 98 (99), Big Harcar 11 (0). The latter island had not been used for nesting since 1992. Fledged young were first noted on 2 July with the last fledging around 12 August. In the June storms approximately 25% of nests and young on North Wamses were washed away. Birds were scarce in autumn with a maximum of seventy present in late October.

Shag *P. aristotelis*

Many birds were on their nests on 21 March with the first eggs recorded on Inner Farne on 23 March. 1060 (994) pairs nested as follows: Megstone 19 (10), Inner Farne 183 (184), West Wideopens 83 (62), East Wideopens 66 (61), Skeney Scar 65 (60), Staple Island 268 (260), Brownsman 136 (118), North Wamses 24 (27), South Wamses 41 (45), Roddam and Green 17 (16), Big Harcar 105 (109), Longstone End 53 (42). The first young was noted on Brownsman on 1 May with the first fledging on 26 June: the last fledging was on Staple Island on 17 October. On 16 July an almost fledged albino shag was discovered on Brownsman south cliff and was still present when the wardens left on 8 December: its sibling was the normal colour. About 300 roosted on the outer group during October and November.

Grey heron *Ardea cinerea*

One to four were seen regularly in March and April, and from late August onwards. There were only five records in May and June and none in July.

Mute swan *Cygnus olor*

Two flew south through Inner Sound on 24 September with three south on 29 October.

Whooper swan *C. cygnus*

Thirteen flew north through Inner Sound on 23 March.

Pink-footed goose *Anser brachyrhynchus*

One flew north through Staple Sound on 13 October and thirty-four south over Brownsman on 22 November.

White-fronted goose *A. albifrons*

Twelve flew south over West Wideopens on 10 October. Eleven seen low over Brownsman on 4 November landed there and when accidentally flushed flew to Inner Farne, landing on the central meadow before departing in the direction of the mainland. This scenario was repeated on 18 November when four birds were flushed from Staple Island and alighted on Inner Farne. These were the second, third and fourth records for the islands; it was only previously recorded in 1989.

Greylag goose *A. anser*

Twenty-two moving north over Inner Farne on 22 March and twenty north through Staple Sound on 31 March were the only spring records. Then 1-19 were seen on five days between 27 September and 24 October.

Canada goose *Branta canadensis*

One was on the sea off Inner Farne on 13 April, followed by forty-five on 28 May, six on 5 June, sixteen on 9 June and fifteen on 22 June, all flying north.

Barnacle goose *B. leucopsis*

Eleven flew low over the Wideopens on 21 April before landing on Inner Farne – one had been ringed at Loch Gruinart, Islay, on 7 November 1996 (Greenland population). 1-59 autumn birds were noted on nine days from 25 September-21 October.

Brent goose *B. bernicla*

One south through Staple Sound on 26 March, one on the sea off the Wamses on 6 April and an immature light-bellied bird on Brownsman on 19 May were the only spring sightings. Autumn records were of 1-18 on eighteen days from 6 September-1 December.

Shelduck *Tadorna tadorna*

A pair was on Brownsman from March until late June but there was no positive evidence of nesting. 2-4 were present around the inner group during the same period but again there was no evidence of nesting. Twelve flew east past Brownsman on 30 June, fourteen east past Inner Farne on 3 July, then 1-4 on four days between 15 August and 20 November.

Wigeon *Anas penelope*

One to twenty-six were recorded on four days from 7-20 April, followed by regular records of 1-155 from 2 September-30 November. One big day was 14 October when 575 were recorded moving north through Inner and Staple Sounds.

Gadwall *A. strepera*

A pair flew over the north end of Inner Farne on 8 April.

Teal *A. crecca*

Two to ten were seen on twelve days from 21 March-26 April. Birds were observed regularly from 28 July onwards with a peak count of sixty-one in late November.

Mallard *A. platyrhynchos*

Birds were seen regularly throughout the season with a peak count of eighty-nine on 15 November. 4 (1) pairs nested as follows: Knoxes Reef 1 (0), West Wideopens 0 (1), Staple Island 1 (0), North Wamses 2 (0). The fate of the ten young from Knoxes Reef is unknown, but no young fledged on the outer group – one nest with five eggs was predated, and eighteen ducklings, from two nests, fell foul of the gulls.

Pintail *A. acuta*

A pair flying north through Staple Sound on 20 April was the only spring sighting. Autumn records were of 1-7 on seven days from 8 September-17 October.

Shoveler *A. clypeata*

Three flew south through the Kettle on 4 August and twenty-five north through Staple Sound on 21 September; single females were noted on 19 October and 2 November.

Pochard *Aythya ferina*

A pair was on the sea between Inner Farne and Knoxes Reef on 7 April and another pair flew north through the Kettle on 16 April.

Tufted duck *A. fuligula*

Singles were seen on 8 September and 10 and 25 October and two flew north through the Kettle on 12 September.

Scaup *A. marila* A female flew north through the Kettle on 14 October.

Eider *Somateria mollissima*

Birds were prospecting sites on Brownsman on 30 March and the first eggs were located on 20 April. 1,021 (1,912) females nested as follows: Inner Farne 629 (1,308), Knoxes Reef 4 (7), West Wideopens 39 (55), East Wideopens 4 (5), Staple Island 46 (46), Brownsman 267 (449), North Wamses 12 (15), South Wamses 13 (17), Big Harcar 5 (6), Northern Hares 0 (1), Longstone main rock 2 (1), Longstone End 0 (2). This was the fourth lowest figure for breeding females on the islands since 1971. Not only were numbers of nesting females low but productivity was much reduced with ducks abandoning their nests during the harsh June weather. The first ducklings were noted on 23 May with the last leaving Knoxes Reef on 29 July. The largest count of the autumn was on 31 October when 2,165 were recorded.

Long-tailed duck *Clangula hyemalis*

A quiet year for this species with just three records: a male flew north through Inner Sound on 14 October and three males north through Staple Sound on 4 November, and an immature male was on the sea just off Brownsman on 21 November.

Common scoter *Melanitta nigra*

1-50 were recorded regularly throughout the season, although there was just one record in May. These numbers were only exceeded on 28 August when 300+ were recorded flying north through Inner Sound.

Velvet scoter *M. fusca*

Two passed north through Staple Sound on 20 April, then singles north on 9 and 14 October.

Goldeneye *Bucephala clangula*

One to twenty were recorded on nine days from 14 October-29 November.

Red-breasted merganser *Mergus serrator*

One to two were recorded on four days from 22 March-23 April, then 1-2 on nine days between 9 September and 29 November.

Goosander *M. merganser*

One male and one female flew north through Staple Sound on 10 November.

Sparrowhawk *Accipiter nisus*

Singles were recorded on 22 March, 13 and 24 April, 2 May, 15 August and 30 October. All records except that on 13 April were from the inner group.

Kestrel *Falco tinnunculus*

A quiet year for this species with no spring records. Singles were seen on the outer group on three days in September with a male on Inner Farne on 2 and 3 October.

Merlin *F. columbarius*

Singles were recorded on eight days from 25 March-3 April, then 1-2 were seen almost daily from 26 September-7 December. Kills included purple sandpiper, skylark, pied wagtail, long-tailed tit (an island rarity!) and starling.

Peregrine *F. peregrinus*

Singles on three days in April and three days in May were the only spring records. 1-2 were seen regularly from 5 September-27 October, then singles on three days in November and two December days. Kills included Sandwich tern, feral pigeon and fieldfare.

Quail *Coturnix coturnix*

A female was on Brownsman from noon on 6 May until dusk on 7 May. This was the seventh record for the islands; it was last recorded in 1994.

Water rail *Rallus aquaticus*

One was by Brownsman pond on 26-27 October, one on Inner Farne on 13 October, and one, again by Brownsman pond, on 19 November.

Moorhen *Gallinula chloropus*

One was on Inner Farne on 5 November.

Coot *Fulica atra*

One flushed from Staple Island on 9 July was lost to view flying south past Crumstone – as the log records 'most unexpected!'. One, just off Brownsman jetty, was reported by the boatmen on 25 August.

Oystercatcher *Haematopus ostralegus*

About a hundred were present in early spring. The first eggs were noted on Inner Farne on 26 April: however, this nest failed and the first young to be located were on Brownsman on 11 June. 34 (33) pairs nested as follows: Inner Farne 5 (6), Knoxes Reef 2 (3), West Wideopens 2 (4), East Wideopens 2 (2), Staple Island 5 (4), Brownsman 11 (8), North Wamses 2 (2), South

Wamses 1 (1), Big Harcar 1 (1), Northern Hares 1 (1), Longstone main rock 2 (1). The first young fledged from Brownsman on 8 July with the last fledging from the same island on 1 August. The maximum autumn count was about 220 on 2 November.

Ringed plover *Charadrius hiaticula*

Display was evident from 21 March with the first eggs found on Inner Farne on 18 April. 11 (12) pairs nested as follows: Inner Farne 5 (6), West Wideopens 1 (1), Staple Island 2 (1), Brownsman 3 (3), Longstone main rock 0 (1). The first young hatched on Inner Farne on 16 June and fledged on 11 July. A number of pairs had more than one nesting attempt, but from a total of fifty-five eggs only two young fledged. Up to fifty birds were present in late August-early September, but this dropped to single figures from October onwards.

Golden plover *Pluvialis apricaria*

One on 27 April, flying around Brownsman in the fog, was the only spring record. They were then noted on eighteen days from 27 July-18 October with a maximum count of twenty-one flying south on 14 August.

Grey plover *P. squatarola*

One heard calling on Inner Farne on 21 March and one on the Wideopens the next day were the only spring records. There were two records in August and two in September, followed by regular sightings throughout October and November and one on 7 December. The maximum count was three birds.

Lapwing *Vanellus vanellus*

Eight on 8 April, three on 12 April and twenty-five on 15 May were the only spring records. 1-10 were noted regularly from 9 August until the end of the season. The only count to exceed this was on 19 October when 70+ flew south-west over Inner Farne.

Knot *Calidris canutus*

First recorded on 16 May when two flew west over Brownsman, then 1-12 were noted regularly from 24 July-21 September, with one on Brownsman on 13 October.

Curlew sandpiper *C. ferruginea*

One, moulting out of summer plumage, was on Brownsman on 16 August.

Purple sandpiper *C. maritima*

Recorded in every month of the season although absent from early June until mid-July. The highest spring count was about 300 on Inner Farne in mid-April, with an autumn maximum of 215+ from mid-November onwards.

Dunlin *C. alpina*

One to ten were recorded regularly throughout the season. The only large count was twenty-five on Longstone on 24 July.

Ruff *Philomachus pugnax*

An immature bird was resident on Brownsman and Staple Island from 13-24 August. On the inner group two were on the Wideopens on 11 August, with singles on 15, 16, 19 and 24 August.

Jack snipe *Lymnocryptes minimus*

Single birds were on Brownsman on 11 April and Staple Island on 12 April, with singles on 7, 11 and 15 October and 5 November.

Snipe *Gallinago gallinago*

Single birds were recorded on six days from 23 March-4 May. One was on Knoxes Reef on 22 June, then 1-7 were noted regularly from 8 August onwards.

Woodcock *Scolopax rusticola*

The only spring record was of two on Inner Farne on 25 March. 1-8 were recorded regularly from 15 October-30 November, with at least thirty-five on 5 November.

Black-tailed godwit *Limosa limosa*

Eleven flew north over Inner Farne on 17 April, and five circled over the same island on 28 April.

Bar-tailed godwit *L. lapponica*

One, in summer plumage, flew south-west over Brownsman on 18 April and was the only spring record. All autumn records came from the inner group and involved 1-12 birds on sixteen days between 4 August and 30 November.

Whimbrel *Numenius phaeopus*

One to two were recorded on six days from 3-20 May, then 1-4 on twenty-three days between 24 July and 27 September.

Curlew *N. arquata*

Recorded regularly throughout the season with lowest numbers and frequency in June. Up to 370 roosted on Knoxes Reef in late March, with an autumn maximum of about 500 in late September.

Spotted redshank *Tringa erythropus*

A juvenile was on Churn Pool, Inner Farne, on 2 September.

Redshank *T. totanus*

Recorded regularly throughout the season. Numbers never exceeded six throughout spring and summer, with counts into double figures by mid-August and reaching a peak of about sixty throughout November.

Greenshank *T. nebularia*

First recorded on 1 August when one flew past Inner Farne, then 1-10 were noted almost daily from 11 August-21 September. One feeding around the fringes of Brownsman pond on 10 October was the final record.

Green sandpiper *T. ochropus*

Singles were recorded on nine days from 6 August-1 September.

Wood sandpiper *T. glareola*

One was on Inner Farne from 18-19 May, and one flushed from Brownsman pond on 28 August was also recorded flying over Inner Farne.

Common sandpiper *Actitis hypoleucos*

Singles were noted on 28 April, six days in May, 4 June and two days in July. Then 1-13 were recorded daily from 7 August-17 September.

Turnstone *Arenaria interpres*

Present throughout the season with lowest numbers in mid-summer. The highest count was about 500 in late September.

Pomarine skua *Stercorarius pomarinus*

Singles were recorded on 5, 10 and 27 July, 27 August, 3 and 10 September, 4 and 5 October and 3 November. Four flew north through Staple Sound on 20 October.

Arctic skua *S. parasiticus*

First recorded on 5 May when one flew past Crumstone. Then 1-15 were recorded regularly from 17 June-3 November.

Great skua *S. skua*

One to fourteen were observed on fifty-three days between 10 June and 30 November.

Mediterranean gull *Larus melanocephalus*

One summer-plumaged adult was watched for five minutes bathing with kittiwakes in Brownsman Gut on 10 April. The eighth record for the islands, and last recorded in 1996.

Little gull *L. minutus*

Twelve records of a first-winter bird on both the inner and outer groups between 1 and 16 April may all refer to the same individual. A first-winter bird flew west over Inner Farne on 28 April and an adult was resident on Brownsman from 18 April-10 May, before being joined by a first-winter bird on the latter date. There were further records of single birds on 23 May and 18 and 23 November, with seven (five adults and two immatures) flying south through Staple Sound on 19 November and finally two south on 25 November.

Sabine's gull *L. sabini*

A record invasion occurred in Europe during the autumn and evidence of this was clearly visible at the islands: an immature flew north through Staple Sound on 7 September, two immatures were noted feeding off Crumstone on 17 September, one immature flew north past Brownsman on 19 September, and a winter-plumaged adult was in the Longstone kittiwake roost on 20 September. These were the fifth-ninth records for the islands, the last being in 1996.

Black-headed gull *L. ridibundus*

Birds were displaying from 21 March onwards, with first eggs located on both Inner Farne and Brownsman on 4 May. 91 (69) pairs nested as follows: Inner Farne 40 (30), Brownsman 51 (39). The first young were recorded on 31 May and the first fledgling on 7 July: all young were fledged by 31 July. Scarce throughout August and early September with a gradual build-up peaking at 350+ from early November onwards.

Common gull *L. canus*

Recorded daily, maximum twenty-one, from 21 March-3 May. One was observed from Inner Farne on 6 June, followed by regular sightings from 11 August until the end of the season. Maximum counts were of about fifty from late September-mid October.

Lesser black-backed gull *L. fuscus* and **Herring gull** *L. argentatus*

1,288 (1,389) pairs nested as follows: Megstone 0 (1), Inner Farne 12 (11), Knoxes Reef 12 (37), West Wideopens 230 (235), East Wideopens 149 (235), Skeney Scar 59 (29), Staple Island 79 (94), Brownsman 63 (31), North Wamses 222 (249), South Wamses 156 (197), Roddam and Green 14 (27), Big and Little Harcar 257 (267), Northern Hares 14 (66), Longstone main rock 5 (5), Longstone End 16 (6). The first eggs were noted on North and South Wamses on 2 May. In late April lesser black-backed gulls were observed killing and eating feral pigeons on Inner Farne. Lesser black-backs were still in evidence in October and November with a roost of about 400 on the Wamses, whilst herring gulls built up to a peak of about 3,500 in mid-late October, reducing to about 1,200 thereafter.

Iceland gull *L. glaucoides*

One was reported on 26 October and a probable sub-adult flew west over the Wamses on 1 November.

Glaucous gull *L. hyperboreus*

A first-summer bird flew south over Inner Farne on 19 April, a first-winter bird flew north through Inner Sound on 13 October, and a first-winter bird was observed from Brownsman on 14 November.

Great black-backed gull *L. marinus*

About 800 were present round the islands in late March decreasing to about twenty-five by mid-May. 2 (2) pairs nested as follows: East Wideopens 0 (1), North Wamses 1 (1), South Wamses 1 (0). Numbers began to build up from mid-July to a peak of 240+ from October onwards.

Kittiwake *Rissa tridactyla*

Birds were present on sites on 21 March with nest building activity already under way. The first eggs were recorded on Staple Island on 1 May with the first young on 31 May. 6,119 (6,236) pairs nested as follows: Megstone 33 (34), Inner Farne 1,716 (1,691), West Wideopens 326 (309), East Wideopens 426 (428), Skeney Scar 277 (310), Staple Island 1,611 (1,643), Brownsman 1,424 (1,514), North Wamses 82 (87), South Wamses 62 (53), Roddam and Green 31 (35), Big Harcar 131 (132). In the storms at the end of June it was estimated that some 3,700 nests were abandoned or washed off the cliffs. The first young fledged on Staple Island on 3 July with the last leaving the cliffs on 14 August. About 420 were present from early September to mid-October with a big influx of about 4,000 on 2 October following south-westerly gales. Counts never exceeded double figures after mid-October.

Lesser crested tern *Sterna bengalensis*

Elsie was found roosting with Sandwich terns on Inner Farne on 3 May – back for her fourteenth season. She was present daily until 11 May but disappeared until 24 May when she was found in the Inner Farne colony. Paired with a Sandwich tern she was incubating one egg from 25 May which hatched on 18 June. The chick fledged on 18 July and moved to the north-east rocks on 24 July where it was fed by both parents. Last seen on the islands on 31 July, the adult was recorded at Filey Brigg, N Yorkshire on 7 August, whilst the colour-ringed offspring was seen roosting with Sandwich terns at La Paracou, near Sables d'Olonne, Vendée, on the western coast of France on 23 September (see front cover).

Lesser crested tern on her nest photographed by Dante Munns

Sandwich Tern *S. sandvicensis*

One flying north through the Kettle on 21 March was the first record. Numbers coming in to roost on Inner Farne built up to an estimated 3,000 by 3 May. Numbers on Brownsman reached 650 by 1 May and, despite much displaying in the area used in 1996, all deserted – possibly moving to Inner Farne. First eggs were recorded on 7 May with the first young on 3 June. 2,484 (2,179) pairs nested as follows: Inner Farne 2,484 (1,657), Brownsman 0 (393). The first fledged young were observed on 3 July with the last on 20 August. All birds had left the islands by late September, with a final record of one off Big Harcar on 29 October.

Roseate tern *S. dougallii*

First recorded on the north-east rocks of Inner Farne on 3 May. Despite at least one pair displaying over Brownsman and inspecting a nesting tyre, all nested on Inner Farne. 3 (2) pairs nested as follows: Inner Farne 3 (2). Six young were hatched and five fledged by 22 July. 1-4 were seen intermittently throughout August, and one flew east over Brownsman on 18 September.

Common tern *S. hirundo*

One roosting on Brownsman on 21 April was the first record. The first egg was noted on 16 May with the first young on 11 June. 184 (183) pairs nested as follows: Inner Farne 183 (183), Brownsman 1 (0). The first chick fledged on 9 July with the last on 24 July. About a hundred birds were still present by late September with three records in early October. The final sighting of an immature off Big Harcar on 10 November is the latest-ever island record.

Arctic tern *S. paradisaea*

The first definite record was not until 23 April. Numbers built up gradually from that point with a roost of about 2,100 by 6 May. Eggs were noted on 12 May with the first young on 6 June. 2,460 (2,420) pairs nested as follows: Inner Farne 1,586 (1,541), Knoxes Reef 0 (1), Staple Island 1 (27), Brownsman 873 (851). The first young fledged on 29 June with the last

on 8 August. Small numbers, maximum 340, were present throughout late August and September with a final record of one flying north through Staple Sound on 17 October.

Little tern *S. albifrons*

The expected roost in St Cuthbert's Cove on Inner Farne started when twenty-eight birds arrived on the evening of 6 May. Numbers built up to fifty-seven by 11 May then declined to eleven by 21 May. There was only one other record of a bird displaying over Knoxes Reef on 17 June.

Black tern *Chlidonias niger*

One to two were recorded from the outer group on eight days from 29 August-18 September. One flying north through Inner Sound on 27 September was the only other record.

Guillemot *Uria aalge*

Birds were present, both on the breeding cliffs and rafting offshore, on 21 March. The first egg (predated) was on Staple Island on 12 April with the first young seen on 29 May. 35,073 (28,650) individuals were present on the breeding cliffs as follows: Megstone 190 (209), Inner Farne 3,876 (3,386), West Wideopens 2,200 (1,567), East Wideopens 2,685 (2,048), Skeney Scar 1,677 (1,000), Staple Island 17,128 (13,332), Brownsman 5,552 (5,730), North Wamses 1,337 (956), South Wamses 311 (303), Roddam and Green 90 (89), Big Harcar 27 (30). Some 5,500 eggs and young were lost from the outer group colonies in the June storms. The first 'jumpling' left the cliffs on 15 June with the last on 6 August. Up to 150 were present during September-December with a passage of about 900 flying south on 2 November, including an albino bird.

Razorbill *Alca torda*

Pairs were on the breeding ledges on Inner Farne on 21 March but it was not until 9 April that birds on the outer group came ashore. The first eggs were located on Staple Island on 11 May and the first young on 6 June. 150 (141) nested as follows: Inner Farne 52 (55), West Wideopens 18 (22), East Wideopens 18 (16), Skeney Scar 5 (4), Staple Island 34 (23), Brownsman 4 (2), North Wamses 7 (7), South Wamses 5 (6), Big Harcar 6 (5), Longstone End 1 (1). The first young fledged on 21 June with the last on 12 August. Birds were scarce throughout August and September with about twelve almost daily from October onwards.

Black guillemot *Cepphus grylle*

Single birds were around the outer group on 23 August and 12, 13 and 15 October, with two on 4 November, then up to three were resident from 15 November until the end of the season. One was off Inner Farne on 21 September.

Little Auk *Alle alle*

A quiet year with 1-3 birds recorded on eleven days from 21 October-2 December.

Puffin *Fratercula arctica*

Birds were ashore on 21 March although it was 14 April before they became resident. The first egg was found on Inner Farne on 24 April, with the first evidence of young on 20 May. The first fledged young was seen in Inner Sound on 30 June with the last leaving on 15 August. Again, no count was undertaken this year, but the population estimate in 1993 was 34,710 pairs. In the June storms burrows flooded on an unprecedented scale and estimates suggest that about 21,500 eggs and chicks were lost. Birds were scarce from mid-August onwards with never more than twenty recorded on any one day, the only exception being 21 September when 120 flew north through Staple Sound.

Feral pigeon *Columba livia*

Present throughout the season with breeding confirmed on a number of islands. Maximum counts occurred in the autumn with about 150 on the inner group and about 200 on the outer group.

Woodpigeon *C. palumbus*

All records were from the outer group: singles on 18 April, two May dates, two June dates, 19 August and three days in October.

Collared dove *Streptopelia decaocto*

Singles were recorded on Inner Farne on 30 March, 16 April and three days in May.

Turtle Dove *S. turtur*

One was on Inner Farne on 6 August.

Cuckoo *Cuculus canorus*

On 2 June one flew south, chased by kittiwakes, over Brownsman and Staple Island.

Long-eared owl *Asio otus*

One spring record of a bird on Inner Farne on 16 April. Singles on six days from 15 October-29 November, with two over Brownsman on 16 October.

Short-eared owl *A. flammeus*

One was flushed from Brownsman north hill on 4 May, one was over Inner Farne on 24 September and one was on Staple Island on 15 October.

Swift *Apus apus*

One to ten were recorded regularly from 21 May-16 September.

Wryneck *Jynx torquilla*

One was on Brownsman on 25 August. Very elusive when first observed, it became increasingly confiding as it fed in the open.

Skylark *Alauda arvensis*

One to three were recorded intermittently from 22 March-30 May. One was on Inner Farne on 20 July then 1-30+ almost daily from early September onwards.

Shorelark *Eremophila alpestris*

An immature male moulting into summer plumage was resident on Brownsman from 12-28 April.

Sand martin *Riparia ripari*

Singles were observed on 13 April, 14, 18, 19, 29 May and 16 September.

Swallow *Hirundo rustica*

For the eighth year in succession a pair nested in St Cuthbert's Chapel. They laid two clutches, each of five eggs, and fledged three young from each. The first record was of one on Inner

Farne on 9 April with birds seen almost daily until 29 September. Maximum count was twenty-four on Inner Farne on 23 August but numbers generally were in single figures.

House martin *Delichon urbica*

One to seven were recorded on fifteen days from 30 April-6 November, the latter date being the latest record from the islands. On 18 and 19 May birds were prospecting under the eaves of Brownsman cottage – similar behaviour at St Cuthbert's Chapel on Inner Farne on 18 May was not welcomed by the resident starling. It attacked one of the martins in mid-air, brought it to the ground, and repeatedly stabbed it. The martin escaped but was attacked again and left for dead whilst the starling pursued the second martin.

Tree pipit *Anthus trivialis*

One to three were recorded regularly from 27 April-4 June, then 1-6 almost daily from 17 August-1 September, with singles on 26-27 September and 12 October.

Meadow pipit *A. pratensis*

One to forty were noted almost daily from 21 March-17 May. 1-50 were recorded daily from 24 August-8 December.

Red-throated pipit *A. cervinus*

One, with a flock of meadow pipits, was heard calling over Staple Island on 28 September and subsequently observed for 2-3 minutes before it flew off high over Brownsman. This was the third record for the islands; it was last recorded in 1991.

Rock pipit *A. spinoletta*

Present throughout the season. 21 (16) pairs nested as follows: Inner Farne 6 (5), West Wideopens 2 (1), Knoxes Reef 1 (0), Staple Island 2 (2), Brownsman 7 (7), North Wamses 1 (0), South Wamses 1 (0), Longstone main rock 1 (1). From September to November some fifty-five were roosting on the inner group, with a further sixty on Brownsman.

Yellow wagtail *Motacilla flava*

One male flew south-west over Brownsman on 6 June; one showing some characteristics of an eastern race bird was present on Brownsman on 21 August, and one was over Brownsman on 25 August.

Grey wagtail *M. cinerea*

All records were of singles: on Inner Farne on 16 September, flying east over Brownsman on 17 September, flying east over Inner Farne on 25 September and on the east shore of Brownsman on 16 October.

Pied wagtail *M. alba*

Recorded daily from 21 March to late September, with just four records in October. 8 (5) pairs nested as follows: Inner Farne 2 (2), West Wideopens 1 (0), Staple Island 1 (1), Brownsman 3 (2), Longstone main rock 1 (1). First fledglings were seen on Inner Farne on 28 May. White wagtails *M. a. alba* were recorded on 7, 10-11 and 24 April, 10, 19-20 May and three days in September.

Wren *Troglodytes troglodytes*

One to three were present daily from 21 March-16 April may well have been over-wintering birds. Absent during the summer then 1-12 seen daily from 23 September onwards.

Dunnock *Prunella modularis*

One on Inner Farne from 25-29 March was the only spring record. 1-8 were seen almost daily from 25 September until the end of the season.

Robin *Erithacus rubecula*

One to three were recorded on twelve days from 23 March-19 May, and 1-11 almost daily from 11 August onwards.

Bluethroat *Luscinia svecica*

A very quiet year with just two records: an adult male and a female/immature on Inner Farne on 20-21 May.

Black redstart *Phoenicurus ochruros*

Singles, all females, were recorded on fifteen days from 23 March-12 June. Autumn records were also of singles, on ten days between 22 August and 19 November.

Redstart *P. phoenicurus*

One to two were recorded on eleven days from 24 April-28 May, then 1-3 on eleven days between 25 August and 16 October.

Whinchat *Saxicola rubetra*

One to two were seen regularly from 27 April-22 May, with 1-7 almost daily from 7 August-28 September. A late bird was on Brownsman on 15 October.

Wheatear *Oenanthe oenanthe*

One to thirty were noted regularly from 23 March-8 June. A very recently fledged bird was on Brownsman and Staple Island from 6-8 July, then 1-16 were observed almost daily from 11 August-10 October.

Ring ouzel *Turdus torquatus*

One was seen on 25 September, and four on 15 and 16 October during large thrush movements.

Blackbird *T. merula*

One to twelve were observed regularly from 21 March-1 May. One was noted on 10 June, then they were seen regularly from 25 September onwards. There were just two days of moderate passage: about 280 moving west on 15 October and about 630 also west on 16 October.

Fieldfare *T. pilari*

One to five were noted on ten days from 23 March-4 May, with regular records from 24 September until the end of the season. On 15 October about 1,000 moved west over the islands and on 27 October about 1,400 also flew west.

Song thrush *T. philomelos*

Singles were recorded on eight days from 21 March-18 May. One was on Staple Island on 8 July, then there were regular records of 1-13 from 21 September until the end of the season. About 100 flew west on 15 October with about 110 on 16 October.

Redwing *T. iliacus*

One to eight were noted regularly throughout March until mid-May. Recorded from 25

September onwards with almost daily sightings of 1-20. On 15 October 2,200+ flew west over the islands, with 2,600+ the following day.

Mistle thrush *T. viscivorus*

Five records, all relating to single birds: 16 and 31 October and 5, 23 and 24 November.

Grasshopper warbler *Locustella naevia*

One was recorded on Inner Farne on 3-4 May, one on Brownsman on 17 May, three on Brownsman/Staple Island on 25 August and one on Brownsman on 27 August.

Sedge warbler *Acrocephalus schoenobaenus*

One to three were seen almost daily from 11-22 May, one was on Staple Island on 7 June, and 1-2 were observed regularly from 11 August-15 September.

Marsh warbler *A. palustris*

One was on Staple Island on 13 June. A very skulking bird – the wardens' log admits 'a real identification challenge!'. This was the third record for the islands, the last record being in 1993.

Reed warbler *A. scirpaceus*

All records were from Brownsman or Staple Island: one on 12 August, two on 27 August and one on 18 September.

Icterine warbler *Hippolais icterina*

Eleven birds in a season – a record year: one was on Inner Farne on 20-21 August, singles on Inner Farne and Brownsman with two on West Wideopens on 27 August, one on Brownsman on 29 August, one on Inner Farne on 31 August and one on Brownsman from 31 August-1 September. A different bird was on Brownsman on 1 September, with two on Inner Farne, one of which was still on the latter island on 2 September.

Barred warbler *Sylvia nisoria*

One first-winter bird was on Brownsman on 19 September.

Lesser whitethroat *S. curruca*

One to three were seen on eight days from 10-23 May. 1-2 were recorded on 11-12 and 27-28 August, with singles on 16 and 29 October.

Whitethroat *S. communis*

One to three were noted on thirteen days from 28 April-30 May, then singles on eleven days from 12 August-8 October.

Garden warbler *S. borin*

Two were on Brownsman on 8 May, followed by singles on seven days between 9 and 20 May, and 1-5 on sixteen days from 15 August-8 November. The only day on which these numbers were exceeded was 27 August when fifteen were scattered around the island group.

Blackcap *S. atricapilla*

One to two were seen on nine days from 24 April-21 May, with 1-2 on seventeen days between 26 September and 29 November.

Yellow-browed warbler *Phylloscopus. inornatus*

There were two records: one on Brownsman on 25 September from midday until dusk and one on Inner Farne from 25-26 September.

Dusky warbler *P. fuscatus*

One was on Inner Farne on 5-6 November. The fourth record for the islands; it was last recorded in 1991.

Wood warbler *P. sibilatrix*

One on Staple Island on 2 May was found dead the following day, then singles were seen on 13 and 27 August and 25 September.

Chiffchaff *P. collybita*

One to seven were seen regularly from 7 April-23 May. Two resident on Brownsman from 9-13 April were seen courtship feeding and the male sang every morning – hopes of a new breeding species did not materialise! A bird showing characteristics of *abietinus* was present on Inner Farne on 3 May. Finally 1-3 were recorded regularly from 12 August-1 December.

Willow warbler *P. trochilus*

One to eight were noted almost daily from 17 April-7 June. Birds showing characteristics of the northern race were present on Inner Farne and Brownsman on 3 May. 1-61 were present almost daily from 30 July-27 September, the peak count occurring on 25 August.

Goldcrest *Regulus regulus*

One to four observed on four days from 23 March-12 April were the only spring records. One to ten were seen almost daily from 15 August-17 November.

Spotted flycatcher *Muscicapa striata*

Two were on Staple Island on 17 May with singles on 18, 29, 30 May and 2-3 June. Autumn records were of singles on 11 and 31 August and 11 and 16 September.

Pied flycatcher *Ficedula hypoleuca*

One to two were recorded on six days from 1-23 May. The first autumn bird appeared on 11 August with 1-5 on sixteen days until 16 October. Double figures occurred on 27 August with thirteen birds on the inner and outer group.

Long-tailed tit *Aegithalos caudatus*

Six were in the walled garden on Inner Farne on 31 October whilst on 6 November one chose the wrong day to fly over Staple Island and was taken by a merlin. The ninth and tenth records for the islands; last recorded in 1990.

Coal tit *Parus ater*

One was on Inner Farne on 4 October. The sixth record for the islands and last recorded in 1988.

Treecreeper *Certhia familiaris*

Singles were on Inner Farne on 30 September and 13 November: they were approachable, very active birds which spent their time finding food on buildings around the courtyard.

Red-backed shrike *Lanius collurio*

An adult male was on Brownsman on 19 May; a female on Inner Farne gave good views to visitors on 31 May-1 June and a female was on Brownsman on 1 June.

Magpie *Pica pica*

One was on Inner Farne on 16 April. Mobbed by linnets it flew from the vegetable garden towards the Wideopens before doubling back and becoming lost to view around the south end of the island. The fourth record for the islands; it was last recorded in 1993.

Jackdaw *Corvus monedula*

One to seven were recorded on ten days from 1 April-4 June, with autumn records of 1-11 on seven days between 19 September and 29 October.

Rook *C. frugilegus*

One to nine were noted on eleven days from 22 March-15 April, one was over Inner Farne on 30 May, ten moved east over Inner Farne and eight east over Brownsman on 25 September, and the final record was three over Brownsman on 27 October.

Carrion crow *C. corone*

Observed regularly throughout the season although scarce in July with just two records. The highest count was ten birds on 25 September. Two pairs nested as follows: Staple Island 1 (0), West Wideopens 1 (1)

Starling *Sturnus vulgaris*

One to thirty-six were recorded daily throughout the spring and summer with regular counts of 250+ in late autumn. Passage was most noticeable on 16 October with about 460 flying west over Brownsman. Three pairs nested as follows: Inner Farne 3 (2). Nest sites were on St Cuthbert's Chapel, Prior Castell's Tower and on the west cliff. The mimic was again on site and included golden plover display call, goldcrest, house sparrow, chaffinch and yellowhammer in its repertoire.

House sparrow *Passer domesticus*

A female was on Prior Castell's Tower, Inner Farne, on 25 September. The twelfth record for the islands and last recorded in 1996.

Chaffinch *Fringilla coelebs*

Singles were seen on seven days from 23 March-27 April, with two on Inner Farne on 31 March. Autumn records were of 1-8 birds on eleven days from 16 October-6 November.

Brambling *F. montifringilla*

Three spring records of single birds on 16, 17 and 21 April. 1-11 were observed regularly from 2 October-21 November with notable passage on 15 and 16 October of about forty and about a hundred birds flying west.

Greenfinch *Carduelis chloris*

There were records of 1-5 birds on fifteen days between 20 October and 7 December. The Inner Farne bird table, with associated peanuts, proved attractive.

Goldfinch *C. carduelis*

One flew north over Brownsman on 20 April with four records of 2-5 birds on Inner Farne between 20 and 30 April. Autumn sightings were of singles on 5 and 12 October and two on 21 November.

Siskin *C. spinus*

One to three were recorded on four days between 17 April and 22 May. A male was on Longstone End on the unusual date of 10 June, then there were records of 1-7 birds on ten days from 24 September-1 November.

Linnet *C. cannabina*

One to eleven were seen regularly from 21 March-30 April. Singles were observed on Brownsman on 15 and 27 May with regular sightings from 17 September onwards. About ninety were resident on Inner Farne and the Wideopens from late October.

Twite *C. flavirostris*

Two were on Brownsman on 22 October, six on Inner Farne on 7 November, and singles on Inner Farne on 28 November and 1, 4 and 7 December.

Redpoll *C. flammea*

Single birds were recorded on 18, 20 and 21 May, then 1-2 on twenty-one days between 26 August and 28 November.

Common crossbill *Loxia curvirostra*

A female was found sleeping outside the Inner Farne toilets in north-easterly winds and heavy rain on 28 June. Another female was resident on Inner Farne from 4-12 July: watching it feed in the Sandwich tern colony was something of a novelty!

Common rosefinch *Carpodacus erythrinus*

Immature/female birds were on Brownsman on 3, 12-13 June, 25 August and 20 October.

Lapland bunting *Calcarius lapponicus*

A male in winter plumage was present on Brownsman for forty minutes on 17 April. A 'probable' seen briefly on Staple Island on 28 November may have been the bird observed on Inner Farne feeding with pipits and skylarks later that day.

Snow bunting *Plectrophenax nivalis*

One to seven were recorded on seven days from 21 March-17 April; the single bird on the latter date was in summer plumage. 1-2 were observed on three days in late October, then noted regularly from mid-November to early December. The largest flock was of twenty-one birds over Staple Island on 1 December, with a merlin in pursuit.

Yellowhammer *Emberiza citrinella*

Singles were recorded on Staple Island on 22 October and on Brownsman on 3 November.

Ortolan bunting *E. hortulana*

A first winter bird, associating with tree and meadow pipits, was on Inner Farne on 27 August.

Little bunting *E. pusilla*

One was on Inner Farne from 24-25 September and one, briefly, on Brownsman on 16 October.

Reed bunting *E. schoeniclus*

A female was on Brownsman from 19-22 May, then singles on ten days from 25 September to 8 November. Two flew north over Brownsman on 7 November.

Exotica

Long-tailed rosefinch *Uragus sibiricus*

One, first located on Brownsman at 18.15 on 2 May, was resident until 9 May. It appeared very much at home feeding on various seeds. Whatever its origins a bonny little bird!

Omission from 1996 report

Hoopoe *Upupa epops*

One was seen in mid-afternoon on Inner Farne on 20 September. It flew from the islands and was observed dropping into Castle Woods at Bamburgh. The tenth record for the islands and last recorded in 1993.

FARNE ISLANDS RINGING REPORT FOR 1997

The aims of ringing on the Farne Islands

Maintaining and increasing biodiversity is a major goal of conservation and, while the north-east coast today has healthy seabird populations, it may not always remain so. Changes from year to year in the numbers of breeding seabirds may be identified by counting the numbers of pairs, but unless the reasons for any long-term trends in population size are understood it may be hard to take corrective action in the event of serious declines. Breeding success and rates of survival and immigration are important factors in maintaining recruitment of new breeding birds to offset losses resulting from mortality and emigration. Ringing has a major part to play in conservation as it is the only means by which rates of survival and dispersal can be estimated as part of population monitoring. Since breeding success is a major factor determining future recruitment, management to reduce chick losses from predation, habitat change and disturbance may be necessary as part of an effective conservation strategy. Ringing also has a role in monitoring the causes of chick mortality and the effects of disturbance and food supplies on chick growth rates. Thus, the ringing of seabirds on the Farne Islands is currently directed towards these specific goals: the estimation of survival rates of seabirds through recoveries and ring-resighting data, the estimation of tern chick survival rates from year to year and in relation to colony habitat, and the monitoring of body condition in young terns to study variation in the characteristics of growth in different years and different colonies.

Recoveries of birds ringed on the Farnes

Estimates of adult and first year survival can be obtained from recoveries of dead birds or by reading the ring numbers of birds that have returned to the colony. Recovery data are much less efficient than resighting data with respect to obtaining survival estimates, but are particularly valuable for identifying the causes of mortality and the patterns of bird movement. Since the 1996 ringing summary, 257 sightings or recoveries of ringed birds have been reported, comprising arctic terns (7), common terns (2), herring gull (1), eiders (26), guillemots (5), puffins (10), kittiwakes (74), shags (80) and Sandwich terns (52). These totals include Farne-ringed birds recovered or resighted, and controls on the Farnes of birds ringed elsewhere. The majority of these reports result from reading the rings of birds in the field, and we are

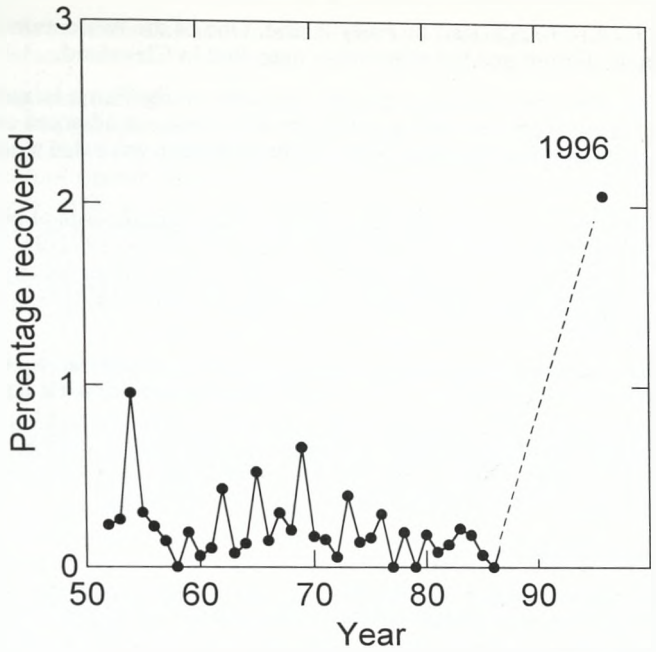

Figure 1 Recoveries of first-winter Sandwich terns in each year along the west coast of Africa, expressed as a percentage of the total chicks ringed in that year. Between 1987 and 1995, inclusive, no ringing took place.

extremely grateful for the hard work that has gone into obtaining these data. Results such as these are especially worthwhile for a species such as the kittiwakes whose marine lifestyle does not generate many recoveries.

An important reason for maintaining a seabird ringing programme on the Farne Islands is to monitor the causes of mortality. Eighteen of the 875 Sandwich terns ringed on the Farne Islands in 1996 have been recovered, all of them (2% of the total ringed on the Farnes that year) on the Atlantic coast of west Africa (Ghana, Morocco, Senegal, Liberia and Gambia) and, of these, fifteen were recorded as "intentionally taken". Children are known to account for some of these birds which are apparently caught either for food (for people or pets) or to play with. The percentage of Sandwich terns ringed as chicks on the Farne Islands and recovered on the west African coast within 300 days was the highest for birds ringed in 1996 than for any year between 1952 and 1985 (Figure 1). Part of the reason for the high recovery of birds ringed in 1996 compared to previous years may be because ornithologists in parts of Africa have been actively seeking rings removed from birds captured for food. The extent to which Sandwich terns from the Farnes are being killed is clearly a conservation issue of major concern. It is important that we continue to monitor the situation through ringing and take positive steps to encourage the conservation of terns and other birds in west Africa.

In addition to recoveries of first-winter Sandwich terns, recoveries or sightings of adults have been reported from Dundee Airport (an aircraft casualty), Seal Sands at Teesmouth, Poole in Dorset, Denmark, the Netherlands (Griend and Texel), Namibia, Nigeria and Senegal. Four colour-ringed birds from Forvie, Grampian Region, were also reported and this gives an indication of movements between colonies for this species. We have details for six arctic terns: two of these were sight records of birds ringed as chicks on the Isle of May (1989) and Orkney (1995), three were sight records of birds ringed on the Farnes in 1974, 1981 and 1983, and one

was a recovery of a bird found dead on Holy Island. One of the two common terns reported was recovered on the Farnes and the other was controlled in Cleveland.

Twenty-five of the eiders reported were ringed as adults on the Farne Islands between 1977 and 1986; nine of these were recoveries, either on the Farnes or adjacent coastline, and the remainder were sight records of breeding birds. Twenty of these were also recorded in previous years.

With respect to auks, the five guillemots reported were all sight records of birds from the Isle of May, four ringed as chicks and one as an adult within the period 1992-95. Ten puffins were reported: four were sight records and the rest were found dead either locally or on the Farne Islands. These were all ringed on the Farnes; the oldest, ringed in 1970, was twenty-six years old when found in 1996.

Apart from the nine-year-old Boston (Lincs) herring gull found dead on Staple Island, reports of ringed gulls were all for kittiwakes. The seventy-four records were of Farne Islands birds ringed from 1976 onwards. Only eight of these were recoveries, the rest being sight records, and were from Dunbar, Seahouses, Blyth, Saltfleet, Lincs (a bird ringed as a chick in 1996), Aberystwyth, Pas-de-Calais, France, and Blavand, Denmark. Two of these were ringed as chicks in 1981 and were therefore fifteen years old when they died.

Results from ringing in 1997

One of the problems in monitoring the breeding success of arctic terns (and other tern species) is that the chicks leave the nest within 1-2 days of hatching, are highly mobile and can hide very effectively in thick vegetation on the breeding colonies. So while clutch size and hatching success can be monitored easily, estimating survival rates without artificially constraining the birds in any way is very difficult unless they are ringed. Arctic tern chicks in study plots on Brownsman and Inner Farne this year were ringed and recaptured at intervals to estimate chick survival throughout the period up to fledging. Preliminary analyses using the MARK program developed by Gary White of Colorado State University, USA, currently the most sophisticated program available for this type of analysis, indicate that, on the whole, survival rates were high at 93% to 98% per four-day analysis period. It is interesting that no marked decrease in survival was apparent at a time (25 June-2 July) when the arctic terns on Coquet Island suffered significant mortality during a period of bad weather. Measurements of total head length and weight were obtained for a sample of arctic tern chicks on both islands, and these data suggested that the Farnes birds may have been in better 'condition' than the Coquet birds, which could be at least part of the explanation for the apparently lower tern mortality on the Farnes compared with Coquet Island.

Dr Chris Redfern putting colour rings on the hybrid chick.

Sandwich terns usually breed in dense colonies, and a minimum estimate of chick mortality can be obtained from the proportion of the ringed chicks that are recovered dead within the colony once breeding has finished. During the 1997 season, only 147 Sandwich tern chicks were ringed and four were recovered dead at the end of the season, a

known mortality of about3%. This is in marked contrast to the high 34% mortality of Sandwich terns on Coquet Island this year which apparently resulted from the bad weather.

The overall ringing total for 1997 (1996 total in brackets) was 977 (1670): Sandwich terns 147 (875), arctic terns 448 (416), roseate terns 4 (0), shags 67 (151), guillemots 0 (30), kittiwakes 279 (198) and eiders 32 (0). As in 1996, the lesser-crested/Sandwich tern hybrid chick of 'Elsie' was ringed and colour ringed: the combination this time was narrow red above metal on the right leg, tall yellow on the left. The hybrid chick fledged successfully, and was seen and well photographed in France in September 1997, presumably on its way to wintering quarters off the west coast of Africa. The ability to follow the progress of these birds through colour ringing has attracted considerable national and international interest, as illustrated by an article in the November 1997 *Birding World* by Frédéric Jiguet. We hope that some of these colour-ringed hybrids will return to breed on the Farne Islands so that we can study their fertility, behaviour and progress: this would be an ideal opportunity to witness the introduction of new genetic variation into the Sandwich tern gene pool.

Despite the bad weather (or perhaps because of it) ringing on the Farne Islands in 1997 has generated useful data: the mark-recapture study of arctic tern chick survival indicated that the arctic terns were not badly affected by the poor weather, in contrast to those on Coquet Island. The mark-recapture method will be a valuable tool for monitoring overall colony productivity in the future. Relative growth measurements for Farne and Coquet birds suggested that the Farnes chicks were in better condition than those on Coquet Island and this could partly account for the markedly different mortality rates between the two island groups. Sandwich terns on the Farnes also appeared to be relatively unaffected compared to Coquet birds. Whether these differences are related to feeding, in terms of either the quality or quantity (or both) of food available, or to some other factor, they do seem to indicate that the colonies on the Farne Islands and Coquet Island have to be regarded entirely independently with respect to factors that influence breeding success.

TRANSACTIONS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBRIA

Editor:
D GARDNER-MEDWIN
Assistant Editors:
D C NOBLE-ROLLIN
M A PATTERSON

Volume 59

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA
THE HANCOCK MUSEUM
NEWCASTLE UPON TYNE NE2 4PT
1998-1999

ISSN 0144-221X

Printed by Pattinson and Sons, Newcastle upon Tyne

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Trans. Nat. Hist. Soc. Northumb. **59**, 1-35 (1998)

ANNUAL REPORT
OF THE
COUNCIL AND TRUSTEES
FOR THE
YEAR ENDED 31 JULY 1998

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA

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VICE PRESIDENTS

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R W T Thorp
M J Hudson
J Alder
Dr G A L Johnson
D F McGuire
D R Shannon
D P Walton
I D Moorhouse
Mrs M A Patterson
Dr A G Lunn
A M Tynan
E Slack

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1995 - H H Chambers, A R Creedy
1996 - M D Anthony, J S North Lewis
1997 - Ms L Kerslake, Dr D N Mitchell

(2) **Nominated by sections:**
Dr D Gardner-Medwin (Chairman of Council, publications), Dr A G Lunn (botany), Dr G A L Johnson (geology), I D Moorhouse (Gosforth Park), H H Chambers (library), Dr C P F Redfern (ornithology), Mrs J Simkin (lichenology)

(3) **University representatives:**
P S Davis, Dr A J Richards, Dr B J Selman

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H H Chambers, Dr D Gardner-Medwin, Dr A G Lunn, I D Moorhouse, J S North Lewis, Mrs M A Patterson, Dr B J Selman, D R Shannon, E Slack, R F Walker (honorary)

HONORARY TREASURER R E Slack ACA

SECRETARY D C Noble-Rollin

SOLICITORS **Eversheds**, Milburn House, Dean Street, Newcastle upon Tyne

BANK **Lloyds Bank,** Grey Street Branch, 102 Grey Street Newcastle upon Tyne

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INDEPENDENT EXAMINERS
PricewaterhouseCoopers, 89 Sandyford Road, Newcastle upon Tyne

GENERAL PURPOSES COMMITTEE
P S Davis, Dr D Gardner-Medwin, Dr A G Lunn, R E Slack, J S North Lewis

SOCIETY REPRESENTATIVES

Coquet Island Advisory Management Committee: I D Moorhouse, D C Noble-Rollin

Lindisfarne National Nature Reserve:
Advisory Committee: D G Bell
Wildfowl Panel: D C Noble-Rollin

Museum Management Committee: Dr D Gardner-Medwin, D C Noble-Rollin, E Slack, Dr R H Stobbart

STAFF Mrs H Dalrymple, Ms P Hammock, Mrs J Jones, Mrs M A Patterson.

GOSFORTH PARK NATURE RESERVE Warden: P Drummond

THE HANCOCK MUSEUM Senior Curator and Principal Keeper: A Coles
Curator and Senior Keeper: S McLean

ANNUAL REPORT OF THE COUNCIL AND TRUSTEES FOR THE YEAR ENDED 31 JULY 1998

The Natural History Society of Northumbria is a registered charity and is governed by the rules of the Charity Commission; the Trust Deed dated 30 December 1965 was updated on 1 February 1989 and a further update is being prepared following the retirement of five trustees and the appointment of new trustees at the annual meeting on 28 November 1997. A list of the present trustees is given opposite with the other officers of the Society. Our rules state that 'The objects of the Society shall be the encouragement by every means of the study of natural history in all its branches; the protection of the local flora and fauna; the maintenance and extension of the Society's library and collections; the publication of *Transactions* and other scientific papers, the organisation of lectures, discussions and field meetings and co-operation with other scientific societies or associations with similar objects'. The Annual Report outlines the main achievements of the year in relation to the charity's objects.

INTRODUCTION

In an interesting and varied year for the Society one of the salient events was the publication in March of the *Red Data Book for Northumberland*. This was the Society's first joint publication with the Northumberland Wildlife Trust and a most enjoyable and stimulating collaboration it turned out to be. The lion's share of the work was undoubtedly done by the editor and compiler, Ms Lisa Kerslake, Conservation Manager of the Trust, who deserves all praise, but with major contributions from a fine team of authors. The Society's task of preparing it for publication involved a certain amount of new writing to achieve consistency of style and content, the compiling of the lengthy gazetteer and index and, of course, the complex business of preparing the page proofs and illustrations for the printers. This all proved highly educational and satisfying and we hope that the result has pleased members and has stimulated them to look afresh at the ecology and conservation of the flora and fauna of their own part of the county. By recording what is known about the rare and threatened species in Northumberland, the Trust and the Society hope not only to prompt vigorous and imaginative conservation measures but also to provoke people to do new research to fill the gaps and put right the errors in our current limited knowledge of the status of our immensely varied and interesting wildlife. The book was formally launched at a most enjoyable party at Blagdon by kind invitation of our President, Lord Ridley.

As we reported last year, the Society has become more actively involved in conservation matters. At the annual meeting members elected Ms Lisa Kerslake and Dr David Mitchell, both experienced ecologists, as members of Council and we are already benefiting from their guidance on these issues. The Society continued to contribute to the Otterburn Inquiry until it closed in October 1997; we understand that the Inspector submitted his report to the Government in July this year and that the Minister's decision is unlikely to be published until 1999. This year our main effort has been directed towards maintaining and improving the wildlife corridor that links Gosforth Park with the open countryside to the north. This enterprise has brought together a diverse and highly constructive group of ecologists, planners and representatives of various 'statutory bodies' who appear (with some touching of wood) to have achieved a remarkable amount of progress in the last few months. Details will be found below in the Gosforth Park report but Council would like to record the Society's gratitude to all who have contributed and to mention particularly the names of Mr Allen Creedy who has chaired the meetings of the group, and Mrs Judith Baker who has done much of the groundwork and has drafted the reports and plans.

We welcomed last year the formation, for the first time in the Society's history, of a Lichenology section. Dr Liz Smith organized this with the help of a small group of enthusiasts, based on her annual Continuing Education classes at the University of Newcastle upon Tyne. Shortly afterwards she was appointed to a busy new post at the University of Northumbria and handed over the leadership of the section to Mrs Janet Simkin; we welcome her as the section's representative on Council. Sadly this gain was balanced by the loss, which we hope will be temporary, of the Entomology section which, as we reported last year, had been struggling

with low attendances. For some years most of the entomological work in the region has been carried out under the aegis of the Northern Naturalists' Union, of which our Society is a member, and is published in their journal *The Vasculum*. We wish the Union well and are glad to offer collaboration and the use of our facilities to maintain local interest in this important field.

As the year drew to an end in July we suffered the double blow of receiving the resignations of Mrs Margaret Patterson who has been the Society's office secretary for twenty-three years, and of Richard Slack, our honorary treasurer, who has been appointed to an important and even busier new teaching job and will not be seeking reappointment at the annual meeting. We congratulate Richard and are very grateful for his exceptionally skilful and conscientious services to the Society for nearly four years. We shall greatly miss them both. Margaret's invaluable contributions to the Society were recognised when she was elected a Trustee and Vice President. Charity law decrees that she is unable to be both an employee and a Trustee of the Society due to potential conflicts of interest. Council would like to offer her its special thanks. We are indebted to her for all that she has done and are delighted that she will continue to be a Trustee and will be available for reappointment as a Vice President, while continuing also with her longstanding voluntary role as Assistant Editor of these *Transactions*.

Our attempt to obtain funding for the development, repair and extension of the museum has met with mixed success this year. A change in the rules of the National Heritage Lottery Fund meant that we were far from having the necessary funds to match the bid we had made to the Fund. Some success was achieved with the Higher Education Funding Council for England but at the same moment the HLF lowered its normal level of funding of museum schemes to £500,000, far below the amount we had requested; clearly the whole plan had to be reassessed. We hope to reach first base by raising funds for the preliminary architectural audit mentioned in last year's report, but at the year's end there was still no certainty even of this. Meanwhile the roof still leaks in rainstorms, the collections remain in desperate need of more and better storage space, the heating system copes only by courtesy of global warming, the library shelves are virtually full and the full-sized *Tyrannosaurus rex* which came for the winter as a most welcome house guest was obliged to camp in a tent in the back yard. We congratulate Mr Alec Coles and Mr Steve McLean and all the museum staff for the way they continue to triumph over adversity but we do invite members to support them in their efforts and to assist the Society in its attempts to solve these rather intractable problems. Steve McLean and Ms Helen Fothergill are also to be congratulated on the absolutely splendid Earthworks gallery which was opened during the year and which displays our geology collections in the most exciting and stimulating way imaginable. If you thought this was not your subject, come and see how wrong you were. The gallery is yet another, and one of the biggest, steps on the road towards making the Hancock one of the best museums in the British Isles. Nor are we the only people to think so. I have left till the last in these preliminary paragraphs the welcome and exciting news that the Tyne and Wear Museums' Natural Sciences and Fine and Decorative Art collections have been designated as outstanding under the Department for Culture, Media and Sport's museum designation scheme. Natural sciences collections are of course largely in the Hancock Museum. This is a triumph for the staff, the University and Tyne and Wear Museums who have all put so much effort into reaching the highest possible standards in the Society's museum. We thank them, and bask proudly in their reflected glory. We have inherited from our predecessors in the Society a magnificent building and magnificent collections. They are being curated, documented and displayed to the highest national standards. It is now our responsibility to make sure that they are protected and used for the benefit of the people of the North-East for many years to come, and also as a stimulus to those people to know, understand and protect the wildlife that is represented in the collections.

MEMBERSHIP

The total membership on 31 July 1998 (with 1997 figures in brackets) was 859 (853). This was made up of 7 (7) honorary members, 40 (41) life members, 514 (514) members who receive *Transactions*, 266 (254) members who do not receive *Transactions*, 23 (25) associate

members, 1 (2) schools and 8 (10) complimentary members. Several people make payments under long-standing bankers' orders ranging from £1 to £12, made when these sums were the current subscription rates, and they are regarded as donors and not members.

The Council reports with much regret the death of three members, Mr A Ibbotson (1967), Professor D M Mennie (1976) and Mr M K O'Brien (1995). The dates in brackets are the years in which they joined the Society. Professor Mennie was a member of Council from 1985-88.

COUNCIL

At the annual meeting on 28 November, in addition to the election of Viscount Ridley as our President, two members were elected to Council, Ms Lisa Kerslake who is the Conservation Manager for Northumberland Wildlife Trust and Dr Dave Mitchell who is the Ecologist for North Tyneside Environmental Function. Mr Ken C Patterson retired from Council by rotation.

PUBLICATIONS

In the autumn the Society's 1997 annual report was published as Volume 58 Part 1 of the *Transactions* and in the spring the *Red Data Book for Northumberland* was published as Volume 58 Part 2. In the introduction this is discussed as a co-operative venture between the Northumberland Wildlife Trust and the Society. Council would like to thank the numerous contributors to the text, and particularly Mr Allan Potts for his excellent photographs, Mrs Joan Holding for her art work and design help and English Nature and Northumberland County Council's North Pennines Project for their generous financial support (two grants which are mentioned under Finance). At the same time 'Birds on the Farne Islands in 1997' by John Walton was produced as part 3 in time for the summer season at Seahouses. For the first time there was a coloured front cover which featured 'Elsie', the lesser crested tern, and her colour-ringed hybrid offspring which had been sighted in France.

STAFF AND MANAGEMENT

The Society relies on a combination of paid and voluntary workers to achieve its objectives during the year.

Mrs Helen Dalrymple moved from her voluntary role to being a member of staff in order to cover the office hours that Ms Hammock was unable to work. She is in charge of the binding of journals and also undertakes the normal day-to-day jobs of dealing with queries and membership.

Ms Tricia Hammock's decision this year to return to full-time education and take a degree in Environmental Management meant that she was not able to continue as one of the staff who run the office between 10.00 and 1.00 each weekday. However, as an experiment, she decided to continue her responsibilities for the covenants, bankers' orders and exchange of periodicals with other organisations around the world. This has proved very successful and she will continue to undertake this work in the future.

Mrs Joyce Jones continues to be responsible for the day-to-day office finance and helps in general clerical duties.

Mrs Margaret Patterson has continued her invaluable secretarial work and her voluntary work as assistant editor of the *Transactions*. The Society is also particularly indebted to her for her work on editing 'Birds on the Farne Islands in 1997' and the current annual report. Margaret has worked for the Society for twenty-three years and during this time her importance to the office has increased and her knowledge of Society affairs always assists at meetings and discussions. Among other things she has been responsible for taking the minutes of the Council and General Purpose Committee meetings. She worked with Mrs Grace Hickling until Mrs Hickling's sudden death in December 1986 and during that time she learned editing and proof reading to a high level of competence so that the Society and other voluntary organisations have benefited from her experience for many years. In 1987 Margaret was faced with running the Society office until a Secretary could be appointed to replace Mrs Hickling. For over a

year she and her colleagues organised both the summer and winter programmes and kept the Society running smoothly. With the appointment of Mr David Noble-Rollin in January 1988, her role altered to educating the new Secretary in the numerous jobs and systems used by the office. While this was going on the Society was working on the publication of the *Flora of Northumberland* and Margaret typed the whole of this at least twice before it was put on to computer, when she typed it again. For the next few years until it was published the *Flora* dominated her work with re-writes, updates and corrections through the numerous proofs and page layouts. Throughout these years she often worked late into the night getting text ready for the following morning, never complaining at the volume or difficulty of the work. Since then she has been part of the small dedicated team that produces the *Transactions* and her input as assistant editor and main proof reader has continued to maintain the high standard that we have come to expect from these publications. In July Margaret decided to retire from her office duties but continue as a Vice President and Trustee. She will also continue her voluntary role as assistant editor.

Mrs Janet Angel continues to assist in analysing the logbooks from Gosforth Park. She comes into the Society's office periodically to collect the information and a month or two later returns with detailed lists of species seen etc.

Mr and Mrs Hugh Chambers staff the library every Wednesday and continue their cataloguing work. When Mr Chambers assembled a new computer he kindly donated his 'old' machine to the library, thus making the book and periodical index compatible with Windows 95.

Miss Barbara Harbottle has also volunteered to help and is working with Mrs Wolland on the enormous backlog of resightings and recoveries of ringed Farne Island birds. During this year she seems to have been bogged down in eider ducks, which she claims are very boring birds as they never seem to go anywhere!

Mrs Joan Holding has continued her voluntary help in preparing the illustrations for the *Transactions* and we are indebted to her for her work on the cover of the *Red Data Book*, as well as her beautiful drawings which were used inside the book. In addition to this she has worked many hours preparing illustrations for the bulletin, and undertaken other graphic tasks requiring her special skills.

Mrs June Holmes continues her work to produce the catalogue of the manuscripts and other archival papers held within the museum and **Miss Ann Stephenson** has been assisting by preparing the archive material ready for cataloguing. The Bewick catalogue is now complete and progress is being made on the other material.

Mrs Anna Newson finished upgrading the catalogue of the contents of the *Transactions* and as she was looking for a job decided that this was a suitable moment to stop her voluntary work for the Society. She has worked in the office for many years and we would like to wish her every success in her career.

Dr Anne Wilson has joined the volunteers who contribute regularly to the work of the Society. Her main task is in cataloguing the diaries of Russell Goddard and Grace Hickling which have not been looked at systematically. However, her most important contribution to the success of the Society this year was the preparation of the index and gazetteer for the *Red Data Book*, which with considerable help from **Miss Heather Weatherill** was completed to a very tight set of deadlines.

Mrs Rita Wolland, who retired two years ago from the office staff, kindly agreed to return on a voluntary basis to help with the growing work on the returns from the Society's ringing activities. Her expertise in understanding the filing of schedules and recoveries is greatly appreciated. She has also prepared maps of the distribution of members on Tyneside which will assist in organising more efficient delivery of our publications by our invaluable volunteers.

Without the support and help of this dedicated team of volunteers and staff the Society would not be able to undertake so many commitments, and Council would like to thank them all for their contributions throughout the year.

HANCOCK MUSEUM

It is pleasing to report that after the disappointments of last year the Hancock has had a very successful year, with over 170,000 visitors. This was due to the staging of three major blockbuster (how I hate that term!) exhibitions.

The first of these was of course *Star Trek – The Exhibition*: not everyone's cup of tea admittedly, but a great commercial success nonetheless. This was followed by the return of *Dinosaurs Alive!* and the creation of the now legendary *T. rex* hut. Still running successfully at the end of this year is another re-run in the shape of the *Monster Creepy Crawlies* exhibition. In terms of capital developments, the great success of the year was, of course, the opening of the new *Earthworks* Gallery. Large numbers of visitors do not arrive without impact, and I would like to pay tribute to Mr John Pratt and Mr John Connell and their attendant staff who have coped magnificently, particularly given the added pressure of being without cleaning staff for much of this period.

The most frustrating part of the year has been the lack of progress with the capital development scheme (the basis of the original Heritage Lottery Fund application). It was impossible to put together a realistic business plan for HLF once it became clear that we needed to demonstrate the existence of matching funding for the scheme, ahead of commencement. Following several changes in the guidelines for HLF applications, and a reduction in the amount of money available, it has become clear that the original development scheme will have to change radically, and that it will be necessary to identify significant funds from a variety of other sources. One good thing that has been born of this adversity is the creation of a small group of Natural History Society members, under the chairmanship of Mr Eddie Slack, to look at fund raising options.

On a brighter note, the announcement, in June, that the natural history collections managed by Tyne and Wear Museums (and by implication the Hancock's collections) have been designated under the Government's Museum Designation scheme, could hardly have been more significant. In achieving designated status, the collections are placed firmly in the premier league of such collections in the UK. Ironically, it should now re-strengthen our call on HLF funds.

New Galleries

Earthworks *Earthworks* is the new interactive geology gallery at the museum and is notable not only for its multi-sensory approach to learning, but also because it displays unprecedented numbers of high quality specimens from the museum's collections, including some type and figured specimens. The gallery was opened by Mr Bob Johnson (The North East's Favourite Weather Man!) on Thursday 29 January. A preview of the gallery was given to visitors over the Christmas period and this served as a test-bed for the interactive displays, some of which were adjusted as a result of the observations over this period. It has made an immediate impact and has received an enthusiastic welcome by visitors, and in reviews in professional journals. The gallery was masterminded by Mr Steve McLean and Miss Helen Fothergill, and was designed and produced by our old friends at Redman Design Associates. All three deserve credit for a superb addition to the museum's facilities.

Ancient Greece *A Visit to Ancient Greece* has been installed in the balcony cases above the main exhibition gallery. This small, new display features items on loan from the Laing Art Gallery, and the University's Shefton Museum, along with supporting graphics and work generated by children. The display is designed to support the *Time Travellers to Ancient Greece* living history activities that have been so popular with schools.

Temporary Exhibitions – The Blockbusters

This year was unusual in that it featured three major exhibitions during the period. This explains the very healthy visitor numbers:

Star Trek - The Exhibition *(14 June-14 September)* By the time that it ended, this exhibition had attracted nearly 70,000 visitors in just three months and this during the usually unreliable summer period. Despite its fictional nature it did form the basis of very successful schools' activities looking at Space. Schools apart, the exhibition attracted a very different audience from that normally recorded at the Hancock: nor surprisingly, there was a notable increase in the proportion of young single males!

Dinosaurs Alive! *(20 October-26 April)* The dinosaurs, as predicted, were not the attraction that they were first time, but they were still more popular than any other exhibition (except dinosaurs first time around!) The star of the show was, without doubt, the life sized *T. rex,* appearing for the first time ever in a UK museum – another first for the Hancock.

Monster Creepy Crawlies *(21 May-6 September)* Despite being another re-run of a previous exhibition, this proved a great success with schools during the summer term. The newly launched *Magic Radio* (formerly GNR) provided sponsorship and promotional support for this exhibition which we gratefully acknowledge.

Temporary Exhibitions – The White Room Programme

The museum's small white-space gallery on the first floor has played host to several interesting exhibitions over the year, including some selling exhibitions. Thanks are due to Mr Eric Morton who has been responsible for the installation of these exhibitions.

Jason Skill - Making Waves *(12 December-20 February)* This has been the museum's most successful commercial exhibition, with paintings to the value of nearly £2,000 being sold. The exhibition featured a variety of seascapes and coastal themes. It was supported by exhibitions on marine conservation.

Simon Terry *(12 March-31 May)* Simon works in a variety of media, and has used the Hancock extensively as a stimulus for his work. The artist has received support from Northern Arts for this exhibition.

Bridget Kennedy - Observations *(11 June-4 October)* Bridget worked with Eric Morton on the museum's lepidoptera collections, and has created an impressive stained and etched glass installation based on her observations of the collections and also received support from Northern Arts.

BG Wildlife Photographer of the Year 1998 *(12 December–26 January)* We were delighted to host the first showing of this exhibition outside London.

Education Activities

As ever, the museum is indebted to our education officer, Miss Gillian Mason, for her unstinting work in developing a full, creative and popular programme of both formal and informal activities.

Schools The Time Travellers' activities dealing with Ancient Egypt and Ancient Greece have been as popular as ever, although it remains to be seen what effect the changes to the National Curriculum will have on them. The main area of additional activity with schools has been the new *Earthworks* geology gallery. The teachers' preview evening for the gallery attracted some sixty teachers including at least half who are teaching science at Key Stage 3 (materials and properties), which is a new audience for the museum. A new resource pack has been launched to support the gallery. In order to stimulate interest a number of special supervised activities for KS2 were arranged over a two week period. These were fully booked, showing, once again, the potential for more contact time with education staff. The themed sessions included rock identification and fossil handling.

Informal Sessions As ever, there has been a full programme of drop-in and bookable activities, most of which were included in the museum's Family Fun programme. Craft days and cartoon workshops on the theme of space were organised to coincide with *Star Trek: The Exhibition* and attracted over 350 children. Similar programmes were organised to coincide with *Dinosaurs Alive!*, *Monster Creepy Crawlies,* and of course *Earthworks.* Altogether seventeen workshops for children were held with such titles as *Ink Blot Aliens*; *Star Prints*; *Dinosaur Disguises; Earthworks* (a look at the latest exhibition and activities showing how the continents move and making miniature model volcanoes and fossil casts); *As Time Goes By*; *Dino Eggs*; *Going Greek*; *Nile Style* and *Bugs on Parade.*

Adult Education and Training Miss Gillian Mason attended a three-day GEM Conference in Cardiff on the theme of Museum Educators in Exhibitions. Together with two colleagues from Tyne and Wear Museums, she presented a seminar entitled *'Access, People and Participation'*. This looked at the three different projects demonstrating audience consultation and participation in the planning of exhibitions. Mr Alec Coles visited the United Arab Emirate of Sharjah for a week, as part of a small team representing North East Museums, delivering staff development and training to the museum staff responsible for running the facilities in what is recognised as the cultural capital of the Gulf. He was responsible for providing training in management and marketing for the museum directors. Mr Steve McLean organised a study visit to the Belgian Royal Institute of Natural Sciences in Brussels on behalf of the UK Geological Curators Group.

Access It is particularly pleasing to highlight improvements in access at the Hancock, most notably the installation of an induction loop, by BT in association with RNID, and the provision of visible fire alarm signalling (for visitors with auditory impairment) through grants from Railtrack ADAPT and NEMS. As part of Tyne and Wear Museums Access Policy, a general Access Guide to the Hancock is now available, and a wheelchair has been provided for use by visitors with mobility difficulties.

Collections Management and Research

Ethnography cataloguing project Probably the most significant collections management work through the year has been the cataloguing of the museum's important collections of Oceanic ethnography under a scheme funded jointly by NEMS, the Jerwood Foundation and the Museums and Galleries Commission. This work has included identification and description of individual items, re-storage, conservation of particular items, documentation, photography of selected items (including digital imaging) and valuation of individual items (for insurance purposes.)

Mrs Janet Starkey has carried out the work under a short-term contract (Janet had worked with the museum when she was peripatetic ethnography curator for NEMS). Illustrations will be added for full publication; the Internet version is at an advanced stage and it is hoped that both versions of the catalogue will be published by the end of the year.

Historic collections research Les Jessop has supervised the Oceanic project and has successfully transformed himself into an instant ethnographer (!). Largely as a result of his work on the ethnography collections, seventy items that belonged to the Allan Museum have now been identified. This represents some of the earliest material in the museum and forms the basis of the Hancock's original collections from the turn of the eighteenth century.

Type and Figured Fossil Vertebrate Catalogue This has now been successfully installed on the Hancock Museum's pages on the World Wide Web and is available to researchers. Thanks are due to Darren Hudson, one of the co-authors, for the production of the Internet version.

Improved geology storage The completion of a new geology store has greatly improved the storage facilities for this collection and provides much-needed room for new acquisitions.

Volunteer and Work Experience placements The involvement of volunteers, mainly students requiring work-experience ahead of their Museum Studies courses, has contributed towards backlog cataloguing that would otherwise not have happened. Collections that have

benefited from this work have included 35mm photographic transparencies, paintings, mammal records and mineral collections. Work on osteology, entomology and botany continues, carried out by Mrs Paddy Cottam, Dr Roger Stobbart and Mr Ronald Cook.

Environmental records Considerable progress has been made in the processing of environmental information on the RECORDER database through the use of key volunteers. Response times to enquiries of the database have also decreased due to the availability of more sophisticated equipment. Work on Professor Swan's flora records from Northumberland has begun.

New cataloguing initiatives A grant-in-aid has been offered through NEMS to enable the museum to employ two part-time cataloguers to labour on the backlogs of geology and botany collections and work on these projects will proceed in the next year.

Principal accessions

Osprey skeleton – collected by Eric Morton (museum staff).
Roe deer skeleton – gift (John Steele).
Whale vertebra and sawfish saw – gift (I Barnes).
Sperm whale tooth – gift (P Kelly).
Capercaillie head and neck bones – purchased at Bigg Market, Newcastle.
Axe from Luba Province, Zaire, found in Blyth thirty years ago – gift (E Morton).
Seventeen artefacts from southeastern New Guinea, collected in 1973 – gift (R Anderson).
A selection of rocks from Northumberland – gift (Brian Young, British Geological Survey).
A selection of Northern Pennine Minerals – gift (Trevor Bridges).
Part of a fossil tree trunk of the genus *Cordaites*, Priors Close Opencast, Co Durham – gift (R J Budge Mining Ltd.).
Stigmaria sp., a fossil tree root from the Carboniferous Coal Measures – gift (Mr Zabrocki).

The Society is grateful to the donors and collectors for these valuable additions to the collections.

Admission Fees for Special Exhibitions

During the year, the Council of the Natural History Society endorsed the principle that members of both the Society and the University should pay a fee to visit blockbuster exhibitions, equal to the difference between the increased charge and the normal (non-blockbuster) charge to the museum. It was with some reservations that the Management Committee made this request, but it reflects the ever tighter financial circumstances of the museum, the increased cost to the museum, and the benefit to the visitor (over and above the normal level of service) of staging large exhibitions.

Touring Exhibitions

The Hancock has continued to tour exhibitions and *Claws!* appeared at Warrington Museum and Bolton Museum, and has just opened in the Yorkshire Museum for the summer as part of an arrangement that will bring York's exhibition *Venom* to the Hancock in the new year. James Alder's *Birds and Flowers of the Castles of Mey and Balmoral* appeared at the Bowes Museum in Barnard Castle, and at North Berwick Museum.

Grants

The following grants have been offered by NEMS:	£
Second round for 1997-8:	
Cataloguing of oceanic collections	4,000
Interpretative materials for dinosaur exhibition	2,000
Conservation of funerary figure	750
Purchase of freeze dryer	750
Valuation of key elements of ethnography collections	250

Production of geology resource packs	200
First round for 1998-9:	
Upgrade of environmental control system	300
Purchase of storage materials	400
Contribution to marketing strategy	2,000
Installation of visual fire alarm signalling	2,200
Appointment of documentation assistants	7,000
Other Grants	
Jerwood Foundation/MGC	
Cataloguing of oceanic collections	4,000
Railtrack ADAPT	
Installation of visible fire alarm signalling	2,253
BT	
Installation of induction loop systems in the museum	In kind
University of Newcastle upon Tyne	
Security grant	1,000
Conservation fund allocation	1,200
Sponsorship	
BT	
Star Trek – The Exhibition (also listed in last year's report)	10,000
Magic AM	
Monster Creepy Crawlies	10,000
The Sponsors Club	
Monster Creepy Crawlies	2,500
Image et Volcans	In kind
Moana Productions	In kind

Staffing One of the pleasures of the year is to report that the staff complement has largely stayed the same! Mrs Fiona Fenwick has been promoted to the post of Senior Curator's Assistant (part-time), and a welcome addition to our number has been Miss Nicola Curry, who has joined us as part-time clerk typist. We have been sorry to say goodbye to our cleaning staff Mrs Freda Rafferty and Mrs Jillian Ramsay. Following their departure we have contracted in the University to carry out the cleaning duties on-site. We also finally said goodbye to Mr Kevin Hughes who, whilst still working for the City Council's IT sections, is no longer seconded to TWM.

The current staffing complement (with part-time staff marked with asterisks) is:

Alec Coles (Senior Curator and Principal Keeper, Natural Sciences)

Steve McLean (Curator and Senior Keeper Natural Sciences)

Les Jessop (Keeper of Biology) *Based at Sunderland Museum*

Helen Fothergill (Assistant Keeper, Geology) *Based at Sunderland Museum*

Eric Morton (Assistant Keeper, Biology)

Kirsty Ramshaw (Biology Assistant)*

Gillian Mason (Education Officer)

Fiona Fenwick (Senior Curator's Assistant)*

Nicola Curry (Clerk/Typist)*

Kevin Hughes (Environmental Recording and Cataloguing Assistant)

John Pratt (Chief Attendant)

John Connell (Senior Attendant)

Sean Dykes (Full-time Attendant)

Anne Aspery (Attendant)*

Gavin Lockey (Attendant)*

Ingrid Solberg (Attendant)*

Volunteers The band of volunteers who carry out vital work, both on the collections and behind the scenes, has included the following:

Janet Angel Transcription of Temperley diaries
Lucy Bolton Geology curation
Trevor Bridges Mineralogy curation
Peter Burke Education support
Katherine Calder Art collections
Amelia Campbell Biology cataloguing
Helen Cheetham Environmental recording
Ron Cook Botany/oology curation
Paddy Cottam Osteology curation
John Durkin Biological recording
Marilyn Elliott Biological recording
Michael Frankis Northumberland bird records
Caroline Gofton Geology collections
Darren Hudson Internet publishing
Maria Maranzo Ethnography research and curation
George March Geology documentation
Melissa Murphy Education support
Alan Pringle Mineralogy curation
The Russell Society Mineralogy curation
Louise Sherrington Education/photographic collections
Roger Stobbart Entomology curation
Alex Urquhart Education support
June Waites Education
Matthew Wasserman General documentation
Julie Watson Biology curation
Helen Wilkinson Mineralogy curation
Gordon Young Environmental recording
Malcolm Woodward Mineralogy curation

MUSEUM MANAGEMENT COMMITTEE

The Committee wrestled this year with the difficult issue of asking members of the Society to contribute to the high cost of hiring major temporary exhibitions. These events are undoubtedly a major source of the museum's wide popularity in the region and a focus for the publicity which attracts crowds of visitors. At their most successful they make a great contribution to the museum's running costs. But owners drive hard bargains and at one such exhibition the museum had to pay the owner a sum for each visitor whether they paid for admission or not. The policy of free entry for members thereby lost the museum a lot of money. The Committee therefore took the decision, approved by Council in July, to retain free entry for members to the Society's own collections but to charge members for entry to major exhibitions the amount of the surcharge over the ordinary public entry fee.

At its last meeting we learned that Professor Richard Bailey, who has chaired the Committee for many years, was to retire. He has been an exemplary chairman but in addition it was he who, as the Pro-Vice-Chancellor with responsibility for museum matters, devised the University's strategy when it was forced to cut its financial outlay to the Hancock. The transfer of the management to the TWMS and other changes which he introduced have proved most successful both for the University and for the Society. We owe a great debt to Professor Bailey for the thoughtful and caring way in which he devised, proposed and carried through the changes.

FINANCE

The surplus for the year is £689, compared with a surplus of £3,059 for the year ended 31 July 1997. The principal changes behind this reduction are shown below (with negative amounts in brackets):

	£
Increase in *Transactions* expenditure	1,126
Increase in appropriations	3,400
Increase in postage and telephone	622

Decrease in research external funding received	1,963
Decrease in sales of *Transactions*	1,295
Less:	
Savings made on printing and stationery	(566)
Contributions to *Red Data Book* publication	(3,200)
Savings made on Gosforth Park Nature Reserve	(580)
Increase in investment income	(1,238)
	2,822
Less net savings on other headings	(452)
Overall reduction in surplus (£3,059-£689)	£2,370

Although there was an overall reduction in the surplus, £3,400 has been set aside as an appropriation for future work in Gosforth Park Nature Reserve. During the year ended 31 July 1998 work on improving the boardwalks was carried out which was financed with the help of £2,400 transferred from the Restoration Fund, resulting in a net increase of the Gosforth Park Nature Reserve Restoration Fund of £1,000. The reserve continues to be a major asset of the Society and it is imperative that provision is made for future development and improvement.

The library book collection continues to be updated as well as money being spent on binding. This is a major activity of the Society alongside other activities such as Gosforth Park, *Transactions* and Coastal Research.

Two major *Transactions* were published during the year, volume 57 part 4 and the *Red Data Book for Northumberland*. The Society received contributions for the publication of the *Red Data Book* of £1,400 from English Nature and £1,800 from Northumberland County Council's North Pennines Project. The Society is very grateful for these contributions, the grant from Newcastle University and other donations received during the year, which make possible the continuation of the Society's wide range of activities.

During the year ended 31 July 1998 an overall review of the Society's investment portfolio was carried out in consultation with Wise Speke. The aims of this were to establish a balanced portfolio of both narrow and wide range investments and to provide an income base through dividend and interest receipts. The review led to a partial reorganisation of the portfolio which gave rise to the following realised gains on investment disposals:

	£
General Fund	1,223
T B Short Memorial Fund	41,449
Grace Hickling Memorial Fund	33,219

The sales proceeds from disposals were reinvested within the funds. The investment portfolio is shown at market value in the Financial Statements. The market value at 31 July 1998 was £618,530 compared with its cost of £359,455, the difference of £259,075 being shown as a revaluation reserve.

Due to a change in personal circumstances the current Honorary Treasurer will not be standing for re-election at the annual meeting.

INDEPENDENT REVIEW

The financial statements to 31 July 1998, independently reviewed by Mr R Bunter of PricewaterhouseCoopers, were approved by Council on 16 October 1998. Council gave its approval for an independent review at its meeting on 17 April 1998.

LIBRARY

This year one hundred and four books, six offprints, two comprehensive Gosforth Park studies and two runs of journals have been added to the library. Forty-three of the books were donated and we must thank Mr Peter Davis, Dr David Gardner-Medwin, Mr Trevor Hardy, Mrs June

Holmes, Mr Les Jessop, Mr Jim Milligan, Dr Dave Mitchell and others for their donations. The books purchased included six County Red Data Books, *The Flora of Cumbria, Fossil Reptiles of Great Britain, Geology of Hadrian's Wall, Breeding Birds of SE Scotland,* a collection of contemporary nature conservation publications and some very good new bird books. More than 300 items of serial publications (*Journals, Transactions* etc.) were received from more than sixty sources by exchange, subscription and donation.

The library evening was on 23 January when Mr Peter Davis gave an enthralling talk, delving into the museum archives and collections to explore aspects of the lives and passions of some of the notable collectors.

The library has been open every Wednesday during the year for use by members, researchers and students. Library committee members staffed the opening during the hour before Friday evening meetings.

During the year the library continued to be serviced by dedicated voluntary effort. Although Mrs Helen Dalrymple joined the office staff she was still able to continue with arranging the binding of journals and periodicals, and this year more than forty volumes were bound to become a permanent part of our collection. Ms Tricia Hammock recorded incoming periodicals and generally dealt with the exchange arrangements with other organisations around the world. Dr Alick Walker did essential work in organising the Palaeontographical Society Monographs for binding. Mrs Helen Roscoe helped with the never-ending task of cataloguing. Mr Trevor Hardy worked steadily on his winter task of reviewing the ten thousand geological off-prints from the University that have been entrusted to our care. Mr Richard Slack paid our bills and made sure that we kept reasonably to our budget. The direction of library affairs is controlled by the library committee which meets four times a year: the members are Mr Hugh Chambers (chairman), Mrs Paddy Cottam (mammals), Mr Peter Davis (marine biology), Dr David Gardner-Medwin (history of natural history), Mrs June Holmes (archives), Mr Les Jessop (entomology), Mr David Noble-Rollin (ornithology), Mrs Joyce Parvin (secretary), Dr Alick Walker (geology) and Dr Trevor Walker (botany). While Mr Jessop and Mr Davis find it difficult to attend the meetings they are always available with ready help and advice. The Society thanks them all for their efforts.

CONSERVATION

In last year's report the Society was much involved in the reaction to the draft Unitary Development Plan for North Tyneside. The result of this was the formation of a Gosforth Park/Cramlington Corridor Workshop which was a gathering of statutory bodies and conservation organisations in an effort to create a new approach to the problems of each Authority preparing development plans in isolation; a cross border strategy was proposed. By January the workshop had produced a draft 'Wildlife Corridor Action Plan' and the launch received both television and press coverage and created debate and comment. A very high percentage of the comments were in favour of the plan. The consultation with landowners to begin implementing the necessary changes to allow usual movement between Gosforth Park and Northumberland was under way by the summer, and by August much progress had been made. It is hoped that this type of co-operation can be repeated in other localities and the work done by the consortium can be used as a bench mark study of how to achieve co-operation to enhance the survival of urban wildlife.

The Society was also involved in the formation of the refuge area in the Lindisfarne National Nature Reserve which will be dealt with later in the report. The other main input is through work on various committees, in particular the Biodiversity Action Plans that are being prepared for Northumberland, Tyne & Wear and the Borders.

ACTIVITIES

Ornithology section The indoor meeting programme began when Mr David Noble-Rollin gave a talk on 26 September on 'Habitat Photography' in which he outlined ways in which members could improve their pictures of what is often considered by naturalists an afterthought

i.e. the habitat of the particular group of fauna or flora that they are studying. The lecture was aimed to appeal to members of all the sections of the Society. This was followed on 3 October by the Pybus Memorial Lecture 'Strangers in our Land' given by Mr David Cottridge. This was a return visit of a very popular speaker who was talking about one of his favourite subjects, the occurrence of rarities in Britain. As usual the talk was illustrated by his superb slides. On 14 November the final autumn meeting of the section was another superb show of photographic expertise when Mr Allan Potts presented his 'North American Show Case', an audio-visual presentation using three projectors, music and natural sound effects.

On 9 January Mr Brian Galloway gave a personal account of his studies of 'European Raptors'. His talk covered both his adventures when looking for birds of prey and his studies of local populations in Northumberland. 6 February brought a return visit by Mr Eric Bird, who is always popular and who this time talked on 'New Zealand and Beyond', his adventure in the Southern Ocean in what looked like a rather small boat. It sounded more like an endurance test than a holiday. Everyone seemed to enjoy the evening. The programme ended with Dr Vladimir Kolbinsev talking about his eight years as a research scientist at 'The Aksu-Jabagli National Nature Reserve in South-east Kazakstan'. His talk ranged over all aspects of the natural history of the area and gave an insight into some of the more remote areas of this fascinating region.

The field meetings began on 5 August with 'Nightjars' or at least that was the object. However, about eighteen members tramped through conifer woods to the spot and stood in silence for a couple of hours before returning to their cars. Everyone enjoyed the night walk but it would have been better with some nightjars!

'Nightjars' was followed by the Pelagic Cruise on Sunday 31 August, again jointly organised with the North Northumberland Bird Club. The next meeting was cancelled due to lack of support: only twelve people booked for Fairburn Ings and Blacktoft Sands and so it was not viable to hire a bus. The annual trip to Holy Island on 25 October was better attended and there was the usual rich mixture of anticipation and excitement; most agreed it was a day of birds of prey with close encounters of both peregrine and merlin.

On 24 January the section went to Aberlady Bay and Musselburgh and were lucky enough to see a surf scoter as well as having good views of both common and velvet. There were other birds but this American vagrant was the highlight of the day.

In February members went to Loch Ken and Murray's Monument. The numbers of geese seen were very good and the party had excellent views of white-fronted. Although the two field meetings just mentioned were successful the numbers of members going meant that both ran at a loss so the section put on a coastal meeting in April that was based on cars. About twenty people turned up and had an enjoyable afternoon birdwatching in the Cresswell and Druridge Bay area. This was followed in late May by an early morning walk in Gosforth Park Nature Reserve and a ringing demonstration. It was a beautiful morning and about a dozen members were able to watch how the ringing group ring and process the birds while listening to the full song of a reed warbler close to the ringers' hut.

On 6 June the group took twelve cars up the College Valley and tried to avoid the rain. This was successful until the members reached the Bizzle where they stood in the pouring rain discussing the size of the raindrops and other exciting topics. Their patience was rewarded by a sight of ring ouzel and a stoat taking a mouse to its young. The final outdoor meeting of the year was supposed to be to Leighton Moss but once again numbers were too small to hire a bus. From the above summary it appears that there is a change taking place towards smaller groups and the bus trips with twenty-five or more members are now less likely to take place. This is the second year that the section has had to report cancellations in its field meetings and every bus trip during this year lost money. At present there is no apparent improvement in the bookings for meetings for the next financial year.

Mammal section The evening meetings for the mammal section were held in combination with the Northumbria Mammal Group. They began on 24 October with a talk by Dr Steve

Rushton about bats at Brinkburn Priory - an interesting look at how disturbance to the bats by the local music festival had meant that it had to be held before flying time. The next talk, on 30 January, was by Mr Peter Eccles on roe deer, the problems that they pose to modern forestry practice and methods for controlling damage. The last meeting was on 27 February and was by Mr Andrew Hooton, updating the Society on the Northumberland Wildlife Trust's otter survey carried out in 1997. As with previous otter talks it painted a successful picture of recovery, with otters on every river system in Northumberland.

The summer field meetings began with badger watches organised by Mr Bob Wilkin and Mr Paul Drummond. The first night of the badger watches was under ideal conditions. A visit to a satellite sett was made earlier in the evening to look at badger signs, including footprints, feeding areas, paths and latrines and a brief history of the badgers in the reserve was given. The first appearance at the main sett was around 8.15pm. It was the old boar who greedily ate the small amount of bait that had been left out before wandering off to do his rounds. A short time later an assortment of adults and cubs of different sizes appeared in the now-growing darkness. The numbers seen were debatable, eight, nine, ten? Grey and white dark shapes appeared and disappeared and as the cubs gained confidence (at intervals the adults did wind the watchers) they explored, tumbled and played around the sett. A fox was seen west of the sett. Unknown to the first group of watchers, an active fox earth lay behind them. Last year the earth was in full view, but vixens will often change their dens for reasons of cleanliness. Later groups had views of both badger and fox families but conditions were not as good as on the first night. Nine people attended over the three nights.

We as members are very fortunate to have access to this valuable reserve which faces pressures in many forms yet still comes up with a wide variety of wildlife. Credit must go to the management committee, to Paul and Mary Drummond, to all the voluntary wardens and helpers and to all the work done by UFAMS that allows this reserve its continuity over the years.

The next meeting, an otter outing with Mr Bob Wilkin, had to be cancelled due to lack of numbers. This is most unusual as otters are normally very popular subjects.

The Northumberland Mammal group had asked the Society to put on a training night for small mammal trapping and this happened on 21 May. Six members of the mammal group turned up to go through mammal trapping procedures and to empty traps. The procedures were fine but unfortunately the small mammals were not so co-operative and only one common shrew was caught and subsequently released.

Geology section There were six lectures during the winter, beginning in October when Mr Ken Patterson, the section secretary, gave an illustrated talk to some sixty members on 'An overview of the geology and scenery of western Canada and Alaska'. His talk included aerial slides of Greenland and northern Canada, a visit to Glacier Bay and a train journey on the Yukon and White Pass Railway from Skagway. He explained how much of Alaska was a collection of quite different terrains which had been brought together since the Carboniferous by plate movement. His travels took him to Field, British Columbia, where he was able to handle and photograph fossils from the Burgess Shales at the Tourist Information Centre in the Yoho National Park.

During November Dr K Thomson of Durham University, who was scheduled to give the talk, lost his voice, and the section was fortunate in filling this void with a colleague of his, Dr Howard Armstrong, who volunteered to come at very short notice. He brought with him some models of conodont fossils and explained that this fishlike animal must have been a very early vertebrate, related to Pikeia, a simple vertebrate from tbe Burgess Shale. Dr Armstrong was very convincing and suggested that the modern hagfish is the nearest living relative. Forty members had turned up to hear about the geology of the Falkland Islands and the search for oil, but went home contented by this revelation on a new species of animal.

Dr Brian Turner, also from Durham University, visited the Society in December to give a lecture to fifty members on 'The Table Rock Sandstone'. He explained how this and several

other sand bodies were Crevasse Splay deposits, which he linked to the types of sediment sequences which could be expected when these beds were being formed. He then examined more closely the Table Rock Sandstone at Whitley Bay. What to us had been a simple sequence of sandstone with some concretions took on a new meaning when he was able to correlate the cliff sections with his theoretical work on river deposits.

The first lecture of the new year was by Dr Gill Foulger who specialises in volcanic activity and has travelled widely. Her talk was specifically on the volcanoes of Iceland and how such activity differed greatly because of the glacial cover there. She explained the siting of the mid oceanic ridge over Iceland and the depth and source of the magma. Her talk was illustrated by slides of the island and she had also brought video tapes of the volcanic activity. The viewing was spectacular and the audience of seventy was keen to ask questions at the end of the talk.

In February Dr John Timney took his audience of fifty-six 'Around the Solar System'. This was done with a collection of colour slides, many of which were obtained through NASA. The slides were of excellent quality and showed the planets and their surfaces, including the rings of Saturn. His lecture showed that he was extremely knowledgeable about the properties of these bodies and his talk took members through a journey from the outer limits of the system to the surface of the sun.

The winter lecture series concluded with a visit by Professor Roger Searle, who had recently returned from another voyage to explore the sea floor to the ocean ridge of the Mid Atlantic. He showed how the expedition had been planned, the submersible which was used and showed photographs from the sea floor. His imaging equipment and the techniques employed were explained and finally members were shown some of the computer-enhanced imaging of the ocean floor. Professor Searle then proceeded to analyse the data and explained a model to show how the mid oceanic ridge grows. The audience of sixty members asked many questions which Professor Searle answered extensively.

The summer meeting in September 1997 was cancelled at the last moment due to the illness of the lecturer, Dr Colin Scrutton.

In South Tyneside College planetarium on Friday 3 October, Mrs Eva Marie Hans took eight members around the galaxy, which proved a lively experience. During the afternoon, with the weather being favourable, Dr Mick Jones was able to take the group along the foreshore to examine some of the Permian rocks of the Durham coastline.

The first summer outdoor meeting in May 1998 was with Dr David Land, a retired member of the British Geological Survey, and was a visit to view the Edinburgh Volcano in Holyrood Park. This took place on a brilliant summer's day, something quite rare in 1998. Dr Land led the group of fourteen members around the Park, to be joined by a number of foreign visitors who were interested. He had been responsible for mapping much of this area and was the prime producer of a pamphlet of the Park, which most of the group purchased and used during their visit.

The June visit was led by Dr Colin Scrutton to the Port Mulgrave-Staithes section of the Yorkshire Jurassic. Though there were only nine members present they had a full day looking at the fossil zones, the ironstone seams and the sediments of the Staithes Sandstone Formation, the Cleveland Ironstone Formation and on top the Whitby Mudstone Formation containing the Grey and Mulgrave Shales which is one of the classic sequences of the Yorkshire coast. Along the shore, members were able to study the sedimentary structures, find monospecific shell coquinas of Protocardia and identify the Ammonite Biozones. Dr Scrutton pointed out the remains of a fossil vertebrate along the way. Many fossils were collected and identified before the group finally arrived a little exhausted after the steep climb up to their cars parked on the cliff top at Port Mulgrave.

The July expedition was to a little-visited part of the Lake District, south of Shap, in Swindale. The object was to examine the glacial features under the guidance of Dr Angus Lunn. Despite a difficult route-finding exercise after passing Shap, the party walked up the road for two miles, pausing to view the features of the valley. Hanging valleys lie above the main floor and at their

bases hummocky moraine was seen cut by the rivers. Dr Lunn proposed various explanations of how these features had been caused in the late Devensian during the Loch Lomond Stadial. It appears there are at least five current explanations, each of which could be used to show how the moraine debris had accumulated. After some lengthy discussion most of the group agreed with his conclusions.

Botany section 'Does biodiversity matter?' was the title of the first winter lecture, in which Professor Phil Grime, Director of the prestigious Unit of Comparative Plant Ecology at the University of Sheffield, described current research which attempts to find out how biological systems are affected when species are lost. He addressed questions such as 'Are some parts of the British landscape already malfunctioning because they no longer contain many species?' and 'Which species are irreplaceable and which can be lost without serious consequences?'

The next lecture was by Dr Angus Lunn, on 'The Vegetation of the Midi' (the mediterranean zone of France). He described the pine and evergreen oak woodlands, and the derived maquis and garrigue, of Roussillon, Languedoc and Provence, and made comparisons with our British moorland vegetation.

Taking members much further afield, Mr Ron McBeath, formerly of the Royal Botanic Garden, Edinburgh, spoke on 'The Alpine Plants of the Tibetan Plateau in the Qinghai Province'. He was part of a joint expedition by a team of British botanists and horticulturalists to the Northwest Plateau Institute of Biology, Xining, Qinghai, and described not just the mountain flowers but the landscape and the people of this very remote area.

Finally, Dr Steve Rushton, Acting Director of the Centre for Land Use and Water Resources Research in the University of Newcastle, lectured on 'Predicting the effects of management on vegetation in northern England'. Given the increasing scope of publicly-funded environmental land management schemes it is important, if they are to be soundly based, to be able to predict the effects of management changes prescribed for farmers. Dr Rushton described the computer models he uses in this work, and the results so far achieved.

The summer of 1998 has been woefully wet. Fortunately only one of the scheduled field trips coincided with a wet day, although that was really wet. In June, in fine weather, Mr Alec Coles led a party to the Hisehope Burn-Derwent Gorge area, on the Northumberland-Durham border. A wide variety of open-ground and woodland plants was seen, the latter especially in the Derwent Gorge and Muggleswick Woods National Nature Reserve. It was particularly interesting to have the characteristic moss of Pennine ravine woods *Hookeria lucens* pointed out.

As an experiment the Society organised an evening identification training session, in the Tyne Riverside Country Park at Low Prudhoe. This was led by Dr Veronica Howard, and was gratifyingly well supported (the more so as it coincided with England *versus* Argentina in the World Cup). The party avoided both rain and midges. The most interesting habitat was the lime waste heaps, with a flora - including traveller's-joy *Clematis vitalba* and marjoram *Origanum vulgare* - in some respects simulating that of chalk downland.

In July members were supposed to climb Mickle Fell with Dr John Richards, for its mountain plants, but the heavy rain and hill fog made this quite impractical. The party diverted to the Swindale Beck area, near Brough, and saw there a good range of limestone plants as well as getting rather cold and wet. It is expected that the assault on Mickle Fell will be renewed next summer.

Finally, at the beginning of August the section miraculously hit a beautiful day for the excursion, led by Mrs Dorothy Hardy and Dr Lunn, to Emblehope Moor. To get there members took their cars across the Kielder Water dam and up forest roads to the edge of the vast area of blanket bog above Kielder Forest. The large and healthy colony of the arctic-alpine shrub dwarf birch *Betula nana* was admired and members also saw bog-sedge *Carex limosa* and bog pondweed *Potamogeton polygonifolius*, but failed to refind bog orchid *Hammarbya paludosa*, formerly known from here. Cloudberry *Rubus chamaemorus* was very abundant and lesser

twayblade *Listera cordata* was also found. The group was delighted to have as a member of the party Miss A L Hale, who originally discovered the dwarf birch here in 1973.

This year for the first time a group of members of the botany section arranged a number of successful informal outings, aimed at mutual help in identifying plants.

Lichen section During the year the lichen group has met several times at Moorbank Botanic Garden to share their recent finds and make use of the microscopes. In March they held an open session there to give non-lichenologists an introduction to the subject. Eight members attended, and Mrs Janet Simkin took them through the basics of lichen identification, including the use of microscopes and chemical spot tests.

The main field trip of 1997 took place in September when Dr Liz Smith took members to a classic lichen site, Muckle Samuel's Crags in Kielder Forest. Sadly, the meeting was poorly attended but those present had an excellent day and saw many unusual species.

In April Mr Don Smith, co-ordinator for the British Lichen Society Churchyards Project in northern England, visited us for two days. After an entertaining talk on the Friday evening on the lichens and small animals that are often overlooked in churchyards and gardens, he took a group out the next day on a tour of graveyards ancient and modern. About sixteen members enjoyed a fascinating day exploring sites in Corbridge, St John Lee and Bywell, but were disappointed to be unable to find the critically endangered *Calicium corynellum* which may now have been lost from its only known British site. So far the Churchyards Project has concentrated on the south of England, due to the shortage of lichenologists elsewhere, but several of those present on this occasion finished the day inspired to get to grips with saxicolous lichens and make their contribution to the survey.

GOSFORTH PARK NATURE RESERVE

The Gosforth Park Management Committee meets six times a year including a site visit. During the year the committee welcomed back Mr Ian Moorhouse as chairman. In 1991 he had had to retire from the position when his work took him abroad. In the interim Mr Edwin Slack has ably run the reserve and negotiated the minefield of relationships with the previous management of the Racecourse Company. During his period as chairman the reserve has flourished; the facilities for members in the form of hides, an enhanced feeding station and the help given for boardwalks for the ringing group as well as the new ringing hut have all been major improvments and he has strengthened the relationship with St Modwens, the new owners, at every opportunity. In recognition of this work the Committee unanimously agreed to elect him vice-chairman, thus ensuring the continuation of his knowledgeable input to the Committee. Council would like to thank Mr Slack for his careful and successful management of the reserve during the last few years.

Reserve maintenance During the year water levels were maintained at a fairly constant level. The sluice gate put in last year has been strengthened by a second control under the bridge and this combination has reduced water loss. The higher water level has assisted the spread of the *Phragmites* and produced excellent reed quality which will help returning warblers and buntings find suitable stands of old reeds in which to nest. During the winter it had been hoped to cut areas of reed that were showing signs of being inhibited by old reed debris but unfortunately there were not enough volunteers to make this possible.

Paul Drummond's volunteers continued to undertake various management projects and tasks and to repair the effects of vandalism, which continues to be a problem. The most serious incident was during the summer when the feeding station was burnt to the ground. The blaze was so fierce that the fire brigade was called but fortunately the surrounding woodland did not catch fire.

Flora and fauna The flora of Gosforth Park reserve includes two very rare plants, coralroot orchid and Young's helleborine. Both species were seen this year and the latter appears to have spread, with a number of sites now identified.

This year three species either started breeding or returned as breeders after a long absence. Last year common terns tried to breed on the platform in the lake. Due to harassment by gulls after they had laid their eggs and the fact that there were only two adult terns, the eggs were eventually stolen by the gulls. This year more adult terns arrived and successfully reared two young. This was despite the gulls and a near disaster when the platform succumbed to old age and broke in half, necessitating emergency repairs by the warden and Mr Dave Fuller from the Activity Centre. This swift action saved the chicks only days before they were due to fledge.

Warden Paul Drummond reported that he had seen a single great-crested grebe during June and July but he was delighted when another appeared from the reeds with young on its back. It has never been a common species in the reserve and last bred in 1980 just before the lake was drained. This is an excellent indicator that conditions are improving and that the management of the area appears to be increasing the diversity of species. If one adds ruddy duck and the possibility that shoveller bred, water birds appear to be having a good year. Perhaps this isn't surprising if you think of how much rain we have had!

There were a number of interesting birds seen during the year but probably the rarest was on 26 July when Mr Drummond saw a hobby. It was sitting in full view, if rather far away, on the open branch of a tree. He reported the sighting to the ringing group and saw the collar and the shape of its wings. When it flew the characteristic shape and flight were visible as it gave a beautiful performance before disappearing northwards over the Park.

In June Mr Drummond reported that red squirrels were eating the unripe friuts of various trees in the reserve. It was decided that squirrel feeders should be put up: this was done and the squirrels have started using them. During the year both roe deer and badger have been seen regularly and foxes have bred.

RINGING GROUP

Conservation, in particular the protection of the local flora and fauna, is an important objective of the Society. Since conservation must be underpinned by scientific studies, the Society has an important role in stimulating and carrying out research into the local flora and fauna. By nurturing a knowledge and understanding of different types of animals and plants, the Society can increase awareness of local biodiversity, and this is badly needed if effective conservation measures are to be put in place. Birds are good markers of the overall health of our natural environment and, as an important monitoring tool, ringing underpins much of ornithological 'conservation science' in the UK. The Society has several programmes of ornithological research designed to monitor bird populations at a local scale, provide data to national monitoring projects and develop new tools for monitoring breeding success. The study of seabirds on the Farne Islands and Coquet Island continues to develop, and results of the work so far were presented in the form of talks to a meeting on the 'Environmental Impact of Coastal Sewage Treatment Improvements', organised by Northumbrian Water, and to the North-east Ringers' Conference held at Durham University.

The tenth year of 'constant effort ringing' at Gosforth Park nature reserve got off to an inauspicious start in spring 1998: weather had a significant effect on the ringing programme and two of the twelve constant effort periods could not be completed due to heavy rain. The continuing poor weather is reflected in the ringing total for the period covered by the report which at 412 birds ringed is 244 fewer than last year. The number of reed warblers ringed (24) was the same as last year, but sedge warblers were down to fifty-seven from 154 in 1997. The decline in the catch of sedge warblers has followed a national trend for this species between 1996 and 1997; however, with the improvement in water levels, the growth of *Phragmites* has improved considerably in recent years, at the expense of *Juncus* and other successional vegetation, and this will reduce the amount of optimal nesting habitat available to sedge warblers. It remains to be seen whether the expanded area of *Phragmites* leads to an increased reed warbler population. We now have details of two sedge warblers controlled at Gosforth Park last year: both of these were first-year birds ringed at Icklesham, Sussex, one on 5 August 1994 and controlled in Gosforth Park on 18 May 1997, and the other on 25 September 1996

and caught in the reserve on 8 June as a breeding female. Details of controls/recoveries of birds ringed at Gosforth Park have also been received from the BTO. A sedge warbler ringed in the reserve on 10 May 1997 was caught by a ringer at St Abb's head, Borders Region, the same morning, an excellent demonstration that birds pass through the reserve on their way further north. Two reed warblers have been controlled: a juvenile ringed in July 1996 was controlled as a breeding female in Cleveland, 52km south, on 12 August 1997. This is our second reed warbler controlled in Cleveland, and indicates that there may be significant interchange of reed warblers between breeding colonies. Another of our reed warblers, ringed as a recently fledged juvenile on 24 August 1997, was controlled by French ringers 1193km south at Villeton, Lot-et-Garonne, France, on 7 October. Finally, a second-year female chaffinch ringed in the reserve on 18 June 1997 was controlled on the Calf of Man on 24 October the same year, presumably on its way to winter in Ireland.

Autumn 1997 marked the fifth year of ringing at Newton Pool, and from September through to early November 1997, 256 birds were ringed there, slightly down on last year's total of 318. The period was notable for the good numbers ringed of two species: redpoll (15) and long-tailed tits (40). Other species, notable for their scarcity, were great spotted woodpecker (1), stonechat (1), grasshopper warbler (1), icterine warbler (1) and bearded tit (1 female). The bearded tit was presumably the same bird that had been present in late summer. An influx of icterine warblers was reported on Holy Island in late August and the one caught at Newton Pool during the first ringing visit in autumn 1997 was presumably part of this influx; this was the second icterine warbler caught at Newton Pool (one was caught in 1996). No birds ringed elsewhere were controlled there this year.

A summary of all birds ringed at Newton Pool in the period September-early November for the last five years is given in Table 1. Wrens, dunnocks and robins have been the most numerous, but these are not necessarily all local birds and some of the dunnocks and robins may well have been of continental origin, nicely illustrated by the robin wearing a German ring (Heligoland) caught in the group's first year of ringing at Newton Pool. Most numerous, however, are blue tits and the total for this species stands at 115, representing 12% of the overall catch. As a wetland habitat, the pool is suitable for sedge warblers and reed buntings; while the catch of sedge warblers has increased recently, the proportion of reed buntings has declined from 19% of the catch in 1994 (ignoring 1993, a year for which the sample size is small) to 4% in 1997. The last couple of years has seen an increase in the catch of meadow pipits, but this is probably entirely due to the fact that we have used audio-tape lures for this species in these years. It is also interesting to note that chiffchaffs are almost four times more abundant, based on the total ringed, than willow warblers.

TABLE 1

Ringing totals (new birds) at Newton Pool during the last five years (totals for September onwards in each year)

Year	1993	1994	1995	1996	1997	TOTAL
Kestrel	0	1	0	0	0	1
Woodpigeon	1	0	0	0	0	1
Great Spotted Woodpecker	0	0	0	0	1	1
Swallow	0	0	0	4	3	7
Meadow Pipit	0	1	0	52	14	67
Wren	3	32	14	16	30	95
Dunnock	3	33	20	29	12	97
Robin	12	19	20	28	18	97
Redstart	1	0	3	3	0	7
Whinchat	0	1	0	1	0	2
Stonechat	0	0	0	2	1	3
Blackbird	7	17	5	7	13	49
Song Thrush	3	1	3	10	3	20

Redwing	1	0	2	7	1	11
Grasshopper Warbler	0	0	0	0	1	1
Sedge Warbler	0	6	5	24	17	52
Reed Warbler	0	1	0	0	0	1
Icterine Warbler	0	0	0	1	1	2
Lesser Whitethroat	0	2	2	0	2	6
Whitethroat	0	0	1	0	2	3
Garden Warbler	0	1	0	2	0	3
Blackcap	3	2	4	8	3	20
Yellow-browed Warbler	1	1	0	0	0	2
Chiffchaff	1	2	3	6	7	19
Willow Warbler	0	0	0	2	3	5
Goldcrest	10	17	6	0	14	47
Firecrest	0	1	0	0	0	1
Spotted Flycatcher	1	0	0	0	0	1
Bearded Tit	0	0	0	0	1	1
Long-tailed Tit	0	0	0	5	40	45
Marsh Tit	0	1	0	0	0	1
Coal Tit	0	7	1	0	2	10
Blue Tit	9	21	10	52	23	115
Great Tit	0	6	3	9	9	27
Treecreeper	0	0	1	0	0	1
Magpie	0	1	0	0	0	1
Starling	0	2	0	0	0	2
House Sparrow	0	0	0	1	1	2
Chaffinch	1	1	1	7	3	13
Greenfinch	0	0	0	1	2	3
Goldfinch	0	0	5	2	1	8
Linnet	0	4	4	5	0	13
Redpoll	0	0	0	0	15	15
Bullfinch	0	4	0	0	0	4
Yellowhammer	0	2	1	8	2	13
Reed Bunting	1	44	13	26	11	95
TOTAL	**58**	**231**	**127**	**318**	**256**	**990**

Permission was again granted by the Farne Islands Local Committee of the National Trust for the seabird studies on the Farne Islands to continue for a further year. As last year, seabird studies on the Farnes and Coquet Island were carried out in parallel. One aim of the work was to estimate arctic tern chick mortality on different islands and habitat types within the Farnes group by capture-recapture analysis. In the previous season, arctic tern chicks in study plots on Brownsman and Inner Farne were ringed and recaptured at intervals to estimate chick survival throughout the period up to fledging. Preliminary analyses using the MARK programme developed by Gary White of Colorado State University, USA, indicate that, on the whole, survival rates were high at 93% to 98% per four-day analysis period and no marked decrease in survival was apparent at a time (25 June to 2 July) when the arctic terns on Coquet Island suffered significant mortality during a period of bad weather (Figure 1). The results from the 1997 season were better than predicted and suggest that mark-recapture methods may have a significant role in estimating variation in colony productivity. The aim of this year's work was to continue and extend this approach. In the event, weather had a large and detrimental effect on the work, although increased effort resulted in over 300 arctic tern chicks being marked in four study plots, and this exceeds the total for last year. Hatching dates were very spread out and differed markedly between Inner Farne and Brownsman. In addition, predation by gulls on one of the study sites reduced the number of terns ringed and surviving to be recaptured. Another aim of the study was to compare the growth condition of arctic tern chicks between Coquet and the Farnes. Despite the weather and mortality of chicks, a sufficient sample of Farnes and Coquet Island chicks of comparable status (i.e. the oldest chicks in each

brood) were weighed and measured. A preliminary analysis of these data indicates that, this year, Farnes and Coquet Island chicks were very similar in their growth characteristics.

Overall seabird ringing totals for this year (both island groups combined) were (1997 in brackets): eider 34 (33), shag 105 (67), kittiwake 153 (302), Sandwich tern 1025 (662), common tern 80 (70), arctic tern 656 (728), roseate tern (Inner Farne) 1 (4), fulmar 14 (13) and black-headed gull 145 (167). Numbers of kittiwakes were severely reduced, mainly because bad weather earlier in the season destroyed many nests on exposed sites. Sandwich terns on Coquet Island fared much better than last year and from ringing data the minimal chick mortality was 4% (34% in 1997). The lesser crested tern 'Elsie' failed to appear this year. However, the hybrid chick ringed last year fledged successfully, and was seen and well photographed in France in September 1997, presumably on its way to wintering quarters off the west coast of Africa. The ability to follow the progress of these birds through colour ringing has attracted considerable national and international interest, as illustrated by an article from France in the November 1997 *Birding World*, by Frédéric Jiguet. We hope that some of these colour-ringed hybrids will return to breed on the Farne Islands so that we can monitor their fertility, behaviour and progress.

The ringing group continues to attract new members to the Society and remains an integral part of the Society's activities for the future. The seabird studies could not be carried out without the boat 'Sea Spray' generously provided by Northumbrian Water and the Society is grateful for their support of the research on the Farnes and Coquet Island. We are also grateful to Mr James Robinson for his help with the tern project, the Farne Islands Local Management Committee for granting permission for the study to continue for a further year, the Coquet Island Management Committee for allowing access to Coquet Island, and Mr Mike Freeman of the National Trust for his support of ringing at Newton Pool. Once again, we thank Major Carr-Ellison for the use of his beach chalet at Newton, an amenity which is greatly appreciated in the cooler autumn weather. The marine environment and its birds is an important part of life in the north-east and the Society hopes that the Farne Islands committee will continue to support the seabird ringing studies as an integral part of their monitoring programmes.

COQUET ISLAND MANAGEMENT COMMITTEE

The Management committee met on 19 December to discuss the various factors affecting the Island. These ranged from domestic issues from the wardens, such as windows that would not open, to the harbour improvements at Amble and any possible impact these may have on the reserve. The most likely problems would be the effect of dredging on the mussel beds in the estuary. MAFF will be undertaking close monitoring of the various environmental parameters, particularly the effect of water turbidity on the health of the mussels.

The wet summer has had a number of effects on the island, mostly the increased growth of the vegetation. This was despite the extensive strimming work carried out by Mr Paul Morrison before the breeding season. The number of pairs of important species (with last year's totals in brackets) seem to be mostly encouraging with both arctic and Sandwich tern numbers up, 843 (749) and 1,897 (1,659) respectively. Common terns were almost the same as last year 805 (806) and roseate terns had increased to 29 (25) pairs, not equalling the 1995 peak of thirty-six pairs but at least going in the right direction. The only species of concern is the eider which is continuing to decrease. There were 400 in 1988, but only 273 (330) nesting females this year.

The Society's research continues on the island and some of the results are shown in the ringing report above. The University of Durham continues its research into the breeding energetics of common and arctic terns and the Coquet Island Research Sub-Committee agreed to a new project on provisioning and growth of northern fulmar, also by Durham University.

The Society also agreed to help with the production of the new management plan for the island which is due to be implemented from the 1999 season. This preparatory work began in July and is continuing into the next financial year.

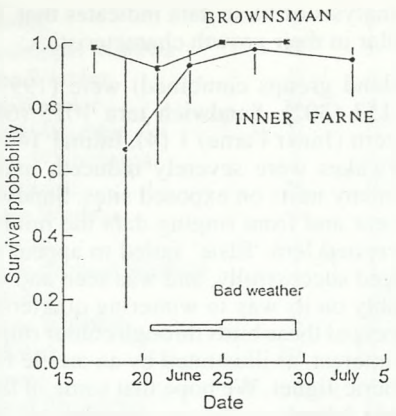

Fig. 1 Survival probabilities estimated by mark-recapture for arctic terns on Inner Farne (●) and Brownsman (■) in 1997. Each point represents the estimated survival probabilities over the time since the last ringing or recapture visit, and the error bars are 95% confidence intervals. The initial ringing date was 15 June;most recapture visits were at intervals of four days but, mainly due to bad weather, some were carried out earlier or later than planned. The MARK programme developed by Gary White was used to apply the Burnham model for live and dead encounters to the data; in this preliminary analysis, survival probabilities were estimated on the assumption that all recapture intervals were equivalent.

LINDISFARNE NATIONAL NATURE RESERVE

Lindisfarne Advisory Committee

The Advisory Committee covers a much wider remit than the Wildfowl Panel. It deals with matters such as the local amenities that may impinge on the quality and long term viability of the Nature Reserve. During this year concern was expressed on the route suggested by SUSTRANS (a trust to promote the increase in cycle tracks). English Nature has objected to the initial planning application and asked for an alternative route and environmental assessment of the impact on the reserve. These negotiations are continuing.

The success of the Roto-buryer experiment was reported to the committee. For many years the continued invasion of the mudflats by vegetation, particularly by *Enteromorpha,* has been a major environmental problem and many ideas and schemes have been tried. The Roto-buryer has been shown to cover the plants which have shown few signs of returning. This success should lead to a more efficient management of this particular problem. Other matters are dealt with under the Wildfowl Panel.

Lindisfarne Wildfowl Panel

The Wildfowl Panel is concerned with the supervision of wildfowling and its effect on the reserve. This was the first year that the refuge area, mentioned in last year's annual report, was operational. In May the preliminary figures were assessed but no firm conclusions can be drawn and it looks as if it will be at least another season before it can be established whether there will be any improvement in the declining numbers of nationally and internationally important species.

A Final Paragraph

Having been abroad during the critical period of the compiling of this report, I am even more than usually grateful to the section contributors, Hugh Chambers, Alec Coles, Andrew Hooton, Angus Lunn, David Noble-Rollin, Chris Redfern, Richard Slack and Bob Wilkin, and to Margaret Patterson and David Noble-Rollin who prepared the report for publication. They and many other people work hard and selflessly to ensure the smooth running of the Society and to involve it in the many enterprising activities that are reported here. Both personally and on behalf of Council, I am very grateful to them all. As always, David Noble Rollin carries the heaviest burden and deserves special mention and special thanks.

DAVID GARDNER-MEDWIN
Chairman of Council

FINANCIAL STATEMENTS

31 JULY 1998

THE NATURAL HISTORY

STATEMENT OF FINANCIAL ACTIVITIES

1997			
£		£	£
30,075	SALARIES, PENSION CONTRIBUTIONS AND NATIONAL INSURANCE (Note 10)		29,867
2,265	PRINTING AND STATIONERY		1,699
2,410	POSTAGE AND TELEPHONE		3,032
1,794	INSURANCE		1,944
182	REPAIRS AND RENEWALS		-
966	GENERAL EXPENSES		721
5	LICENCE FEE		5
425	INDEPENDENT REVIEW		450
884	SUBSCRIPTIONS TO SOCIETIES		825
1,828	LECTURE AND FIELD MEETING EXPENSES		1,708
	TRANSACTIONS		
6,271	Expenditure	7,397	
—	Less:Contributions for publication of Red Data Book	3,200	
6,271			4,197
2,496	LIBRARY		2,612
	GOSFORTH PARK NATURE RESERVE		
2,034	Expenditure	3,854	
—	Less: Transfer from Gosforth Park Nature Reserve Restoration Fund	2,400	
2,034			1,454
1,558	COASTAL RESEARCH (Note 11)		1,546
2,197	DEPRECIATION		2,113
	APPROPRIATIONS		
—	Gosforth Park Nature Reserve Restoration Fund		3,400
3,059	EXCESS OF INCOME OVER EXPENDITURE FOR THE YEAR		689
£58,449			£56,262

SOCIETY OF NORTHUMBRIA

FOR THE YEAR ENDED 31 JULY 1998

1997			
£		£	£
	SUBSCRIPTIONS		
15,915	Annual subscriptions	15,486	
240	Add: Transfer from Life Members' Fund	240	
16,155			15,726
931	DONATIONS		1,018
2,142	ARCHIVE CATALOGUE RESEARCH FUNDING		179
7,825	UNIVERSITY OF NEWCASTLE UPON TYNE		8,000
28,003	INVESTMENT INCOME (GROSS)		29,241
3,393	PROCEEDS FROM SALES OF TRANSACTIONS		2,098
£58,449			£56,262

THE NATURAL HISTORY

BALANCE SHEET

1997			
£		£	£
	GENERAL FUND		
	Balance at 1 August 1997	108,188	
	Add: Excess of income over expenditure for the year (Note 4)	689	
108,188	Add: Surplus on sale of investments	*1,223*	*110,100*
2,359	LIFE MEMBERS' FUND (Note 5)		2,119
	EXPENDABLE ENDOWMENTS		
	T B Short Memorial Fund (Note 6)		
	Balance at 1 August 1997	114,534	
114,534	Add: Surplus on sale of investments	41,449	155,983
	Grace Hickling Memorial Fund (Note 6)		
	Balance at 1 August 1997	85,078	
85,078	Add: Surplus on sale of investments	33,219	118,297
235,263	INVESTMENT REVALUATION RESERVE (Note 7)		259,075
	DESIGNATED CAPITAL FUNDS		
3,000	**Provision for deferred repairs**		3,000
	Gosforth Park Nature Reserve Restoration Fund (Note 8)		
	Balance at 1 August 1997	19,500	
	Less: Expenditure during year	2,400	
19,500	Add: Appropriations for year	3,400	20,500
£567,922			£669,074

Approved by Council on 16 October 1998

D GARDNER-MEDWIN – Chairman and Trustee

R E SLACK – Honorary Treasurer

SOCIETY OF NORTHUMBRIA

31 JULY 1998

1997			
£		£	£
	FIXED ASSETS		
	Freehold property (Note 2)		
	Hancock Museum		Not valued
	Lake Lodge		
3,899	Cost	3,899	
5,300	Electrical installation	5,300	
9,199		9,199	
6,860	Less: Depreciation	6,938	
2,339			2,261
	Hides, equipment, office furniture and computers (Note 3)		
25,243	Cost 1 August 1997	25,243	
20,232	Less: Depreciation	22,267	
5,011			2,976
	Investments in trustee securities, at market value (Note 7)		
	Quoted		
140,587	Narrow range	170,496	
155,523	Wide range	256,593	
124,933	Special range	91,338	
	Unquoted		
	Charities Official Investment Fund		
86,628	9,750 shares	100,103	
507,671			618,530
	CURRENT ASSETS		
2,705	**Income tax recoverable, accrued income and payments in advance**		2,610
	Cash at bank		
31,446	Charities deposit fund	20,849	
5,204	Deposit account	1,268	
27,511	Current account	26,736	
64,161			48,853
	CURRENT LIABILITIES		
(13,965)	**Creditors, accrued charges and subscriptions received in advance**		(6,156)
£567,922			£669,074

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA

RECONCILIATION OF FUNDS FOR THE YEAR ENDED 31 JULY 1998

1997		
£		£
3,059	Excess of income over expenditure for the year	689
71,068	Net investment gains (realised and unrealised)	99,703
1,000	Change in capital funds	1,000
(240)	Change in life members' fund	(240)
74,887	Net movement in funds	101,152
493,035	Net funds brought forward	567,922
£567,922	Net funds carried forward	£669,074

STATEMENT OF TRUSTEES' RESPONSIBILITIES

The Trust deed, the Charities Act 1993 and the Charities (Accounts and Reports) Regulations 1995 require the trustees to prepare accounts for each financial year. In preparing these accounts, the trustees are encouraged to follow the recommendations outlined in Statement of Recommended Practice No. 2 - Accounting by Charities (issued by the Accounting Standards Board in 1995).

The trustees consider that in preparing these accounts they have used appropriate accounting policies, consistently applied and supported by reasonable and prudent judgements and estimates.

The trustees are responsible for keeping proper accounting records to enable them to ensure that the accounts comply with the Charities Act 1993. They are also responsible for safeguarding the assets of the charity and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

ACCOUNTING POLICIES AND NOTES

1. **Basis of accounting**

   The accounts have been prepared under the historical cost convention as modified by the revaluation of investments.

2. **Freehold property including Library and Collections**

   (a) No value was attributed to the Hancock Museum at the date of its completion in 1884. The building is leased to the University of Newcastle upon Tyne which is normally responsible for all repairs and improvements.

   (b) (i) The cost of Lake Lodge, less donations and grants received, of £3,899 is depreciated at 2% per annum.

   (ii) The cost of installing mains electricity, less donations received, of £5,300 has been fully depreciated.

3. **Hides, equipment, office furniture and computers**

   The cost of the hides, equipment and office furniture is depreciated at 10% per annum and computers at 20% per annum.

4. **Income and expenditure account**

   All of the charity's revenue income received is unrestricted and is applied by the trustees to meet general expenditure. Any excess of income over expenditure for the year is arrived at after making any appropriations to special funds for the purpose of setting aside temporary surpluses of income to meet future expenditure.

5. **Life members' fund**

   Amounts received in payment of life subscriptions are taken to the life members' fund and are released to income and expenditure account over a period of 20 years in equal annual instalments.

6. **T B Short and Grace Hickling Memorial Funds**

   The funds from these legacies are invested in accordance with the Trustee Investment Acts and are subject only to expenditure for special projects.

7. Investments are shown on the Balance Sheet at their market value. The difference between market value and cost is shown as an Investment Revaluation Reserve.

8. **Gosforth Park Nature Reserve Restoration Fund**

	1998	1997
General restoration	£12,000	£11,000
Sir James and Lady Steel donation for lake rejuvenation	£8,500	£8,500
	£20,500	£19,500

9. Payments made to trustees comprised salary costs £1,996 (1997 £1,807), travelling expenses £238 (1997 £112) and reimbursement for entertaining speakers after lectures £72 (1997 £147), library books £100 (1997 £43) and office sundry expenses £7 (1997 £68). The payments made related to four trustees (1997: three trustees).

10. **Employees' Remuneration**

Total remuneration (excluding employer's National Insurance contributions) for the year was £27,718 (1997 £27,996). The average number of paid staff for the year was one full time and four part time employees.

11. Coastal Research comprises boat costs and ringing expenses for Farne Islands and Coquet Island research.

12. The Society is a registered charity, official number 526770.

Independent Examiner's Report to the Trustees of The Natural History Society of Northumbria

I report on the accounts of the Trust for the year ended 31 July 1998, which are set out on pages 28 to 34.

Respective responsibilities of trustees and examiner

As the charity's trustees you are responsible for the preparation of the accounts; you consider that the audit requirement of section 43 (2) of the Charities Act 1993 (the Act) does not apply. It is my responsibility to state, on the basis of procedures specified in the General Directions given by the Charity Commissioners under section 43 (7) (b) of the Act, whether particular matters have come to my attention.

Basis of independent examiner's report

My examination was carried out in accordance with the General Directions given by the Charity Commissioners. An examination includes a review of the accounting records kept by the charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts, and seeking explanations from you as trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit, and consequently I do not express an audit opinion on the view given by the accounts.

Independent examiner's statement

In connection with my examination, no matter has come to my attention:

(1) which gives me reasonable cause to believe that in any material respect the requirements

- to keep accounting records in accordance with section 41 of the Act; and
- to prepare accounts which accord with the accounting records and to comply with the accounting requirements of the Act

have not been met; or

(2) to which, in my opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

R BUNTER
PRICEWATERHOUSECOOPERS
89 Sandyford Road
Newcastle upon Tyne
NE99 1PL

16 October 1998

Trans. Nat. Hist. Soc. Northumbria **59,** 37-59 (1999)

BIRDS ON THE FARNE ISLANDS in 1998

compiled by

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National Trust Property Manager

MICHAEL MAHER[1]
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ringing report by

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INTRODUCTION

The wardening team sailed out to the islands on 27 March and took up residence on Inner Farne and Brownsman, both island groups being occupied until 6 December. Twenty-two species bred with an estimated population of just under 70,000 pairs - a decrease from the record 73,000 pairs in 1997. Last year's report told of the poor breeding season due to disastrous weather in June: this year was worse but, because it was season-long atrocious weather, it did not make the headlines as it did in 1997. Rainfall was well above average in every month, temperatures lower and strong winds more frequent. Species reports from the islands read 'badly hit by cool and wet weather', 'burrows were flooded', 'many nests were deserted during cool and wet weather', 'exceptionally low productivity'– and so it goes on. Details can be found in the body of the report, but suffice it to say that only shag and razorbill fared better than in 1997. Roseate terns maintained their presence on the islands with three pairs fledging only three young – a poor performance in comparison with recent years. The eight-year run of swallows breeding in St Cuthbert's Chapel came to a dramatic end – read on for further details!

Passage birds were represented by 158 species, the overall total of 180 equalling the record year of 1995. In what will long be remembered as a classic year for migrants, five species were added to the island list: great white egret, hobby, common crane, tawny pipit (2) and red-flanked bluetail. Avocets appeared for the third time and Richard's pipit and marsh warbler were both recorded for the fourth and fifth times. Short-toed lark was recorded for the seventh occasion with quail making an eighth appearance. Other species of note included Mediterranean shearwater (a record 10), storm petrel (6), Leach's petrel, garganey (2), marsh harrier, long-tailed skua (5), black tern (2), stock dove, cuckoo, wryneck (3), shorelark (11), nightingale (3), bluethroat (14), icterine warbler (2), barred warbler (2), yellow-browed warbler (4), firecrest (2), red-breasted flycatcher, red-backed shrike (an amazing 11!), common crossbill, ortolan bunting (4) and little bunting (3).

Add to this list a number of 'record' counts and it really was a year to savour – but how much better it would have been if the breeding birds had not taken such a hammering.

Thanks go to the 1998 wardening team of Andrew Auckland, Steven Bloomfield, Juan Brown (October-December), Dominic Coath, Mark Cornish (who also provided the sketches used in this report), Stephen Ernst, Michael Maher, Stephen Oswald, Stuart Thomas and Colin (alias

Nick) Williams, as well as to various boatmen and members of the public, for supplying the records that make up this report.

Details of all the birds are given in the following list: this follows the order and scientific nomenclature of Professor Dr K H Voous' list of recent holarctic species (1977), except for the shearwaters and gannet which adopt the new changes recommended by *Ibis* **133**, p438. Where appropriate, the figures for 1997 breeding birds are included, for comparison, in brackets.

SYSTEMATIC LIST

Red-throated Diver *Gavia stellata*

One to four were recorded regularly from 4 April until 24 May, with one flying south on 3 June. Autumn birds were noted regularly from 6 September and almost daily throughout November. The maximum count was twenty-one on 21 November.

Black-throated Diver *G. arctica*

One to two summer-plumaged birds were noted on five days from 5 April-27 May. Singles were recorded on five days from 21 October-2 December.

Great Northern Diver *G. immer*

One to four were recorded on ten days from 5 April-3 May, with one flying south on 30 August. 1-8 were noted on seventeen days from 2 October-4 December, whilst fifteen flying north on 4 November made an impressive day count.

Great Crested Grebe *Podiceps cristatus*

One flying north through Staple Sound on 1 October was the only record.

Red-necked Grebe *P. grisegena*

Up to nine birds were seen regularly around the islands between 4 and 21 April. A juvenile flew north on 8 August, then 1-11 were observed regularly from 2 October until the end of the season.

Fulmar *Fulmarus glacialis*

Birds were present when the wardens arrived and, allowing for the 'honeymoon period', were back on site by mid-April. The first eggs were located on 16 May on Staple Island and 17 May on West Wideopens, with the first young on 13 July on Staple Island and 25 July on East Wideopens. 254 (266) pairs nested as follows: Inner Farne 34 (46), Knoxes Reef 21 (22), West Wideopens 19 (13), East Wideopens 18 (15), Skeney Scar 1 (2), Staple Island 34 (38), Brownsman 59 (68), North Wamses 29 (28), South Wamses 33 (28), Big Harcar 3 (3), Northern Hares 0 (3), Longstone End 3 (0). The first young fledged from both the inner and outer group islands on 30 August with the last fledging on 13 September. Blue phase birds were recorded on 13 July and 3 November. The largest day count occurred on 24 August when 1,346 flew north in just over eight hours.

Sooty Shearwater *Puffinus griseus*

Recorded on twenty-four days from 14 July-2 November. Generally 1-3 birds were involved, with counts of twenty-three flying north on 17 September, twenty-six north on 24 August and sixty north on 13 September.

Manx Shearwater *P. puffinus*

Recorded regularly from 2 April-17 October. The peak spring count was of 269 east past the Wideopens on 27 May, with an autumn maximum of 259 flying north on 28 August. On 28 June Dr Redfern, leader of the ringing team, was convinced that he could smell the distinctive musty odour associated with breeding Manx shearwater (or storm petrel) whilst working on the

north shore of Brownsman. On 20 July one of the wardens, up and about at 03.00, heard the distinctive calls of a shearwater on Inner Farne – the first time this has been recorded.

Mediterranean Shearwater *P. yelkouan*

A record year for this species with ten birds observed: one flew north past Crumstone on 31 July and a 'flock' of four was seen on 13 August, with singles on 20 and 22 August, two on 27 August and finally one north through Staple Sound on 1 October.

Storm Petrel *Hydrobates pelagicus*

One flew south through Staple Sound on 3 August, three passed north on 23 August with a single on 24 August, and one flew south on 17 October.

Leach's Petrel *Oceanodroma leucorrhoa*

The wardens on Brownsman enjoyed excellent views of a bird on 17 October. Rather than the usual 'fleeting glimpse' this individual showed well for over four hours, often feeding just off the west cliffs.

Gannet *Morus bassanus*

Recorded almost daily until early November but scarce thereafter. On 1 May 4,077 flew north through Staple Sound during a five hour seawatch, whilst 2,079 in one hour on 3 November was a record count for the islands.

Cormorant *Phalacrocorax carbo*

Nests were well under construction when the wardens arrived. A number of birds on North Wamses lost their nests in northerly storms in early- to mid-April. Exact laying dates are not known but young were seen from 1 June onwards. 175 (227) pairs nested as follows: East Wideopens 87 (118), North Wamses 88 (98), Big Harcar 0 (11). Fledged young were first noted around 10 July with the last fledging around 10 August. Birds, as ever, became scarce in autumn with a maximum of *ca* 40 in October-November.

Shag *P. aristotelis*

The first eggs were located on Brownsman on 31 March and on Inner Farne on 5 April – however, the nest on Brownsman was washed off in storms and the first egg on Inner Farne was predated. 1,000 (1,060) pairs nested as follows: Megstone 16 (19), Inner Farne 212 (183), West Wideopens 40 (83), East Wideopens 43 (66), Skeney Scar 62 (65), Staple Island 258 (268), Brownsman 126 (136), North Wamses 28 (24), South Wamses 46 (41), Roddam and Green 11 (17), Big Harcar 91 (105), Longstone End 67 (53). The first young was recorded on North Wamses on 28 May with the first fledging on Inner Farne on 16 July: the last had fledged by 10 October. Up to 480 roosted around the outer group in November.

Great White Egret *Egretta alba*

On 7 June one was seen close to the seals on Longstone End. It flew off, pursued by gulls, and was seen over the A1 north of Morpeth later that day. It was observed by some thirty bird watchers on board one of the trip boats. First record for the islands.

Grey Heron *Ardea cinerea*

One flying east over North Wamses on 28 March was the only spring record. There was one record in June and four in August, then 1-3 were noted daily from 10 September until the end of the season.

Mute Swan *Cygnus olor*

Three were in Inner Sound on 21 April, five were 'resident' in the same area from 26 July-4 August and five were seen on 15 August.

Whooper Swan *C. cygnus*

Twelve flew north through Staple Sound on 31 March, with four north over Brownsman on 5 April and fourteen north through Inner Sound on 25 November.

Pink-footed Goose *Anser brachyrhynchus*

Spring records involved seven birds flying north through Staple Sound on 5 May, with sixty-five over Brownsman on 8 May. There were seven autumn records between 15 September and 3 December involving between two and eighty birds, and one skein of *ca* 190 on 23 November.

Greylag Goose *A. anser*

Two birds flying north-east over Brownsman on 24 April was the only record.

Canada Goose *Branta canadensis*

Twenty-two flew north through Staple Sound on 20 June, then seven passed south over Brownsman on 28 June.

Barnacle Goose *B. leucopsis*

Twenty-four moved north over Brownsman on 2 May, *ca* 700 in two skeins were seen high over Brownsman on 3 May and one was over Brownsman on 4 May. *Ca* 100 flew east over Brownsman on 4 June – a late date for this species. 1-80 were recorded on five days from 28 September-2 November.

Brent Goose *B. bernicla*

Twenty-two seen flying west over Inner Farne on 5 June were somewhat unseasonal. More expected were the ten records of 1-30 noted between 8 September and 3 December.

Shelduck *Tadorna tadorna*

From mid-April onwards 2-3 pairs were on Brownsman and display was recorded regularly. By early May it was presumed that at least one pair was nesting, but as both male and female were seen regularly on the pond from 16-28 May without any sign of ducklings, they were thought to have failed. Fifteen moving west over Knoxes Reef on 19 June was the largest count of the year, with 2-10 recorded on twelve days from 25 June-24 November.

Wigeon *Anas penelope*

One to twenty-seven were recorded on eight days from 7 April-25 June, followed by regular records of 1-250 from 27 August until the end of the season.

Teal *A. crecca*

One to four were seen on three days in April, *ca* ninety on 25 June, two on 28 July and 1-59 on four days in August, followed by regular sightings from September onwards with a peak count of *ca* 500 on Knoxes Reef on 28 November.

Mallard *A. platyrhynchos*

Observed regularly throughout the season with records in every month except June. The peak count was 121 on Knoxes Reef on 19 November. For the first time since 1995 there were no recorded nesting attempts.

Pintail *A. acuta*

A male flying north-east over Brownsman on 6 May was the only spring record. 1-4 were recorded on eleven days from 10 September-21 November.

Garganey *A. querquedula*

Two males commuted between Brownsman pond and the Wamses on 13 May. They roosted on Brownsman that evening but had gone by the following morning.

Shoveler *A. clypeata*

A male and female were on Brownsman pond in the early morning of 24 June, two males flew north past Crumstone on 28 July, then 1-3 were noted on nine days from 20 October-4 December.

Pochard *Aythya ferina*

One flying north through Staple Sound on 21 April was the only spring record. One flew north past Crumstone on 14 September and 1-6 were seen on four days from 2-15 November.

Tufted Duck *A. fuligula*

One to six were recorded on seven days from 5 April-23 May, with 1-12 on thirteen days between 3 September and 18 November.

Scaup *A. marila*

Two flew north through Staple Sound on 10 April, one passed north through Inner Sound on 15 November in a mixed flock of tufted duck and pochard, and two flew north on 18 November.

Eider *Somateria mollissima*

Birds were prospecting sites from 27 March and the first eggs were found on Inner Farne on 26 April. 1,082 (1,021) females nested as follows: Inner Farne 704 (629), Knoxes Reef 3 (4), West Wideopens 29 (39), East Wideopens 9 (4), Staple Island 37 (46), Brownsman 270 (267), North Wamses 10 (12), South Wamses 13 (13), Big Harcar 3 (5), Longstone main rock 0 (2), Longstone End 4 (0). Many nests, particularly on the outer group, were deserted during the cool, wet weather in June. The first ducklings were recorded on 26 May with the last on 1 August. Some 3,400 birds were around the islands in late October/early November.

Long-tailed Duck *Clangula hyemalis*

Two records from the outer group, of a single on 5 October and eight on 3 November, contrast strongly with twenty-eight records from the inner group between 2 October and 3 December. Maximum counts of twenty-seven occurred on 1 and 3 November.

Common Scoter *Melanitta nigra*

Recorded in every month of the season with flocks of between 200-300, the greater numbers appearing from October onwards. An excellent count of 640 on 4 November was somewhat eclipsed by the count on the previous day when 2,011 flew north during the day, with 1,772 of these recorded in Inner Sound. A record count for the islands.

Velvet Scoter *M. fusca*

Well recorded throughout the autumn: one flew north on 27 August, then 1-18 were seen on fourteen days from 2 September-16 November.

Goldeneye *Bucephala clangula*

One to four were observed on seven days from 5-18 April, then 1-42 on twenty-four days between 4 October and 6 December. The only count to exceed this was when fifty-eight moved north through Inner Sound on 4 November.

Red-breasted Merganser *Mergus serrator*

One to three were observed on eight days from 4 April-23 May, with one on 14 August, seven on 18 September and 1-9 on seventeen days between 27 September and 30 November.

Goosander *M. merganser*

Two flew along the east shore of Brownsman on 17 August. Records from the inner group were of four birds on 1 November, two on 25 November and a single on 3 December.

Marsh Harrier *Circus aeruginosis*

An immature bird was flushed from Staple Island on 26 September. It flew to Longstone, then back along Big Harcar before being lost to view.

Sparrowhawk *Accipiter nisus*

A female was noted on three days in April and on 2 May. Single birds were seen on a further sixteen days between 12 August and 25 November. One resident for three days in early September killed redstart, garden warbler and pied flycatcher.

Kestrel *Falco tinnunculus*

Singles were seen on 20 and 29 April and 18 June. Sightings became more regular from early August onwards with 1-2 on twenty-two days between 9 August and 11 November.

Merlin *F. columbarius*

One to two were noted almost daily from 29 March-19 April, with 1-2 probably resident on the islands from 15 September onwards. The wardens on Brownsman witnessed a rare occurrence on 12 October when a merlin was watched pursuing a bat (possibly a pipistrelle). This is only the seventh record of a bat on the islands.

Hobby *F. subbuteo*

An adult was seen in flight over Staple Island on 31 May before being re-located roosting on the cliffs of Brownsman. The bird, present for just over one hour, appeared very wet and tired having arrived on a day of north-easterly winds, mist and almost constant drizzle. A record of this species in 1956 cannot be confirmed so this becomes a 'first' for the islands.

Peregrine *F. peregrinus*

Singles were seen on nine days between 28 March and 10 May, an immature male was over Inner Farne on six days from 12 August-5 September, then singles were observed on twenty-three days from 10 September-27 November.

Quail *Coturnix coturnix*

A female commuted between Brownsman and Staple Island on 13-14 May. Eighth record for the islands and last recorded in 1997.

Water Rail *Rallus aquaticus*

One was on Brownsman on 30 September, whilst a freshly dead bird was on Inner Farne on 16 October.

Moorhen *Gallinula chloropus*

One was around the Brownsman buildings in the early morning of 5 April.

Common Crane *Grus grus*

Two flew north over Brownsman at 08.55 on 2 May and were watched flying out to sea before being lost to view at 09.03. The wardens' log records 'Collective euphoria was much in evidence!'. First record for the islands.

Oystercatcher *Haematopus ostralegus*

About seventy-five were present in early spring. The first eggs were noted on 15 May and the first young located on 3 June. 31 (34) pairs nested as follows: Inner Farne 5 (5), Knoxes Reef 2 (2), West Wideopens 3 (2), East Wideopens 3 (2), Staple Island 4 (5), Brownsman 8 (11), North Wamses 2 (2), South Wamses 1 (1), Big Harcar 0 (1), Northern Hares 1 (1), Longstone main rock 2 (2). It was an appalling season for this species – from sixty-three eggs only nine young were fledged. The first fledged from Brownsman on 10 August. The maximum autumn count was *ca* 280 in late October.

Avocet *Recurvirostra avosetta*

Two flew south-west over Brownsman on 29 April. This was only the third record for the islands; last recorded in 1960.

Ringed Plover *Charadrius hiaticula*

Display was evident from 27 March with the first egg found on Inner Farne on 28 April. 9 (11) pairs nested as follows: Inner Farne 4 (5), West Wideopens 0 (1), Knoxes Reef 1 (0), Staple Island 1 (2), Brownsman 3 (3). This proved to be another disastrous year for the species: in 1997 only two fledged from fifty-eight eggs and this year there was just one young from forty eggs. There was a count of twenty-four birds on the Bridges on 4 October, otherwise never more than 4-10 during autumn.

Golden Plover *Pluvialis apricaria*

One to two were noted on three days in April, one flew north over Brownsman on 23 July, then 1-42 were observed on twenty-three days from 3 September-5 December.

Grey Plover *P. squatarola*

One, moulting into summer plumage, flew north past Brownsman on 1 May. A summer-plumaged bird was on Northern Hares on 11 August and one flew over Brownsman on 1 September. Then 1-3 were seen almost daily from 23 September-29 November.

Lapwing *Vanellus vanellus*

One flew over Inner Farne on 28 March, with singles on two days in April and one on 20 July. Seen more frequently in autumn with 1-20 recorded on seventeen days from 1 September-1 December.

Knot *Calidris canutus*

One was on Knoxes Reef on 3 June with 50-65 on 30 June-2 July. 1-10 were recorded on fifty-four days from 20 July-23 November.

Sanderling *C. alba*

One, moulting into summer plumage, was on the Northern Hares on 24 April, fifteen flew west over Longstone on 4 July, and one flew west over Brownsman on 22 September.

Little Stint *C. minuta*

An excellent year for this species with 1-7 present daily from 2-9 September, reducing to 1-2 daily from 10-13 September. One was on Brownsman on 27 September with four on the outer

group on 28 September and 1-2 resident on Brownsman, with one on Inner Farne, from 1-10 October. Two were on Inner Farne on 16 October with singles on 19 and 24 October.

Curlew Sandpiper *C. ferruginea*

Two adults were on Knoxes Reef on 17 August and a juvenile flew west over Brownsman on 30 August. Two juveniles were on Brownsman pond on 2 September with one on West Wideopens on 3 September. Finally a juvenile was resident on West Wideopens from 2-9 October.

Purple Sandpiper *C. maritima*

Recorded regularly until late May with a maximum of *ca* 200 on 13 May. Three birds were noted on 5 June, becoming regular from early July onwards. A peak autumn count was *ca* 520 on 17-18 November.

Dunlin *C. alpina*

One to two were seen almost daily throughout spring and early summer, with numbers starting to increase from mid-July onwards. The maximum was *ca* 100 around the islands in early September with a passage of 530+ flying north through Inner Sound on 13 November.

Ruff *Philomachus pugnax*

Singles were noted on 15 May and 6 August, then 1-7 were seen on eight days from 1 September-1 October.

Jack Snipe *Lymnocryptes minimus*

One on Brownsman on 30 April was the only spring record. 1-4 were noted on seventeen days from 21 September-24 November.

Snipe *Gallinago gallinago*

One to two were seen on six days between 29 March and 30 April. Twenty-two were on Inner Farne on 14 August with 1-16 on twenty-nine days from 18 August-21 November.

Woodcock *Scolopax rusticola*

Single birds were on Brownsman on 5 and 23 April. 1-5 were present on twenty-five days from 27 September-6 December with twenty-four on Brownsman, Staple Island and Inner Farne on 12 November.

Black-tailed Godwit *Limosa limosa*

A summer-plumaged bird flew north over Staple Sound on 18 September.

Bar-tailed Godwit *L. lapponica*

Birds were present daily from 14 August-11 September, with a maximum of five on 10 September, then daily from 1 October-3 December with a peak count of thirty-four on Knoxes Reef/West Wideopens on 9 November. Twenty-five flew north through Inner Sound on 13 November during a day of wader passage.

Whimbrel *Numenius phaeopus*

One to two were seen daily from 7-11 May, one was on West Wideopens on 27 May, then 1-3 were present almost daily from 5 July-11 September

Curlew *N. arquata*

Recorded regularly throughout the season with lowest numbers in May and June and peak counts of 500+ from mid-November onwards.

Redshank *Tringa totanus*

Recorded regularly throughout the season: the highest spring count was twenty in early April, with an autumn peak of 50+ in early December.

Greenshank *T. nebularia*

Singles were noted on 3 April, 3 June and 16 July followed by 1-2 on eleven days between 10 August and 12 September.

Green Sandpiper *T. ochropus*

Singles were seen on 8 and 30 April, 27 July and 30-31 August, with a 'resident' from 1-9 September and finally two on 11 September. All records were from Brownsman or Staple Island.

Wood Sandpiper *T. glareola*

One was feeding around the edges of Brownsman pond on 15 May, whilst another spent the afternoon of 6 June in the same area before being seen on Inner Farne in the early evening.

Common Sandpiper *Actitis hypoleucos*

One to two were seen daily from 24 April-14 May and one was on Brownsman on 31 May. Four birds on 1 June was the highest count and 1-3 were seen on thirty-three days from 30 June-6 November.

Turnstone *Arenaria interpres*

Recorded daily throughout the season with at least ten resident during the summer. Peak counts, from late October onwards, involved 460+ birds. A male was 'singing' to a female on Brownsman on 2 May.

Phalarope spp. *Phalaropus* spp.

A phalarope, almost certainly a grey phalarope, flew south through Inner Sound on 20 October.

Pomarine Skua *Stercorarius pomarinus*

Birds were recorded on nineteen days from 6 August-2 December. Records were predominantly of single birds with a peak count of ten (nine in one flock) on 17 October.

Arctic Skua *S. parasiticus*

Recorded regularly from 3 June-13 November. The maximum count was twenty-eight flying north on 1 August.

Long-tailed Skua *S. longicaudus*

An adult flew south over the Wideopens on 17 September, two juveniles were off the south end of Brownsman on 18 September, a juvenile flew north past Inner Farne on 30 September, and an adult passed north through Inner sound on 1 October.

Great Skua *S. skua*

There were ten records of 1-4 birds from 11 April-14 June, then more regular sightings of 1-26 from mid-July until mid-November. The only count to exceed this was when forty-seven flew north through Inner Sound on 3 November.

Little Gull *Larus minutus*

Singles were noted on 16 April and 19 May with two on 27 May, followed by 1-5 on sixteen days from 12 July- 4 December.

Black-headed Gull *L. ridibundus*

Birds were displaying from 27 March onwards with the first eggs on Inner Farne on 2 May and on Brownsman on 14 May. 67 (91) pairs nested as follows: Inner Farne 27 (40), Brownsman 40 (51). The first young were noted on 28 May with the first fledging on 29 June: all young were fledged by 15 August. Scarce from this date with numbers building up to 400-500 from early October onwards.

Common Gull *L. canus*

Recorded regularly until late May with a maximum count of 350+ on 13 April. There were records of single birds on 14 June, 10 July and 3 August, with numbers building up from late August. Largest counts of 200+ occurred in mid-October.

Lesser Black-backed Gull *L. fuscus* and **Herring Gull** *L. argentatus*

1,192 (1,288) pairs nested as follows: Inner Farne 5 (12), Knoxes Reef 15 (12), West Wideopens 175 (230), East Wideopens 98 (149), Skeney Scar 52 (59), Staple Island 56 (79), Brownsman 61 (63), North Wamses 308 (222), South Wamses 192 (156), Roddam and Green 15 (14), Big and Little Harcar 142 (257), Northern Hares 31 (14), Longstone main rock 12 (5), Longstone End 30 (16). A rough count suggests that lesser black-backs are approximately twice as common as herring gulls as a breeding species. The first eggs were located on 4 May. The lesser black-back roost numbered 300 in September reducing to *ca* ninety in October with just single birds thereafter. Herring gull numbers peaked at 2,800. Several *argentatus* birds were present in early December.

Iceland Gull *L. glaucoides*

One second-summer bird was feeding off the north rocks of Brownsman on 3 April. Watched for one hour during the morning it occasionally roosted on South Wamses, at one point next to a first winter glaucous gull.

Glaucous Gull *L. hyperboreus*

Two first winter birds were roosting on Brownsman and South Wamses on 3 April. Single birds were noted on nine days between 4 October and 4 December: most records involved first winter birds, with a second year bird on 21 October and an adult on 22 November.

Great Black-backed Gull *L. marinus*

Up to 200 were present in early April, reducing to ten by late May. 1 (2) pair nested as follows: North Wamses 1 (1), South Wamses 0 (1). An increase in numbers was evident from mid-June with a peak of 340 from late August onwards.

Kittiwake *Rissa tridactyla*

Birds were collecting nest material when the wardens arrived, although gales and rough seas hampered or destroyed their early efforts. The first eggs were recorded on 8 May with the first young on 3 June. 5,009 (6,119) pairs nested as follows: Megstone 23 (33), Inner Farne 1,464 (1,716), West Wideopens 221 (326), East Wideopens 336 (426), Skeney Scar 243 (277), Staple Island 1,438 (1,611), Brownsman 1,069 (1,424), North Wamses 43 (82), South Wamses 65 (62), Roddam and Green 19 (31), Big Harcar 88 (131). In mid-late June heavy rain and cool winds caused heavy losses of eggs and young on the outer group: 533 nests on Brownsman and Staple Island were monitored and these produced 1,048 eggs, and just 273 young of which only 139 fledged. The first fledged young was noted on 6 July, with the last on 14 August. On 12

October 5,000+ birds flew north through Inner Sound in one hour, otherwise numbers rarely rose above single figures in the autumn.

[**Lesser Crested Tern** *Sterna bengalensis*

Not recorded. After fourteen summers on the islands, with eight (possibly nine) nesting attempts and four hybrid young, 'Elsie' did not arrive.]

Sandwich Tern *S. sandvicensis*

One over Brownsman on 27 March increased to *ca* 2,500 (2,300 roosting on Inner Farne, 200 on Brownsman) by late April. 1,785 (2,484) pairs nested as follows: Inner Farne 778 (2,484), Brownsman 1,007(0). Heavy rain and cool winds reduced the Brownsman colony to about 600 pairs by late June. First eggs were recorded on 12 May with the first young on 6 June. The first fledged bird was noted on 6 July with the last on 28 September. The final bird of the year was seen flying south past Inner Farne on 17 October.

Roseate Tern *S. dougallii*

One bird roosting with arctic and common terns on the Bridges (the shingle reef between the Wideopens and Knoxes Reef which is exposed at low tide) on 5 May was the first of the year. 3 (3) pairs nested as follows: Inner Farne 3 (3). Five eggs were laid and three young fledged. Two birds roosting on West Wideopens on 27 August were the last of the season.

Common Tern *S. hirundo*

Singles on 23 April on Inner Farne and Brownsman were the first records. The first egg was found on 26 May with the first young on 29 June. 160 (184) pairs nested as follows: Inner Farne 158 (183), Brownsman 2 (1). The first chick fledged on 20 July with the last on 15 August. A juvenile off the north end of Inner Farne on 17 October was the last record.

Arctic Tern *S. paradisaea*

One flying north through Staple Sound on 10 April was the first record, with a steady build-up from 25 April onwards. Eggs were noted on 14 May with the first young on 6 June. 1,721 (2,460) pairs nested as follows: Inner Farne 1,212 (1,586), Staple Island 7 (1), Brownsman 502 (873). The first young fledged on 30 June with the last on 18 August. Small numbers were present in late August and September with a final record of an adult feeding in Inner Sound on 1 November.

Little Tern *S. albifrons*

The first bird on Inner Farne was recorded on 4 May and the roost, in St Cuthbert's Cove, had built up to fifty-eight by 17 May. Thereafter numbers declined with six birds on 23 May marking the final departure. Four flew south through Inner Sound on 12 June and one flew north past Crumstone on 3 August.

Black Tern *Chlidonias niger*

One was 'dip-feeding' in the Kettle on 29 June, with another exhibiting similar behaviour around Crumstone on 6 August.

Guillemot *Uria aalge*

Birds were present on the cliffs, and rafting offshore on 27 March. Egg-laying was delayed by storms and it was not until 23 April that the first egg was recorded. 33,456 (35,073) individuals were present on the breeding cliffs as follows: Megstone 172 (190), Inner Farne 3,552 (3,876), West Wideopens 1,631 (2,200), East Wideopens 2,165 (2,685), Skeney Scar 1,715 (1,677), Staple Island 16,546 (17,128), Brownsman 5,531 (5,552), North Wamses 1,507 (1,337), South Wamses 482 (311), Roddam and Green 111 (90), Big Harcar 44 (27). The first young was observed on 30 May with the first 'jumpling' on 16 June. The final young of the year left the

cliffs on 11 August. Birds were scarce from late August onwards with a maximum count of 100+ on 29 October; otherwise 10-15 were around the islands, particularly after gales.

Razorbill *Alca torda*

Birds were occupying nesting ledges on 27 March, but absent during storms in early April. The first eggs were found on Staple Island on 8 May with the first young on 13 June. 156 (150) nested as follows: Inner Farne 68 (52), West Wideopens 19 (18), East Wideopens 16 (18), Skeney Scar 5 (5), Staple Island 28 (34), Brownsman 5 (4), North Wamses 4 (7), South Wamses 4 (5), Big Harcar 6 (6), Longstone End 1 (1). The first young left the cliffs on 30 June and the last on 5 August. Birds were scarce from then onwards with a maximum of 5-7 observed in autumn.

Black Guillemot *Cepphus grylle*

One to three were noted on six days from 9-18 April, with summer-plumaged adults on 4 and 27 May and 3 June. 1-2 were observed regularly from 3 October-28 November. One roosted on Staple Island west jetty on 3 October.

Little Auk *Alle alle*

Recorded on just six days from 3-13 November. Maximum count was forty-two flying south through Staple Sound on 3 November.

Puffin *Fratercula arctica*

'Thousands' were rafting offshore on 27 March, with birds coming ashore from 28 March onwards. The first egg (predated) was noted on 4 May, whilst an adult carrying sandeels on 2 June indicated the first young. The first fledged chick was seen on 8 July with the last presumed to have left its burrow around 28 August. Due to the fragility of the nesting areas no count was undertaken – the population estimate in 1993 was 34,710. Heavy rain throughout June caused severe flooding of the burrows which had disastrous results, particularly on the outer group. From the one hundred monitored burrows only thirty-two young fledged: twenty-eight from fifty burrows on Inner Farne, four from the twenty-five on Brownsman, and none from the twenty-five on Staple Island. Contrast this with a 'normal' year when we would expect 85-95% fledging success.

Feral pigeon *Columba livia*

Present throughout the season with an estimated sixty pairs nesting. There were peak counts of *ca* 300 in late autumn.

Stock Dove *C. oenas*

Singles were on Staple Island on 17 May and Inner Farne on 7 October. Something of an island rarity, this species was last recorded in 1991.

Woodpigeon *C. palumbus*

There were twenty-two records, the majority in spring. Autumn birds were present from 1-8 October with a maximum of four on both Brownsman and Inner Farne on the 8th. One was on Inner Farne on 3 December.

Collared Dove *Streptopelia decaocto*

There were three records, all of single birds: on Brownsman on 29 March and 10 May, and on Inner Farne on 30 April.

Turtle Dove *S. turtur*

One was on Staple Island on the evening of 23 April.

Cuckoo *Cuculus canorus*

An immature male was on Brownsman on 29 May. First located by its call, it spent the day on Brownsman cliffs sheltering from strong winds and rain.

Long-eared Owl *Asio otus*

There were six records during the season: two on Inner Farne on 13 May, with singles on 14 May, 3 and 19 November, one on Staple Island on 3 November and one on Brownsman on 16 November.

Short-eared Owl *A. flammeus*

Ten birds were recorded, all in autumn: singles on Inner Farne from 30 September-1 October and on 5 October, three on 8 October, and one on East Wideopens on 13 October. On Brownsman single birds were recorded on 19-21 August, 23 September, 1-6 October and 2 November. A lone *Asio* sp. high over Inner Farne on 2 November could not be identified as to species.

Swift *Apus apus*

One to twenty-five were recorded regularly from 29 May-10 September.

Wryneck *Jynx torquilla*

One on Inner Farne on 2 September moved to West Wideopens and was 'resident' until 6 September. Two were on Brownsman on 3 September with one still present on 4 September – this bird was caught in the cottage and 'hissed like a snake' until released.

Short-toed Lark *Calandrella brachydactyla*

An elusive individual commuted between Inner Farne, the Wideopens and Knoxes Reef from 26-30 September. Seventh record for the islands; last recorded in 1994.

Skylark *Alauda arvensis*

Recorded regularly between 27 March and 29 November with a maximum count of fourteen on Inner Farne on 5 October.

Shorelark *Eremophila alpestris*

An excellent year for this species with eleven records. There was one spring record of a bird in flight over Brownsman on 25 April. A lone bird on Inner Farne on 1-7 October was joined by three others on 6-7 October, then one was recorded flying west on 24 October. On Brownsman/Staple Island three were recorded on 5 October, one on 7 October and one from 27-28 October.

Sand Martin *Riparia riparia*

Nine birds were recorded from the outer group on five days from 28 April-29 May. The only autumn record was of five over Inner Farne on 10 September.

Swallow *Hirundo rustica*

Nesting in St Cuthbert's Chapel looked set for a ninth consecutive year until one of the 'resident' pair was killed by a red-backed shrike on 31 May. Birds were recorded regularly from 19 April-6 October, with a maximum count of forty-four flying west over Brownsman on 10 September.

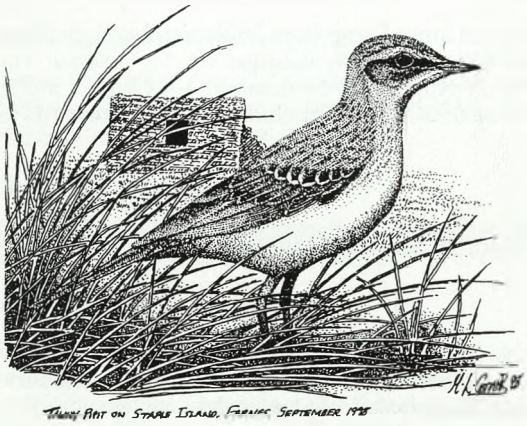
House Martin *Delichon urbica*

Recorded on nineteen days between 23 April and 18 September. The largest count was eight over Inner Farne on 6 September.

Richard's Pipit *Anthus novaeseelandiae*

One flew west over Staple Island on 30 May. On 21 September one was watched for a short period on Brownsman before flying off west with meadow pipits: the same bird was heard calling over Inner Farne. Fourth and fifth records for the islands; last recorded in 1994.

Tawny Pipit *A. campestris*



TAWNY PIPIT ON STAPLE ISLAND, FARNES SEPTEMBER 1995

An adult was on Staple Island on 13 May, and another seen on Brownsman and Staple Island on 28 September. First and second records for the islands.

Tree Pipit *A. trivialis*

Birds were recorded regularly from 28 April-2 June, then again from 6 August-5 October. There were maximum counts of seven birds daily throughout early and late September.

Meadow Pipit *A. pratensis*

Recorded regularly throughout the season although absent during July. A large passage of 444 was observed flying west over Brownsman during the morning of 10 September.

Rock Pipit *A. spinoletta*

Present throughout the season. 21 (21) pairs nested as follows: Inner Farne 5 (6), West Wideopens 1 (2), Knoxes Reef 1 (1), Staple Island 3 (2), Brownsman 8 (7), North Wamses 1 (1), South Wamses 1 (1), Longstone main rock 1 (1). Throughout October/November *ca* forty birds were present on both the inner and outer groups.

Yellow Wagtail *Motacilla flava*

One to four were recorded regularly from 23 April-15 May, with 1-5 on thirteen days from 1 September-4 October. A blue-headed wagtail *M. f. flava* was on Staple Island on 15 May.

Grey Wagtail *M. cinerea*

One was on Brownsman and Staple Island on 29-30 March, three on 3 October (one over Brownsman, two on the inner group), two on Inner Farne on 7 October and one flew west over Inner Farne on 1 November.

Pied Wagtail *M. alba*

Recorded daily throughout the season until early October with a maximum of *ca* twenty on Brownsman in August and September. 8 (8) pairs nested as follows: Inner Farne 2 (2), West Wideopens 1 (1), Staple Island 1 (1), Brownsman 3 (3), Longstone main rock 1 (1). White wagtails *M. a. alba* were recorded on the inner group on 28 March, 12 May, 1 October (two) and 2 October, and from Brownsman on 19-20 and 30 April and 9-11 May.

Wren *Troglodytes troglodytes*

One to six were present daily from 27 March-29 April: one bird on Brownsman was seen carrying nesting material on 24 April. Present daily from 10 September until the end of the season with a maximum of sixty-two on Inner Farne and Brownsman/Staple Island on 7-8 October.

Dunnock *Prunella modularis*

One to three were seen regularly from 28 March-23 April. Autumn birds were present from 20 September onwards with a peak count of twenty-five on Inner Farne and forty-one on Brownsman on 28 September.

Robin *Erithacus rubecula*

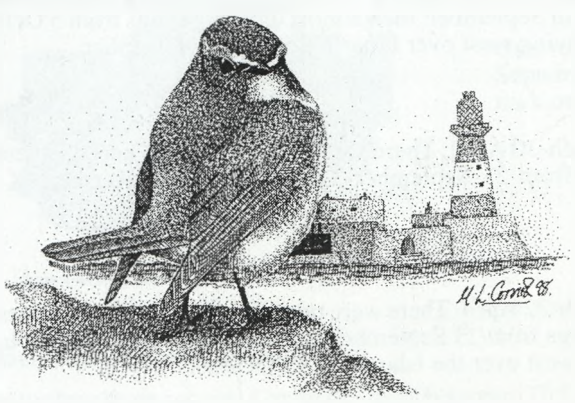
Spring birds were recorded between 27 March and 12 May, with autumn birds from 31 August-4 December. They were far more numerous in autumn with a maximum of 100+ on 1 October.

Nightingale *Luscinia megarhynchos*

A remarkable year with three birds recorded on Brownsman: one on 28 April, a different bird on 30 April (caught in Brownsman cottage), and a 'vocal' bird from 4-6 September. Frustratingly, to say the least, a very elusive and short-staying bird on Brownsman on 28 May may well have been a thrush nightingale *L. luscinia.*

Bluethroat *L. svecica* After a quiet year in 1997 with just two records, fourteen birds this season were most welcome: six males were seen between 11 and 16 May, with two males and four females between 28 May and 3 June, all on the outer group. Two males were on Inner Farne from 11-12 May.

Red-flanked Bluetail *Tarsiger cyanurus*



A Red-Flanked Bluetail. Longstone. Farne Islands. Sept '98

Probably the bird on the 'most wanted' list of the majority of Farne Island wardens down the years, an adult male, moulting into winter plumage, was present on Longstone End during the evening of 25 September. The three outer group wardens enjoyed excellent views but the inner group team were not so fortunate – dense fog delayed their arrival and by the time they got to Longstone it was too dark to relocate the bird. As the wardens' log commented 'heartbreaking stuff!'. First record for the islands.

Black Redstart *Phoenicurus ochruros*

One to three were recorded regularly from 29 March-1 May, one was present on 1 September, then one to three were noted regularly from 3-22 November.

Redstart *P. phoenicurus*

Recorded regularly from 22 April-2 June with a maximum of four on Brownsman on 23 April. Autumn birds were recorded from 31 August-8 October with a maximum of fifteen on Brownsman on 3 September.

Whinchat *Saxicola rubetra*

Fourteen were recorded between 23 April and 2 June and one was noted on 9-10 August, then there were almost daily sightings from 1 September-7 October with a peak count of twelve in early September. A leucistic bird, present on Inner Farne from 25 September-7 October, was an excellent 'confusion species'!

Wheatear *Oenanthe oenanthe*

Observed daily from 28 March-5 June, then almost daily from 16 August-24 October. The highest spring count was thirty-two on 8 May, and in autumn some forty birds were present on 3 September.

Ring Ouzel *Turdus torquatus*

The only spring record involved three birds on 20-21 April. Lone birds were on the outer group on 24-25 and 27 September and 24 October, with three on 28 September. An immature was on Inner Farne from 26 September-2 October.

Blackbird *T. merula*

Recorded daily in small numbers from 27 March-25 April, with single records in May and June. In autumn birds were recorded daily from 23 September until the end of the season. No major movements were witnessed with the peak count of 200 on 12 November.

Fieldfare *T. pilari*

One to twenty-two were recorded daily from 27 March-30 April, with one bird on Brownsman on 6 May. There were three records in September, then almost daily sightings from 5 October onwards with a peak count of 350 flying west over Inner Farne on 12 November.

Song Thrush *T. philomelos*

Observed almost daily from 27 March-30 April. There were three records in early September then birds were seen almost daily from 23 September-3 December. A peak count of 125 occurred on 23 September.

Redwing *T. iliacus*

Recorded almost daily from 27 March-22 April. There were two records of single birds in early September, then almost daily sightings from 23 September-2 December. There was one large count in autumn when 4,700+ flew west over the islands on 13 October.

Mistle Thrush *T. viscivorus*

Single birds were present on Inner Farne on 2 and 18 April, with one on Brownsman on 5-6 April. In autumn singles were on Inner Farne on 26 October and 7 and 20 November.

Grasshopper Warbler *Locustella naevia*

Four records from Brownsman between 25 April and 13 May probably involved just three birds. Singles were on Brownsman on 11 and 31 August, with daily sightings from 1-8 September, 23 September-3 October and one on 7 October. The maximum count was five on 25 September.

Sedge Warbler *Acrocephalus schoenobaenus*

One was found dead on Northern Hares on 24 April. One to five were recorded on eleven days from 9 May-16 August with birds singing on 9 May and 19 June. There was one on 3 September, then 1-2 were present on seven days from 26 September-9 October. A late bird was on Inner Farne from 16-18 October.

Marsh Warbler *A. palustris*

Two birds were present on 1 June – one on Staple Island and another on Longstone End. A bird on West Wideopens on 3 June may well have been this species but fleeting views did not allow specific identification. Fourth and fifth records for the islands; last recorded in 1997.

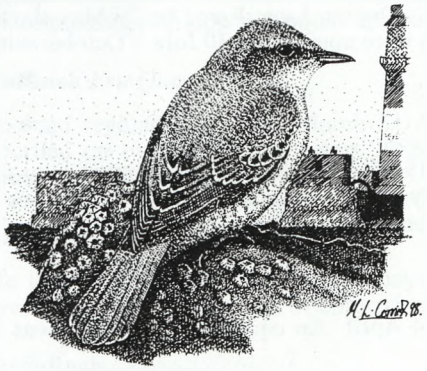
Reed Warbler *A. scirpaceus*

An excellent year with at least twenty-nine birds recorded, the largest day count of eight being on 3 September. Two were observed on West Wideopens on 3 June, with daily sightings from 1-10 September and 24 September-6 October. A very late bird was on Inner Farne on 14 November. An 'unstreaked *acrocephalus*' was on Staple Island and Brownsman throughout 4 November but could not be positively identified – the possibility of an eastern race reed warbler could not be discounted.

Icterine Warbler *Hippolais icterina*

One was on Brownsman on 1-2 September and one was on East Wideopens on 2-4 September.

Barred Warbler *Sylvia nisoria*



BARRED WARBLER ON LONGSTONE, FARNES. SEPTEMBER 1998.

One was on West Wideopens on 2 September and another on Longstone main rock on 25 September.

Lesser Whitethroat *S. curruca*

One to three were recorded on seven days between 27 April and 4 June. In autumn 1-2 were noted regularly from early September-4 November.

Whitethroat *S. communis*

One to five were recorded on seven days between 7 May and 15 June. 1-4 were recorded on thirteen days from 6 August-2 October.

Garden Warbler *S. borin*

One to two were observed on ten days from 13 May-2 June. There were three records in mid-August followed by regular sightings from 1 September-3 October. Forty-one birds on 3 September was the largest count, the only one in double figures.

Blackcap *S. atricapilla*

One to four were seen on twenty-one days from 3 April-3 June. In autumn birds were recorded regularly from 3 September-18 November with a peak count of eighteen on 1 October.

Yellow-browed Warbler *Phylloscopus inornatus*

Four birds were recorded: one on Inner Farne on 27 September, and singles on Brownsman, Staple Island and Longstone End on 28 September.

Wood Warbler *P. sibilatrix*

One was on Inner Farne on 23 April.

Chiffchaff *P. collybita*

One to fourteen were observed regularly between 27 March and 30 May. One was on Inner Farne on 31 July, with birds appearing regularly from 1 September-19 November. The peak count was in excess of sixty on 5 October. 'Eastern race' birds were recorded on six occasions, with birds showing characteristics of the Siberian race *tristis* present on 6-7 and 16 October.

Willow Warbler *P. trochilus*

Present almost daily from 3 April-19 June with a peak count of forty-five in late April. Many birds during this period were recorded as 'singing'. One on Inner Farne on 29 May showed characteristics of the northern race. Returning birds were noted from 30 July-9 October with a maximum count of seventy on 1 September.

Goldcrest *Regulus regulus*

Recorded daily between 28 March and 8 April and 19-25 April, with a peak count of sixty-five on 29 March. In autumn birds were seen almost daily from 30 August-21 October, with one on Brownsman on 21 November. Forty were present on 3 October.

Firecrest *R. ignicapillus*

A very confiding female was on Inner Farne on 4 April. An equally 'tame' male was on Brownsman on 7 April.

Spotted Flycatcher *Muscicapa striata*

One to six were recorded on ten days from 13 May-6 June. In autumn 1-5 were seen on fifteen days between 1 September and 3 October.

Red-breasted Flycatcher *Ficedula parva*

A first winter bird was on Longstone main rock on 27 September, frequently flycatching on its sorties from the lighthouse fence.

Pied Flycatcher *F. hypoleuca*

Four birds were noted in spring with records from the outer group on 30 April, 28 May and 30 May-1 June, and one on Inner Farne on 30 May. Recorded on twelve days from 31 August-28 September with a peak count of nineteen on 3 September.

Red-backed Shrike *Lanius collurio*

A record year with eleven birds observed. Females were on the outer group on 11, 27 (two) and 30 May (two). Males were seen on 27-28 May and 1 and 20 June and one was on Inner Farne from 29 May-2 June. Juveniles were present on Brownsman/Staple Island on 30 August and 3-4 September. Birds were seen to take one of the 'resident' swallows, wheatear and pied flycatcher.

Jackdaw *Corvus monedula*

In spring, birds were recorded on ten days from 29 March-20 June with peak counts of five on 29 and 31 March. Four were observed on 9 October with three on 22 October. All records refer to birds flying over the islands.

Rook *C. frugilegus*

Observed daily from 20-23 April, then recorded on 6 May and 13 and 24 October. Never more than two birds were seen and, as with the previous species, all were fly-overs.

Carrion Crow *C. corone*

Recorded regularly throughout the season although scarce in mid-late June. The peak count was six birds on 19 April.

Starling *Sturnus vulgaris*

Recorded daily throughout the season. The peak count was 700+ flying north over Inner Farne on 1 November. 3 (3) pairs nested as follows: Inner Farne 3 (3). Nest sites were on St Cuthbert's Chapel, Prior Castell's Tower and the west cliff. The regular mimic was present with impressions of lapwing, house sparrow, chaffinch, bullfinch and yellowhammer.

Chaffinch *Fringilla coelebs*

Recorded regularly from 28 March-23 April with a maximum of eleven on 29 March. Recorded on twenty days between 24 September and 25 October with a peak count of twenty-six on 28 September.

Brambling *F. montifringilla*

One to two were recorded on eight days in April. Seen regularly from 23 September-21 November with a peak count of approximately fifty birds on 1 October.

Greenfinch *Carduelis chloris*

One to seven were noted on six days from 4-18 April. Two were on Brownsman on 1 and 7 October and one was over Inner Farne on 3 October, with two on 23 November and one on 2 December.

Goldfinch *C. carduelis*

All sightings came in spring with birds recorded on eleven days between 8 April and 14 May. All records were of single birds with two exceptions: five flying east on 8 April and ten on Brownsman on 2 May.

Siskin *C. spinus*

One to three were present between 22 and 29 April. A female was on Brownsman on 16-17 May. In autumn 1-10 birds were present on thirteen days from 14 September-8 November.

Linnet *C. cannabina*

Birds were present almost daily from 28 March-28 May with a peak of twenty-four on 19 April. There were two records in July, then almost daily sightings from 25 September-2 December with a maximum of 115 on 18 November.

Twite *C. flavirostris*

An excellent autumn with birds present almost daily from 21 October-3 December and numbers regularly into double figures. The peak count was eighty birds on Inner Farne on 17 November.

Redpoll *C. flammea*

Spring records, all from the outer group, of single birds on 20-21 April and four days in May. One to three were seen on thirteen days from 20 September-28 November.

Common Crossbill *Loxia curvirostra*

One, calling, flew over Inner Farne on 25 September.

Lapland Bunting *Calcarius lapponicus*

An excellent year with at least eight individuals recorded. The only spring record was a female on Inner Farne on 23 April. In autumn birds were recorded almost daily from 20 September-7 October.

Snow Bunting *Plectrophenax nivalis*

There were three records of single birds on 28 March and 6 and 14 April. In autumn birds were observed almost daily from 23 September-30 October, and daily from 2 November-5 December. The largest flock was sixty-one birds flying low over Brownsman on 16 November.

Yellowhammer *Emberiza citrinella*

All records were of single birds on Brownsman: 29 March, 'resident' from 8-13 April, 16 October and 4 November.

Ortolan Bunting *E. hortulana*

There were four definite records – a fifth bird on Brownsman could not be confirmed. One to two (possibly three on 4 September) were on Brownsman from 3-11 September, with singles on Inner Farne on 1-2 and 5 October.

Little Bunting *E. pusilla*

Three birds were recorded: one on Inner Farne/West Wideopens on 4-7 October, with one on Brownsman on 6 October being joined by a second bird on 7-8 October.

Little Bunting, Inner Farne, Oct. 1998

Reed Bunting *E. schoeniclus*

Four birds were recorded on three spring days between 7 April and 15 June. Observed daily from 24 September-31 October, with singles on 20 November and 2 December. The peak count was sixty-six birds on 1 October.

FARNE ISLANDS RINGING REPORT FOR 1998

Weather, and the wide spread of laying dates, affected the numbers of birds ringed during the 1998 breeding season. Many of the accessible kittiwake nests were washed out in bad weather, and some shag chicks were too old to ring once the ringing team was able to get access to Staple Island. However, good numbers of Sandwich terns were ringed on both Inner Farne and Brownsman, and this will be a useful sample to continue long-term monitoring of this species.

The ringing totals for all species in 1998 (1997 totals in brackets)were: shag 105 (67), eider 34 (32), kittiwake 153 (279), Sandwich tern 609 (147), roseate tern 1 (4), arctic tern 378 (448).

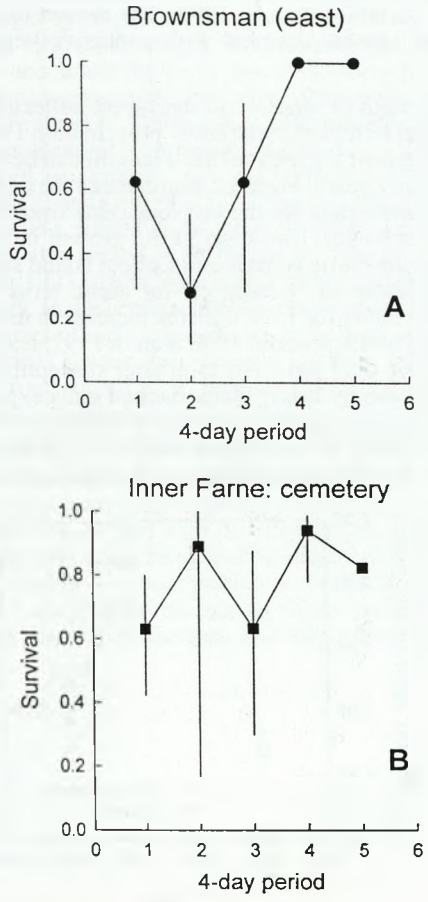


Figure 1 Survival probabilities by 4-day periods from hatching (approx.) for arctic tern chicks on Brownsman (A) and Inner Farne (B) in 1998 (June-July). Bars represent 95% confidence intervals.

This year, the ringing team repeated the mark-recapture study of arctic tern chicks to produce information on chick survival which can be used to improve the management of breeding habitat, and as a tool for monitoring long-term changes in the breeding success of terns on the Farne Islands. The study design was similar to last year and four areas, two on Brownsman and two on Inner Farne, were used for mark-recapture in 1998. The numbers of arctic terns ringed in the study plots were lower than hoped, and the eventual sample sizes from one area on Brownsman and one on Inner Farne were too small for analysis. The remaining Inner Farne and Brownsman study areas used for analysis differed markedly in character. On Brownsman, the study plot (seventy-nine arctic tern chicks ringed) was around the old lighthouse cottage and was predominantly grass, bordered by nettles. The Inner Farne plot (103 chicks ringed) was the old cemetery and consisted of bare ground with patches of nettles, thistles and areas of lush *Amsinkia* growth. When the tern chicks were ringed, their hatching status was recorded (when known) as ***a***, ***b*** or ***c*** to indicate chicks of decreasing age within a brood, and their total-head length was measured to estimate age.

Recording the status of chicks and the age at ringing (total head length measurement) will allow survival rates to be related more closely to age, and survival of ***a*** and ***b/c*** chicks to be estimated separately. Ringed chicks were recaptured at approximately four-day intervals during routine nest-monitoring visits by the Farne Island wardens.

The mark-recapture data have been analysed using the MARK program, as before. Information from both live recaptures and recoveries of dead chicks was used to estimate survival rates during the pre-fledging period. Results of a preliminary analysis, in which relative age at ringing (most chicks were actually ringed within a few days of hatching) and hatching status have not been taken into account, are given in Figure 1. Due to an unusually extended season, the analysis has been done with respect to post-hatching development and not with respect to ringing date (i.e. chicks ringed later are included with earlier ringed chicks so that the periods represent survival probabilities relative to age and not date). Survival rates for arctic tern chicks on Brownsman were markedly lower than in 1997, particularly during the early stages of development, and this may have been due to the predation by lesser black-backed gulls frequently observed by the wardens. Arctic tern chicks fared better on the Inner Farne cemetery plot, but survival was again lower (and more variable) than in 1997. The reason for this is unknown, but the wet weather throughout the season, coupled with excessive vegetation growth, may have been to blame.

Data for chick weight in relation to total head length (a measure of age) were collected from arctic tern chicks greater than nine days old (***a*** and ***b*** chicks) in the study plots in both 1997 and 1998. The elevations of plots of $\log_{10}$ (weight) against $\log_{10}$ (total head length) can be used as an index of growth quality for comparison between years. Figure 2 summarises the data from the Farnes in the last two years, and, for comparison, data for the last four years from Coquet Island. Although there can be considerable year-to-year variation in the growth index, the parallel change between 1997 and 1998 for both the Farne Islands and Coquet Island suggests that this growth index may be a valuable indicator of 'condition' for arctic terns in the north-east. It is tempting to link the low condition index for 1998 with the increase in mortality of arctic tern chicks compared with 1997. If food was scarcer in 1998 than in 1997, leading to reduced body condition of arctic tern chicks, this may have led to greater susceptibility to adverse weather conditions and increased predation by lesser black-backed gulls exploiting the tern chicks as an alternative food source. While we have, as yet, no direct evidence of a link between growth index and food available to the chicks, it would be worthwhile to monitor the type of food brought to the arctic tern chicks in view of the importance of sandeels, sprats and other small prey fish for the marine ecosystem around the Farne Islands. Furthermore, identifying a link between chick condition (growth index) and chick mortality from causes other than predation (such as weather), would increase our understanding of factors regulating tern breeding success.

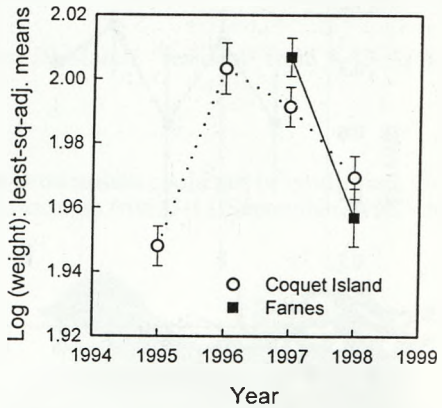


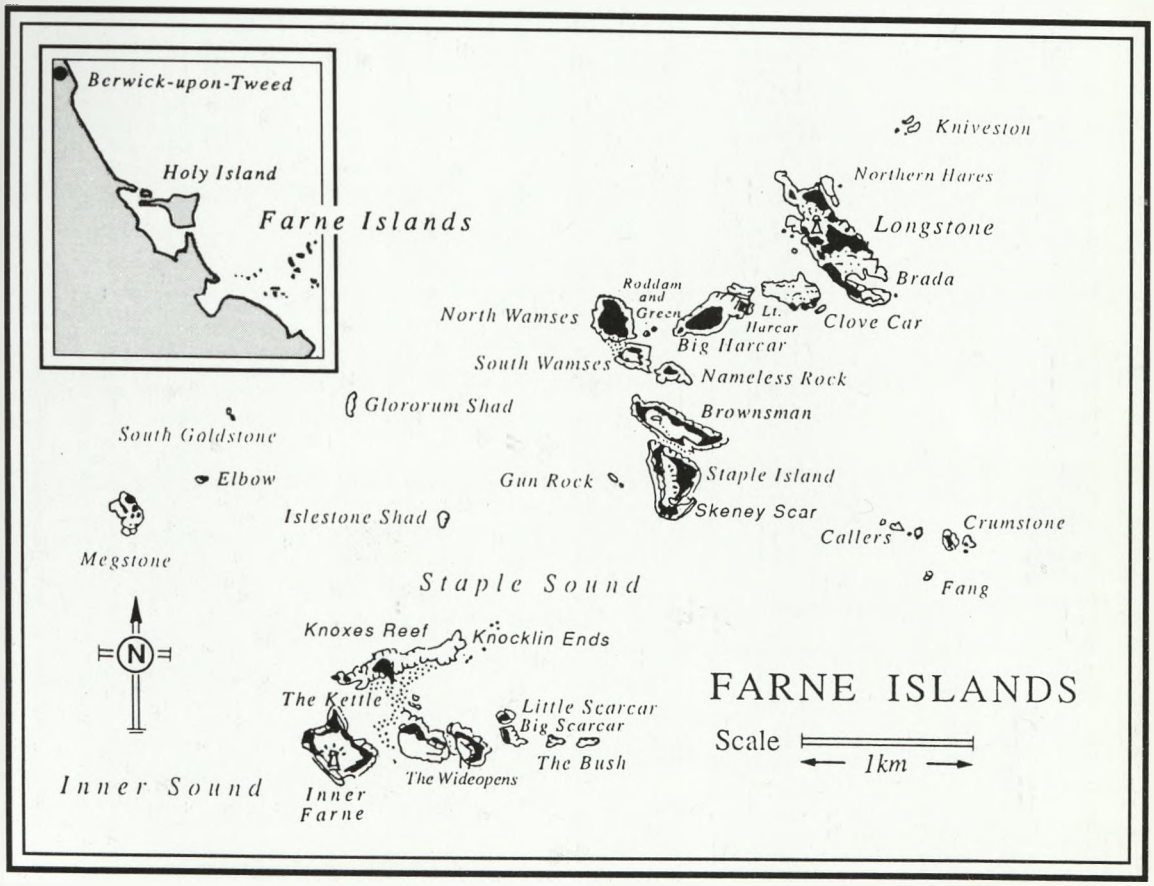
Figure 2 The growth index for arctic terns on the Farne Islands in 1997 and 1998 (■) and Coquet Island for 1995-1998 (○). The points represent the mean elevations of the lines relating chick weight in relation to total head length (plotted on a Log_{10} scale), ± standard error, derived from analyses of covariance.

Recoveries and resightings of birds ringed in previous years continue to provide valuable data for monitoring survival rates, movements and population structure. Resighting data are particularly valuable as this is the most efficient way to obtain estimates of survival or mortality rates. Shags and kittiwakes are the two species for which most resighting data are obtained, and in 1998 around 85% of the records for these two species (86/102 and 83/94, respectively) were from rings read in the field. Since the kittiwake is a pelagic species outside of the breeding season,

these resighting data are particularly valuable as recoveries alone are unlikely to yield sufficient data for reliable estimates of survival rates. Apart from local recoveries of kittiwakes, two chicks ringed in 1981 were caught again on the Isle of May, Fife, in 1997, and a chick ringed in 1997 was found dead in Gwynedd, Wales, in July 1998. One long distance recovery was reported: a kittiwake chick ringed in 1996 was shot in Atammik Maniitsoq, Greenland, on 3 June 1997. This bird was following a familiar pattern, both with respect to its location and the mode of its demise: immature kittiwakes are known to cross the North Atlantic to reach the Canadian coast, and for the Ringing Scheme as a whole up to 1996 there have been 141 recoveries of kittiwakes in Greenland, where seabird shooting is common. For the shags, twelve adults were retrapped during ringing in 1998, and amongst birds recovered dead there were no long distance movements of note: chicks ringed in 1996 were recovered dead in the Grampian and Lothian regions, and two ringed in 1997 were recovered locally.

As for the kittiwake, there are usually only small numbers of arctic tern recoveries reported annually. Sight records or local recoveries accounted for most of the sixteen reports of ringed arctic terns, and there were only two long distance recoveries: a bird ringed as a chick in 1986 was caught by ringers on the Isle of May, Fife, in 1997, and a much younger bird, ringed as a chick in 1997, was caught and released in Lagos, Nigeria, in October the same year. Sight records accounted for thirty-one of the forty-two ringed Sandwich terns reported: sightings on the Farnes were complemented by sight records from Italy (1), Griend, Netherlands (8), Dorset (2) and France (1). The number of birds reported from Griend reflects the intensity of effort of local ornithologists to read ring numbers of ringed birds. Two adult Sandwich terns were recovered in Senegal, and chicks ringed in 1996 and 1997 were recovered in Ghana (2), Senegal (2) and Gibraltar (1). The two oldest birds reported as recoveries this year were both puffins: one, ringed as an adult in 1976, was found dead in Sweden in February 1998, and another, also ringed in 1976 but as a chick, was found dead (oiled) in Humberside during October 1997. Apart from a bird ringed in 1984 as an adult and recovered dead (also oiled) in Denmark in December 1997, other recoveries or sightings of ringed puffins were local. Recoveries of eider (three local recoveries and ten retraps during ringing), guillemot (3) and cormorant (3) were also reported last year. Of the cormorants, two were reported from further afield: one, ringed as a chick in 1982, was found dead in Suffolk, possibly killed by being unable to swallow a large flounder found in its throat, and the other was a report from Lincolnshire of a ring but no bird, the ring having been put on a cormorant chick in 1985.

We are extremely grateful to the Farne Islands Local Management Committee of the National Trust for allowing the ringing studies to be carried out on their behalf, the resident wardens who not only helped with the ringing and mark-recapture but also spent many hours reading ring numbers in the field, and Northumbrian Water who generously support the work through the provision of a boat, which is vital for allowing access to the Farne Islands and Coquet Island. Last year, Northumbrian Water also provided a Land Rover to help launch the boat over the soft sands at Seahouses, and this proved to be particularly useful.


Berwick-upon-Tweed
Holy Island
Farne Islands
Kniveston
Northern Hares
Longstone
Brada
Roddam and Green
North Wamses
Lt. Harcar
Clove Car
Big Harcar
South Wamses
Nameless Rock
Glororum Shad
Brownsman
South Goldstone
Elbow
Gun Rock
Staple Island
Skeney Scar
Islestone Shad
Callers
Crumstone
Megstone
Staple Sound
Fang
Knoxes Reef
Knocklin Ends
The Kettle
Little Scarcar
Big Scarcar
The Bush
The Wideopens
Inner Sound
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N
FARNE ISLANDS
Scale
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TRANSACTIONS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBRIA

Editor:
D GARDNER-MEDWIN
Assistant Editors:
D C NOBLE-ROLLIN
M A PATTERSON

Volume 59
Part 3

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA
THE HANCOCK MUSEUM
NEWCASTLE UPON TYNE NE2 4PT
1999

Front Cover: Thrislington Plantation, Durham. An example of Magnesian Limestone grassland photographed by Dr Sam Ellis.

Butterflies: (top to bottom) Dingy Skipper basking on a rock; Ringlets mating; Northern Brown Argos on Bloody Cranesbill photographed by Dr Hew Ellis.

ISSN 0144-221X

Printed by Pattinson and Sons, Newcastle upon Tyne.

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ERRATUM

Bryophytes of Castle Eden Dene

In the paper by G. Mitchell and G. Robertson, (*Transactions* volume 57 part 4, page 128, paragraph 2), the following sentence should be deleted: "In this study, a number of species have been found to be unique to elm; most notably *Mnium stellare* which is rare in VC66". This species, though rarely recorded in the Vice County, was not found on elm and is correctly recorded as an epilith in the appendix to the paper.

Trans. Nat. Hist. Soc. Northumbria **59**: 65-82 (1999)

BIRD SPECIMENS FIGURED BY THOMAS BEWICK SURVIVING IN THE HANCOCK MUSEUM, NEWCASTLE UPON TYNE

L Jessop

The Hancock Museum (Tyne & Wear Museums), Barras Bridge, Newcastle upon Tyne NE2 4PT

SUMMARY

A survey of the mounted bird collections at the Hancock Museum, Newcastle upon Tyne has revealed the survival of thirty-three specimens that were figured by Thomas Bewick for use in his *History of British Birds* and two others that were cited by him. The curatorial history of these specimens is discussed.

INTRODUCTION

During recent decades, staff at the Hancock Museum have retrieved from the museum's attic four specimens of birds that were figured by Thomas Bewick. Early in 1995 a specimen of a knot was found in the attic which was labelled as a Bewick-figured specimen, and this fed suspicions that there might be further, hitherto-unrecognised, material stored there. Through the summer of 1995 a very thorough search of the attic and other storage areas in the museum was carried out, and a detailed scrutiny was made of archival material. The search revealed the presence of dozens of late 18th- and early 19th-century mounted birds.

When the rediscovered Bewick-figured material is added to the specimens that were previously recognised, there are thirty-three birds figured by Bewick and two cited by him surviving in the Hancock Museum. Twenty-five of the birds are 18th century mounts from the collection of Marmaduke Tunstall (1743-1790) of Wycliffe in Yorkshire, and together these comprise a highly important sample of 18th century taxidermy. One bird[1] from Tunstall's collection not figured by Bewick was found associated with Bewick-figured specimens: it is discussed below because of that previous association.

The birds are of undoubted interest, both in the history of natural history and for comparative study of Bewick's work and its sources. The present paper provides documentation of the specimens at a basic level, generally leaving detailed investigation to other workers: some specimens, however, have already been discussed in greater detail elsewhere (Jessop and Prŷs-Jones in press; Jessop 1999a). As the project progressed, new information on the life of Marmaduke Tunstall was amassed, and this has also been presented in a separate paper (Boyd and Jessop 1998). The fate of Tunstall's collections, within the context of the history of the Hancock Museum, is discussed by Jessop (1999b).

In addition to the rediscovery of this important material, the study is of interest because it demonstrates how rapidly – in terms of the life of a museum – a collection can degrade once it loses its integrity.

HISTORY OF THE COLLECTION

Marmaduke Tunstall amassed one of the most important systematic bird collections in 18th century Europe. After his death in 1790 the collection remained at his house at Wycliffe for a short while, where some of the birds were figured by Thomas Bewick, who made a two-month visit to Wycliffe in 1791 (Bewick 1975; Bain 1981). Later in the same year, the birds from Tunstall's Museum were acquired by the antiquary George Allan, of Darlington, and remained in his possession until his death in 1800. Allan's collection was bought by the Newcastle Literary and Philosophical Society in 1822 and was thoroughly catalogued by George Townshend Fox in 1827. Although originating with Tunstall, the specimens have long been referred to as being from the 'Allan Museum', and that convention is followed here.

1 The green-headed bunting, the holotype of *Emberiza chlorocephala* Gmelin, 1788 and of *Emberiza tunstalli* Latham, 1790 (Jessop and Prŷs-Jones in press).

Thomas Bewick commented on the poor preservation of the birds in his *Memoir* (Bewick 1975) "... I found the very great difference between preserved Specimens & those from nature, no regard having been paid at that time to place the former in their proper attitudes, nor to place the different series of the feathers, so as to fall properly upon each other". Scrutiny of a list of the species for which Bewick relied on Tunstall's specimens (Appendix Two) shows that he used the collection at Wycliffe only for the rarer birds, i.e. those species of which he could not obtain locally-shot specimens or draw from life. It is possible that Bewick sketched a wider range of species in Tunstall's collection but superseded these figures when 'better' reference material was located: in two instances (the capercaillie and great auk) there are surviving drawings based on Tunstall specimens that were not worked up for publication.

Bewick continued to add new figures as his *History of British Birds* proceeded through various editions, but he did not call upon the Allan Museum specimens again until the edition of 1826, published after the collection had arrived in Newcastle. The birds illustrated in this later period included some species, like the bluethroat, that had been added to the British List since 1791 as well as other species for which he had earlier been unable to find illustrative material. Fox (1827) listed all of the specimens in the Newcastle Museum that he knew, or suspected, to have been drawn by Bewick. Twenty-five of those birds listed by Fox have been lost over the last 170 years, a survival rate of about 40% (Appendix Two). This rate is indeed impressive when contrasted with the birds in Tunstall's collection *not* figured by Bewick, of which only two – a long-tailed tit and the green-headed bunting – out of some 600 specimens (0.3%) have survived.

The birds of the Allan Museum initially formed the greatest part of what was to become known as the Newcastle Museum but, as material was added to the collections during the 19th century, many of the earlier specimens were discarded (Jessop 1999b). Effectively under the care of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne (renamed the Natural History Society of Northumbria in 1974) from 1829 until the present, the Newcastle Museum was removed in 1884 to a purpose-built new home, which has been called the Hancock Museum since 1891.

A number of Bewick's original drawings and watercolours have survived, and Bain (1981) reproduced a large selection of them alongside copies of the finished woodcuts. Fifteen of the watercolours of birds in Bain (1981) relate to the surviving specimens.

A DISPLAY OF BIRDS FIGURED BY BEWICK.

A special display of the birds figured by Bewick once existed in the Hancock Museum, and its predecessor the Newcastle Museum.

Two of the Hancock Museum's long-serving curatorial staff, E Morton[1] and A M Tynan[2], remember (*pers. comm.*) being told by the late Grace Hickling[3] that when she was young there was a large case on display in the museum "full of birds figured by Bewick". Mrs Hickling was born in 1908, which implies that her recollection of the case possibly related to the 1920s or 1930s. The display she remembered was probably that mentioned in the Council minutes of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne on 23 March 1867: "Messrs J. Hancock ... to direct the erection of suitable cases for the birds figured by Bewick separate from the general collection". The display that John Hancock erected in the Newcastle Museum was transferred to the new building in 1884: Bewick-figured birds were certainly on display in the Hancock Museum in 1897, as Watson (1897) reported that "there is a case of the birds above mentioned as they were when Bewick's pencil made them live".

1 Worked at the Hancock Museum from 1970 to the present. Initially employed as a taxidermist and, from 1992, as Assistant Keeper of Biology.

2 Curator of the Hancock Museum, 1958-1992.

3 Grace Hickling (1908-1986) worked as an honorary secretary to the Society at the Hancock Museum from the late 1940s until her death (Shannon 1988).

Gill (1908) wrote an article about the history of the Hancock Museum, in which he said of the Allan Museum "... practically all that survive in the museum of to-day are a few stuffed birds which served Bewick as models for his woodcuts, and some extremely valuable native implements ... A group of the old 'Allan Museum' birds, together with Bewick's figures of them, are now on show on the 'Bewick Gallery' in the museum; they were probably thought satisfactory when they were stuffed, more than a hundred years ago, but to us now they look very distorted, and even in Bewick's woodcuts they have undergone much 'editing' ".

The Bewick-figured specimens were not listed by Howse (1899) in his catalogue of the birds displayed at the Hancock Museum. Howse, however, included only those specimens on display in the Bird Gallery and not elsewhere in the museum, and Gill's mention of a 'Bewick Gallery' suggests that they were displayed in a separate room. The display may have been on the balcony of the southern large gallery (known as the Zoology Room), where for many years there was an exhibition of Bewick's work[1].

The most valuable specimens of the Hancock Museum were removed from display in 1939 and sent to country houses in Northumberland for the duration of World War II. The Bewick-figured birds were probably evacuated at that time, and the capercaillie (at least) was seen by the museum's taxidermist S E Cook at Wallington Hall during the war years[2]. It is not known whether the display was re-assembled after 1945, and there is no mention of it in the curators' reports covering the period 1932-1970[3]. The birds were not entered in the lists of specimens in the stores or on display made by Cook in the 1940s/50s[4], and the display had certainly been dismantled before A M Tynan joined the staff of the Hancock Museum in 1958 (AMT *pers. comm.*).

Whether or not the display was reassembled after 1945 or was subsequently removed during the 1940s or 1950s is perhaps immaterial. The specimens were ultimately consigned by an unknown person to the museum's attic, the start of a process that led to the break-up of the collection.

'A' STANDS FOR ATTIC

The attic of the Hancock Museum is a dusty, dimly-lit, maze of roof posts, with a mostly lath-and-plaster floor. It may be thought to be an astonishingly bad storage location for material that ranks among the museum's greatest treasures, but for much of the 20th century it was the only available storage space for the museum's collection of non-display large items (bird mounts, fish, and mammal trophy heads)[5]. In this respect, it was probably the most obvious place to relocate the boxes of Bewick-figured birds when they were removed from display.

At some time, probably during the 1960s, a list was prepared of all of the 600 or so specimens stored in the attic[6]. All of the specimens were numbered with the characteristic prefix 'A', so the list is here referred to as the 'A-list'[7]. Against several of the entries in the A-list is the word 'Bewick', indicating that the person who compiled the list was aware of their significance – it

1 James Alder, ornithologist, artist and long-standing supporter of the Hancock Museum, has confirmed (*pers. comm.*) that he remembers the display of Bewick-figured birds being on the balcony of the Zoology Room in the 1930s.

2 Manuscript book SL10 in the archives of the Hancock Museum.

3 In the Council minute books of the Natural History Society of Northumbria.

4 Manuscript books SL5 & SL6 in the archives of the Hancock Museum.

5 Since 1992 the attic has been progressively cleared, the material being moved to better stores.

6 The list certainly pre-dates 1979: the bird gallery was thoroughly redeveloped in that year (Tynan 1979), and those specimens not needed for the new display were removed to the attic. Because none of these ex-display specimens was given an 'A' number, it suggests they were not there when the list was made. A pre-1970 date is suggested, because there is photographic evidence that some birds numbered in the A-list were exhibited in a temporary display in that year: they were found, in 1995, in the (unnumbered) boxes in which they had been displayed in 1970.

7 The A-list survives in the archives of the Hancock Museum.

is puzzling that he or she took no action to retrieve the birds from the attic at that time. Because the 'A'-list provides storage localities within the attic, we know that most of the Bewick-figured specimens were housed together at the time the list was made.

The word 'Bewick' appears against two unnamed birds (A520 and A521) in the A-list. No birds with those numbers have been found in the attic: however two birds that once were housed in the attic (spoonbill and merlin) have not been matched to A-numbers. It may be presumed that these two birds equate to specimens number A520 and A521.

Case A508, according to the 'A-list', contained "Night Heron. Curlew. Bustard. LTLE". The word 'Bewick' does not appear alongside, but there is only one night heron on the list, and this is known to be a Bewick-figured specimen. The other specimens in the box were not figured by Bewick[1].

The 'A-list' has proved useful in assessing one important specimen. When the South African shelduck was found it had no indication, by way of old labels, that it had been figured by Bewick, although it is on a similar style of wooden base to other such birds. Listed as 'A525 ruddy shelduck Bewick?', it agrees with Bewick's figure and is the only specimen of that species in the Hancock Museum's collections (Jessop 1999a).

AFTER THE A-LIST

There has been considerable disturbance and dispersal of the attic-stored birds in the decades since the A-list was produced. Many of the Bewick-figured birds were taken out of their wooden cases, and when found in 1995 were housed in polythene bags (a recent innovation, not available in the immediate post-war years).

In 1970, five birds were removed from store and used in an exhibition about Thomas Bewick[2]. In preparing the exhibition, the birds were taken out of their original cases and put into glass-fronted boxes with distinctive black-painted interiors. Four of them were still in these cases in 1995: the bee-eater (removed from case A473) was found in the attic together with the nutcracker (A518) and the great-crested grebe (A510)[3]. The chough (A516), was found in another store: when found it was unlabelled, and but for its distinctive stance and for the association of black-painted boxes it would have been overlooked as a Bewick-figured bird. The merlin (?A520 or A521) was utilised as part of the synoptic series of British birds when the Bird Gallery was redeveloped in 1979 and is still on display.

Further confusion was created when the birds that were stored loosely in polythene bags were moved about within the attic by workmen during electrical re-wiring during the 1980s, and heaped into several separate piles. The great bustard, kite, king eider, sea eagle, roller and gyr falcon (all in polythene bags when found) lay together in a distinct heap at the eastern end of the attic, so heavily covered with dust that they were barely recognisable as bags of birds. Three wooden boxes were stored together at the western end of the attic. Box A548, which once housed the ptarmigan and turtle dove, as can be seen from a label on its side, was still in the attic but now empty[4]: the box was found in one of the central bays. The other wooden boxes that once housed the polythene-bagged birds have not been traced: perhaps they were emptied of their specimens because the boxes were needed elsewhere.

Some of the birds in polythene bags bore manuscript labels stating that they were drawn by Bewick and were from the Allen [*sic*] Museum; presumably these labels were added when the

1 The curlew *should* not be a Bewick-figured specimen, as the species does not appear on Fox's list (Fox 1827): the one curlew found in the attic does not agree with Bewick's figure. A little bustard figured by Bewick was once on display in the bird room but was probably removed prior to the 1940s (no little bustard has been found in the attic).

2 Photographs of the exhibition, dated October 1970, are in the archives of the Natural History Society of Northumbria.

3 The glass front of the case containing the great-crested grebe was missing, and the bird was very dirty.

4 Since 1984 these birds have been on display in the Hancock Museum in a small gallery devoted to the work of Bewick.

birds were taken out of their wooden cases in order to be bagged. To make a slightly pedantic point, the knot and king eider, which were labelled as being 'ex Allen Museum', were not actually Allan Museum specimens.

Most of the specimens are in fair condition considering their age, and some (the red kite in particular) are in good condition. A few have faded badly, and have loose feathers, and the osprey has deteriorated very seriously.

SPECIMENS ON DISPLAY IN THE BIRD GALLERY

Some of the birds figured by Bewick have a slightly different history to that detailed above. They were not used in the special display of Bewick-figued birds, instead forming part of the general synoptic series in the Bird Gallery of the Hancock Museum. Howse's catalogue of 1899 lists six: ortolan bunting, bluethroat, little bustard, little bittern, red-breasted goose and juvenile great auk (which was sketched by Bewick, but was not the subject of a woodcut).

The ortolan bunting, bluethroat, red-breasted goose and juvenile great auk are still on display, being retained when the gallery was re-developed in 1979. The male bluethroat is mis-labelled as a female and will shortly be removed from display. The little bittern was removed from display in 1979, and was found in 1995 in store together with other ex-display little bitterns. The little bustard appears to have been discarded several decades ago (see below).

A long-tailed tit from the Allan Museum mentioned (but not figured) by Bewick was on display in the Bird Gallery until 1979, when it was removed to the attic. It was found, in its ex-display case together with other long-tailed tits, in 1995.

SUMMARY OF FINDINGS

A display of birds figured by Thomas Bewick was assembled by John Hancock in 1867, and following the move to the new museum in 1884 was placed on display together with illustrations by Bewick. Although the late Grace Hickling recalled this display as comprising a large case, the evidence from surviving birds is that they were probably housed in a number of glazed wooden boxes[1]. At some time in the mid-20th century the boxes were removed to the Museum's attic, where they were initially housed together. They were listed, probably in the 1960s, but subsequently most of the birds were removed from their boxes; five were used as part of a temporary display and the others were moved about in the attic by workmen. Following a prolonged search most of the birds have been found: only a spoonbill is definitely known to be missing.

Other birds that formed part of the permanent display of British birds have enjoyed a greater degree of stability. The museum's Bird Gallery remained virually unchanged from 1884 to 1979, and most of the birds were re-used following a major gallery development. Those that were removed from display in 1979 were left in their ex-display cases and were readily recognisable.

The specimens and their associated labels survived intact over a long period, during which the museum's displays changed little. It was only during a period of development that the threats arose. Following their transfer to an attic store the integrity of the collection was lost: birds were removed from their cases, separated from their labels and mixed with specimens of various origins. It would have been a very small matter in the years between 1945 and 1970 (when the collection was last known to be intact) to have maintained the integrity of the collection: re-assembling it in 1995 involved many hours spent looking at hundreds of birds, poring over old photographs, checking and re-checking catalogues and checklists. The lessons to present, and future, curators should be clear.

1 These cases agree in design with those shown in photographs of the old Newcastle Museum (in the archives of the Natural History Society of Northumbria), suggesting that the display was transferred intact to the new museum in 1884.

Figure 1 Specimen label. Typical 'old-style' label: upper case vernacular name and italicised Latin name, and ruled top and bottom.

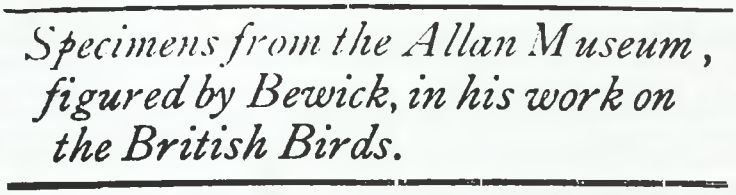

Figure 2 Case label. All of the surviving glass-fronted wooden cases that contained Bewick-illustrated specimens bore one of these labels.

APPENDIX 1: LIST OF SPECIMENS

Conventions

The bird species are listed below in a systematic order, following Cramp *et al.* (1977-1994). Both the Latin binomina and the English vernacular names are those used in that work. English names used by Bewick are added in parenthesis.

Because of the importance of Fox's (1827) *Synopsis of the Newcastle Museum* in documenting the history of these specimens, his catalogue numbers and pagination are given.

The pagination in the '*Bewick*' entry follows the 1826 edition of *British Birds*, being the last published during Thomas Bewick's lifetime, with two exceptions: the harlequin and bluethroat were acquired and were figured by Bewick in 1826, and were published in the Additamenta (n.d.) and in the 1832 and 1847 editions of *British Birds* (see Roscoe 1953).

The 'A-list' was also crucial in the recognition of some specimens as being Bewick-figured, and numbers assigned to specimens in that list are therefore cited. The specimens were entered into the museum's computerised cataloguing system in 1995, and their modern catalogue numbers are given.

Many of the birds have a distinctive label, here referred to as 'old style label' (Figure 1). These apparently date from the early- to mid-19th century: the earliest acquisitions bearing 'old-style' labels were acquired with the Allan Museum in 1827; the latest so far seen are affixed to ethnographic items acquired in 1855. The surviving cases from the old display of Bewick-figured specimens also bear distinctive labels (Figure 2).

Glossary of terms

Tunst. ms. A manuscript compiled by Marmaduke Tunstall and relating to his bird collection was quoted extensively by Fox, who called it 'the *Tunst. ms*'. It dates from 1783-84, was addressed to Dr Latham and gave notes on the natural history of various bird species. This catalogue has apparently not been seen since 1827 and is presumed to be no longer extant.

Allan Museum (sometimes mis-spelled as *Allen Museum*). The part of Marmaduke Tunstall's collection that was bought by George Allan, together with objects Allan acquired from other sources. Acquired by the Newcastle Literary & Philosophical Society in 1822.

Newcastle Museum. The collections of the Newcastle Literary and Philosophical Society, comprising the *Allan Museum* plus objects acquired from other sources. The bluethroat, for instance, was a *Newcastle Museum*, not an *Allan Museum* specimen.

Hancock Museum.. A building rather than a collection. Opened in 1884, and called The Hancock Museum since 1891, it houses the collections of the Natural History Society of Northumbria. The collections comprise the *Newcastle Museum* plus material acquired from other sources.

Natural History Society of Northumberland, Durham and Newcastle upon Tyne. The Society was founded in 1829 and assumed responsibility for the Natural Curiosities of the *Newcastle Museum* almost from its foundation. It was renamed the *Natural History Society of Northumbria* in 1974.

1. Great crested grebe *Podiceps cristatus* **(Great-crested grebe)**

Catalogue no.	NEWHM 1995.H2075
Location	Removed from the attic to secure storage, October 1995.
Fox	Number 206. A male and female were present in the collections in 1827. Fox did not list this species as being one figured by Bewick from specimens in the Allan Museum.
Bewick	Volume 2, p. 153. No data cited..
A-number	A510
Notes	Found in a black-painted box[1] with no labels, but in association with other boxes containing Bewick-figured specimens.

2. Manx shearwater *Puffinus puffinus* **(Shearwater)**

Catalogue no.	NEWHM 1995.H2076
Location	On display in Thomas Bewick display
Fox	Number 230, p. 288. "Mr. Bewick's figure was made from our specimen."
Bewick	Volume 2, p. 241. "The above figure was taken from a stuffed specimen in theWycliffe Museum."
A-number	A515
Notes	Old-style label present..

3. Little bittern *Ixobrychus minutus* **(Little bittern – male)**

Catalogue no.	NEWHM 1995.H2077
Location	Removed from a store behind Abel's Ark display to secure storage, October 1995.
Bewick	Volume 2, p. 25. "The above figure was taken from a stuffed specimen, obligingly lent to this work by Sir M.W. Ridley, Bart. Of Blagdon Northumberland: the bird was shot there on the 10th of May, 1810."
A-number	Not applicable: this bird has not been stored in the attic.
Notes	The bird was on display in the Bird Gallery in 1899 (Howse 1899). It was stored, together with the other ex-display little bitterns. On a decorative wooden base. Labelled: 1. The female little bittern from the Wycliffe Museum, figured by Bewick, has not been found.

1 The specimen was displayed, in this box, in a temporary exhibition about the work of Thomas Bewick, in October 1970 (*see above*).

4. Night heron *Nycticorax nycticorax* **(Night heron)**

Catalogue no. NEWHM 1995.H2078

Location Removed from the attic to secure storage, October 1995.

Fox Number 178 and p. 288. "Mr Bewick's figure was taken from this specimen, which should have three white feathers in the crest, of which one is wanting."

Bewick Volume 2, p. 14. "The above figure was taken from a stuffed specimen now in the Newcastle museum, and is the only one we have seen".

A-number A508

Notes On a square base. Old-style label present.

5. Spoonbill *Platalea leucorodia* **(Spoonbill)**

An old-style label for a spoonbill was found in association with a shoveler duck removed from the attic during 1995. The Latin name on the label, *Platalea leucorodia*, leaves no doubt that it was originally associated with a spoonbill, not a shoveler duck. No specimen of a spoonbill has been found.

6. Red-breasted goose *Branta ruficollis* **(Red-breasted goose)**

Catalogue no. NEWHM 1995.H2079

Location On display in the Bird Gallery.

Fox Number 240 and p. 288. " 'It was shot in the severe frost in the beginning of the year 1776, near London. Never heard, I think, but of two more seen in England.' *Tunst. Ms*."

Bewick Volume 2, p. 280. "They are very rare in this country, only three of them (so far as our own knowledge extends) having ever been met with in it, and those all by the late M. Tunstall, Esq. of Wycliffe, in Yorkshire, in whose valuable museum the first of these birds, in high preservation, was placed. (Footnote: The foregoing figure was taken from this specimen, now in the Newcastle Museum). It was shot near London in the beginning of the hard frost in the year 1766 [*err. pro* 1776, copied from Latham: see Fox]."

Bain Volume 2, p. 103; figured Wycliffe 1791.

A-number Not applicable: this bird has not been stored in the attic.

Notes A label associated with the bird on display in the Bird Gallery clearly indicates its source. An old-style label is present in the Hancock Museum's Archive Store. This specimen represents the first British record of the species (see Yarrell 1882-84).

7. South African shelduck *Tadorna cana* **(Ferruginous duck)**

Catalogue no. NEWHM 1995.H2081

Location Removed from the attic to secure storage, 1995.

Fox Number 328 and p. 288.

Bewick Volume 2, p.313. Figure "taken from a stuffed specimen once in the extensive museum of Wycliffe ... It is now in the Newcastle Museum."

A-number A525

Notes This specimen was removed from the attic together with sundry other birds not figured by Bewick, and its importance was not immediately recognised. There was no old-style label or other indication that it was a Bewick-figured specimen. However, A525 was a "Ruddy Shelduck possibly figured by Bewick" according to the list of 'A' numbers.

The wooden base agrees with other Bewick-figured specimens in its style, and there is a cut-off corner that probably bore a label at one time.

The female specimen is of interest in that it represents a long-standing misidentification. It has long been accepted as the earliest British record of the ruddy shelduck *Tadorna ferruginea* (Jessop 1999a) and is a possible syntype of *Tadorna cana*.

8. Gadwall *Anas strepera* **(Gadwall)**

Catalogue no.	NEWHM 1995.H2080
Location	Removed from the attic to secure storage, October 1995.
Fox	Number 250 and p. 288. A male and female were present in the Newcastle Museum.
Bewick	Volume 2, p. 348. "The foregoing figure was made from a Wycliffe specimen now in the Newcastle Museum."
A-number	A474 (part)
Notes	On a square wooden base. Old-style label present. Specimen is in a glass-fronted wooden box, labelled "specimens from the Allan Museum, figured by Bewick, in his work on British Birds".

9. King eider *Somateria spectabilis* **(King duck)**

Catalogue no.	NEWHM 1995.H2082
Location	Removed from the attic to secure storage, October 1995.
Bewick	Volume 2, p. 310. "The stuffed specimen from which our figure was made, was obligingly lent to this work by Matthew Bell, Esq. of Woolsington, to whom it was presented by William Nelson Griffiths, Esq. of his Majesty's ship Griper. It was shot at Melville Island, during Captain Parry's first expedition for the discovery of a North West passage to the Pacific Ocean."
A-number	A509
Notes	The specimen has a manuscript label "figured by Bewick Allen [sic] Mus." Old-style label present. Square base with label: "2. male, specimen figured in Bewick's Br Birds."

10. Harlequin duck *Histrionicus histrionicus* **(Harlequin duck)**

Catalogue no.	NEWHM 1995.H2084
Location	Removed from the attic to secure storage during the 1980s (E Morton, *pers. comm.*)
Fox	Number 148 of the Recent Acquisitions. The bird was shot by a member of the crew of the whaling ship *The Cove* on Disko Island, Baffin Bay and presented to the Newcastle Museum by Mr G Palmer.
Bewick	Volume 2, p. 341 (1847 edition) "shot in 1826".
A-number	A475 (part)
Notes	An old-style label present, plus a label: "specimens from the Allan Museum, figured by Bewick, in his work on British Birds." It was not figured in any edition during Thomas Bewick's lifetime, but a woodcut of it (by "the author", i.e. Thomas Bewick) was included in the posthumous edition of 1847. Not in Bain (1981), but the pencil transfer drawing for the figure is in the Society's collection (NEWHM 1997.H65.202) and is by Thomas Bewick.

11. Common scoter *Melanitta nigra* **(Scoter)**

Catalogue no. NEWHM 1995.H2083

Location Removed from the attic to secure storage during the 1980s (E Morton, *pers. comm.*).

Fox Number 244 and p. 288. Listed among specimens from the Wycliffe Museum figured by Bewick.

Bewick Volume 2, p. 322. No data.

A-number A475 (part)

Notes Has an old-style label. This is probably the '& other duck' entered in the 'A-list' as being in a case with the Harlequin.

12. Smew *Mergellus albellus* **(Smew)**

Catalogue no. NEWHM 1995.H2085

Location Removed from the attic to secure storage, October 1995.

Fox Number 236 and p. 288.

Bewick Volume 2, p. 260. No data.

A-number A474 (part)

Notes Specimen is in a glass-fronted wooden box, labelled "specimens from the Allan Museum, figured by Bewick, in his work on British Birds." On a square wooden base. Label on base: "male. Summer plumage. Allan Mus. Specimen figured in Bewick's Br. Birds." Old-style label present.

13. Red kite *Milvus milvus* **(Kite)**

Catalogue no. NEWHM 1995.H2087

Location Removed from the attic to secure storage, October 1995.

Fox Number 45.

Bewick Volume 1, p. 32. No data.

A-number A511

Notes On a piece of half-round dowelling. Old-style label present.

14. White-tailed eagle *Haliaeetus albicilla* **(White-tailed eagle)**

Catalogue no. NEWHM 1995.H2088

Location Removed from the attic to secure storage, October 1995.

Fox Number 43.

Bewick Volume 1, p. 9. No data.

A-number A543

Notes On a wooden perch, which has the word 'Bewick' written on the side. Old-style label present. Bewick figured the white-tailed eagle twice under different names, both figures being taken from specimens in Tunstall's Museum. The specimen figured on p. 11 of Volume 1 of *British Birds* had deteriorated badly by 1822, and was left behind when the Allan Museum was brought to Newcastle (Fox 1827).

15. Osprey *Pandion haliaetus* **(Osprey)**

Catalogue no. NEWHM 1995.H2086

Location Removed from the attic to secure storage during the 1980s (E Morton, *pers. comm.*).

Fox Number 44. "A fine specimen of this species."

Bewick Volume 1, p. 13. No data.

A-number A512

Notes On a piece of twig. The specimen has been very badly damaged by insect attack, and the barbs of most of the feathers have been eaten away. It was found in the attic several years ago in this condition, labelled as being from the Allan Museum and figured by Bewick (E Morton, *pers. comm.*), but no labels have been preserved.

16. Merlin *Falco columbarius* **(Stone falcon)**

Catalogue no. NEWHM 1997.H152

Location On display, in the Bird Gallery.

Fox Not listed. Presumably, the bird was donated by John Hancock (1808-1890) to the Newcastle Museum after 1827.

Bewick Volume 1, p. 46. "Our specimen, which was lent to this work by a young friend and promising naturalist, Mr. John Hancock, of Newcastle, is the fourth of the kind which we have ever heard of in the north of England."

A-number Not mentioned by name in the A-list. Possibly A520 or A521.

Notes Not mentioned in any published work, other than Bewick's *History of British Birds*, and not referred to in any of the manuscripts consulted, the specimen was used (and photographed) as part of a display of Thomas Bewick's work in 1970. Through the photograph, housed in the archives of the Natural History Society of Northumbria, the surviving specimen – now on display among the synoptic series of British birds – and Bewick's figure have been matched.

17. Gyrfalcon *Falco rusticolus* **(Jer-falcon)**

Catalogue no. NEWHM 1995.H2099

Location Removed from the attic to secure storage, October 1995.

Fox Number 54. "This bird was presented to Mr. Tunstall by the late Earl of Orford, in 1775 ... Mr. Bewick has engraven this bird, after it has been well repaired by Mr. R. Wingate. The excellent condition of this valuable specimen, considering its age, is indeed a curiosity."

Bewick Volume 1, p. 15. No data.

A-number A514

Notes Style of label agrees with other Bewick-figured specimens. On a dowelling base. Old-style label present.

18. Ptarmigan *Lagopus mutus* **(White grouse)**

Catalogue no. NEWHM 1995.H2089

Location On display, in the Thomas Bewick display.

Fox Number 167 (four specimens).

Bewick Volume 1, p. 343. No data.

A-number A548 (part)

Notes Old-style label present. This species was not listed by Fox as being one of those in the collection of the Newcastle Museum figured by Bewick.

19. Capercaillie *Tetrao urogallus* **(Wood grouse)**

Catalogue no. NEWHM 1995.H2090

Location Removed from the attic to secure storage in the 1980s (E Morton, *pers. comm.*)

Fox Number 164.

A-number A476

Notes No labels present. The specimen was placed on a modern base in the 1980s. The watercolour by Bewick reproduced by Bain (1981) matches this bird, especially regarding the tail, which is erect and tilted to one side. However, Bewick's published woodcut (Volume 1, p. 335) was not taken from that watercolour. Our bird has been claimed by Fox to represent the last surviving male specimen of the original British race of the capercaillie.

20. Little bustard *Tetrax tetrax* **(Little bustard)**

A female was taken on Newmarket Heath and later presented to the Newcastle Museum by Walter Trevelyan, Esq. in July 1874 (Bewick 1797, 1826). The bird was on display in 1899, in case GRALLAE 3, (Howse 1899), but seems to have been discarded some decades ago. There are two labels in the archive store originally from the case of little bustards, each listing four birds (of which the most recent was presented in 1935). One label lists this bird as 'number 3', the other label does not include the specimen. Cook's manuscript list[1] of birds on display in the Bird Gallery (undated: *ca*1960) agrees with the second label.

21. Great bustard *Otis tarda* **(Great bustard)**

Catalogue no. NEWHM 1995.H2091

Location Removed from the attic to secure storage, October 1995.

Fox Number 171 and p. 288. Male and female. "Our male specimen furnished the figure for Mr. Bewick's work."

Bewick Volume 1, p. 355. "Drawn from a preserved specimen at Wycliffe."

A-number A544

Notes On a square base. Old-style label present. This specimen has deteriorated slightly, and some of the feathers are very loose.

22. Stone-curlew *Burhinus oedicnemus* **(Great plover)**

Catalogue no. NEWHM 1995.H2094

Location Removed from the attic to secure storage, September 1995.

Fox Number 173 (as the "Thick-kneed Bustard or Stone Curlew").

Bewick Volume 1, p. 362. No data.

A-number A513

Notes According to the *Tunst. ms,* as cited by Fox "one was taken in this neighbourhood in August, 1782, probably blown out of its customary haunts by storms, many of which were felt about that time. It was extremely lean and pined": this may, or may not, be the surviving specimen. On a square wooden base. Old-style label "Great Plover." MS label "From Allen [*sic*] Mus Fig by Bewick."

23. Knot *Calidris canutus* **(Red sandpiper)**

Catalogue no. NEWHM 1995.H2093

Location Removed from the attic to secure storage, Summer 1995.

Bewick Volume 2, p. 90. "The above figure and description are taken from the stuffed specimen of a bird shot at Sunderland, in January of the severe winter of 1814, and presented to this work by Mr Bullock, of the London

1 Manuscript book SL7 in the archives of the Hancock Museum.

Museum."

A-number A514

Notes Specimen is labelled: "Calidris canutus Briss & Cuo. The specimen which Bewick engraved from. Presented by Mr R. R. Wingate 1843 to J. Hancock. from JHs collection of skins April 1888." The provenance data are the same as for the pigmy curlew (see no. 24, below).

24. Curlew sandpiper *Calidris ferruginea* **(Pigmy curlew)**

Catalogue no. NEWHM 1995.H2092

Location Removed from the attic to secure storage, October 1995.

Bewick Volume 2, p. 40. "The stuffed specimen from which the foregoing figure and description were taken, was presented to the author by Mr Bullock, in the latter end of January, 1814; it was shot near Sunderland, among many other birds, which had been driven from their northern haunts by the extremity of the weather, during the very stormy winter of that year."

A-number A517

Notes On a square base with rounded edges. Old-style label present with, added in ms, "specimen from which Bewick made his figure": the printing on this label differs slightly from that of the other old-style labels.

Specimen is labelled: "this specimen is from J Hancock's collection of skins. April 1888 / Tringa subarquata (young) This being the specimen from which Bewick made his drawing lent for his book on British Birds was presented by R. R. Wingate to John Hancock in August 1843 (this sp was shot near Sunderland)". The provenance data are the same as for the red sandpiper (no. 23, above): either a *lapsus* or both birds have the same provenance.

25. Great auk *Pinguinus impennis* **(Great auk)**

Catalogue no. NEWHM 1995.H2095

Location On display in the Bird Gallery.

Fox Number 211. "Our bird is apparently a young one, ...".

A-number Not applicable: this bird has never been stored in the attic.

Notes With the exception of a bird with disputed juvenile status in the National Museum of Prague, this is the only surviving specimen of a juvenile great auk (Grieve 1885, 1897; Hanzák 1980). Bewick's drawing of this specimen was reproduced by Bain (1981). Bewick's published engraving was not taken from a figure of this bird, but represented an adult specimen: the latter could not have been the adult great auk now in the Hancock Museum (as suggested by Bain 1981), as this was not acquired until 1844 (see Howse 1899). Grieve (1897) published photographs of both of the great auks in the Hancock Museum.

26. Turtle dove *Streptopelia turtur* **(Turtle dove)**

Catalogue no. NEWHM 1995.H2096

Location On display in the Thomas Bewick display.

Fox Number 161. No data.

Bewick Volume 1, p. 312. No data.

A-number A548 (part)

Notes Old-style label present. This species was omitted, in error, from Fox's list of birds in the museum that had been figured by Bewick. No provenance data.

27. Bee-eater *Merops apiaster* **(Bee eater)**

Catalogue no. NEWHM 1995.H2097

Location Removed from the attic to secure storage, October 1995.

Fox Recent acquisitions no. 212. Purchased from Mr B. Leadbeater, Brewer Street, London.

Bewick Volume 1, p. 146. "Through the medium of the late Lieut. J.A. Howard, of the seventy-third regiment, we have obtained from Mr Leadbeater, Bird and Animal Preserver to the British Museum, the specimen (footnote: now in the Newcastle Museum) from which our figure was taken."

A-number A473 (part)

Notes On a dowelling perch. Old-style label present. In a glass-fronted wooden box, labelled "specimens from the Allan Museum, figured by Bewick, in his work on British Birds".

28. Roller *Coracias garrulus* **(Roller)**

Catalogue no. NEWHM 1995.H2098

Location Removed from the attic to secure storage, October 1995.

Fox Number 77. "I have a beautiful pair of the *Coracias Garrula*, the Roller, sent me from Hamborough [=Hamburg]." *Tunst. ms.*

Bewick Volume 1, p. 100. "The above drawing was from a stuffed specimen in the Wycliffe Museum."

A-number A519

Notes On a dowelling base. Manuscript label "From Allan Mus Fig by Bewick".

29. Lesser spotted woodpecker *Dendrocopos minor* **(Barred woodpecker)**

Catalogue no. NEWHM 1995.H2100

Location Removed from the attic to secure storage, October 1995.

Fox Number 86. "Mr Bewick has lately figured this specimen".

Bewick Volume 1, p. 140. No data.

A-number A473 (part)

Notes On a dowelling perch. Old-style label present. Specimen is in a glass-fronted wooden box, labelled "specimens from the Allan Museum, figured by Bewick, in his work on British Birds".

30. Dartford warbler *Sylvia undata* **(Dartford warbler)**

Catalogue no. NEWHM 1995.H2101

Location Removed from the attic to secure storage, October 1995.

Fox Number 135. "It was first noticed in England in 1773, by Dr. Latham."

Bewick Volume 1, p. 234. "Our figure was from a specimen now in the Newcastle Museum."

A-number A473 (part)

Notes Old-style label present. On a dowelling perch. Specimen is in a glass-fronted wooden box, labelled "specimens from the Allan Museum, figured by Bewick, in his work on British Birds." Although Tunstall and Latham corresponded, there is no evidence to suggest that this specimen was ever in Latham's possession.

31. Bluethroat ***Luscinia svecica*** **(Bluethroat)**

Catalogue no.	NEWHM 1995.H2102
Location	On display in the Bird Gallery.
Fox	Additional recent aquisitions Number 292, and note 3 on p. 298.
Bewick	Volume 1, p.159 (1847 edition).
A-number	Not applicable: this bird has never been stored in the attic.
Notes	Listed by Howse (1899) as: "Male, with red spot. Shot on Newcastle Town Moor, 28th May, 1826. Shot and presented by Thos W. Embleton, Esq. Specimen from which Bewick made his figure, and the first recorded British example of this species" (see also Yarrell 1882-84).

32. Long-tailed tit ***Aegithalos caudatus*** **(Long-tailed titmouse)**

Catalogue no.	NEWHM 1995.H2103
Location	Removed from the attic to secure storage, November 1995.
Fox	Number 151. No data.
Bewick	Volume 1, p. 280. Not figured by Bewick, but cited by him: "There was a preserved specimen in the Museum of the late Mr Tunstall, at Wycliffe, in which the black band through the eyes was wholly wanting; the back of the neck was black; the back, sides, and thighs, were reddish-brown, mixed with white: it was probably a female."
A-number	Not applicable: this bird was on display at the time that the A-list was compiled. It was moved to the attic in 1979.
Notes	Howse (1899) listed this specimen "from the Allan Museum"as being on display in the bird gallery. It was one of three in case PASSERES No. 154, where it was on the lower right of the case. The case was photographed before the gallery was remodelled in 1979, and from this photograph it has been possible to assign provenance to the several specimens in case 154. A watercolour drawing of this specimen is in the Society's collection (NEWHM 1997.H6556).

33. Nutcracker ***Nucifraga caryocatactes*** **(Nutcracker)**

Catalogue no.	NEWHM 1995.H2108
Location	Found in an unlabelled case in the attic and removed to secure storage, October 1995.
Fox	Number 76. " I have ... sent me from Hamborough [Hamburg], together with a fine pair of the *Corvus Caryocatactes Tunst.* MS...The specimens are labelled inside "Tannen Heher Sie". From one of them Mr Bewick made his figure."
Bewick	Volume 1, p. 97. "Our drawing was from a stuffed specimen in the Wycliffe museum."
A-number	A518
Notes	On a perch made out of oval-section dowelling, and on a square base. Old-style label present.

34. Chough ***Pyrrhocorax pyrrhocorax*** **(Chough)**

Catalogue no.	NEWHM 1995.H2109
Location	Removed from a store behind the museum's Abel's Ark display to secure storage, November 1995.
Fox	Number 75 and p. 288.
Bewick	Volume 1, p. 90. No data.

A-number A516

Notes Misidentified in the list of 'A' numbers as an alpine chough. This specimen was found in November 1995 in a black-painted box, housed in the store behind the *Abel's Ark* display. The specimen was displayed in this box, in a temporary exhibition about the work of Thomas Bewick, in October 1970. There was no label with the specimen, but it agrees so closely with Bewick's figure as to leave no doubt as to its attribution as a Bewick-figured specimen.

35. Snow bunting *Plectrophenax nivalis* **(Snow bunting)**

Catalogue no. NEWHM 1995.H2107

Location Removed from the attic to secure storage, October 1995.

Fox Recent Acquisitions number 161, presented by Mr William Robertson of Newcastle. "It alighted in an exhausted state on the rigging of a Greenland Whaler, in Baffin's Bay, and was caught and brought to England by Mr. Geo. Haswell, late of Newcastle, now of Halifax, Nova Scotia. Mr. Bewick has made his figure from this specimen, for his new edition."

Bewick Volume 1, p. 178. No data.

A-number A473 (part)

Notes On a square wooden base. Old-style label present. Specimen is in a glass-fronted wooden box, labelled "specimens from the Allan Museum, figured by Bewick, in his work on British Birds".

36. Ortolan bunting *Emberiza hortulana* **(Green-headed bunting)**

Catalogue no. NEWHM 1995.H2104

Location On display in the case of ortolan buntings in the Bird Gallery.

Fox Number 121. Fox gave full details of the capture of his specimen, which was taken at sea by a coasting vessel. He acquired it in 1822.

Bewick Volume 1, p. 170. "The crew of a collier vessel caught this rare visitant at sea, as it was making its way to the shore, on the Yorkshire coast, after a severe storm of wind in the month of May, 1822. It lived a short time after it was brought to land, and was lent to this work by G.T. Fox, Esq. of Westoe, and is now in the Museum of the Literary and Philosophical Society of Newcastle."

A-number Not applicable: this bird has never been stored in the attic.

Notes This bird should not be confused with Tunstall's specimen of the green-headed bunting (see below). If Tunstall's bird is set aside as the first British record of an ortolan bunting, then this specimen takes its place as the first recorded British specimen of that species (see Yarrell 1882-84).

37. Ortolan bunting *Emberiza hortulana* **(Green-headed bunting)**

Catalogue no. NEWHM 1995.H2105

A-number A473 (part)

Notes Not figured by Bewick but cited by him (vol. 1, p. 171) as "at present in the Newcastle Museum", the specimen is included here because it is housed in a glass-fronted wooden box together with four Bewick-figured birds. This specimen is important systematically, being the holotype of two nominal taxa *Emberiza chlorocephala* Gmelin, 1788 and *Emberiza tunstalli* Latham, 1790 (Jessop and Prŷs-Jones in press). The bird has long been accepted as the first British record of an ortolan bunting, but may be an escaped cage-bird.

APPENDIX TWO: FOX'S LIST OF BIRDS IN THE NEWCASTLE MUSEUM FIGURED BY BEWICK

Bird	**Whereabouts and number in Appendix One**
Cinereous eagle	present (14)
Osprey	present (15)
Hobby	missing
Kite	present (13)
Red-backed shrike	missing
Red-legged crow	present (34)
Roller	present (28)
Hawfinch	missing
Nightingale	missing
Dartford warbler	present (30)
Wren	missing
Bustard	present (21)
Thick-kneed bustard	present (22)
Spoonbill	missing (label present) (5)
Stork	missing
Night heron	present (4)
Little bittern	missing (3)
Ruff	missing
Avoset [sic]	missing
Lesser speckled diver	missing
La petite mouette grise	missing
Smew	present (12)
Siberian goose [=Red-breasted goose]	present (6)
Shieldrake	missing
Garganey	missing
Scoter	present (11)
Manks puffin	present (2)
Stormy petrel	missing
Crested cormorant	missing
Jerfalcon	present (17)
Pine grosbeak	missing
Black woodpecker	missing
Lesser spotted woodpecker	present (29)
Carrion crow	missing
Little white heron	missing
Gadwall	present (8)
Casarka duck [= South African shelduck]	present (7)
Cirl bunting	missing
Secretary vulture	missing
Crested grakle	missing
Minor grakle	missing
Silky starling	missing

Fox also mentioned among the most recent acquisitions, on p. 306, that Mrs Beilby had presented a Bewick-figured siskin. Presumably, that specimen arrived after Fox's main list

had been compiled. The specimen has not survived.

ACKNOWLEDGEMENTS

I am very grateful to Hugh and Stella Chambers and June Holmes of the Natural History Society of Northumbria for providing access to material in the Society's library. David Gardner-Medwin checked the text and suggested various useful amendments and corrections. James Alder, Paddy Cottam, Eric Morton and Tony Tynan all provided much background information about developments in the Hancock Museum over recent (and some not-so-recent!) decades.

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GEORGE ALLAN'S GREY-HEADED DUCK: TWO CENTURIES OF CONFUSION PARTLY RESOLVED

L Jessop

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SUMMARY

An 18th century mounted bird, representing the earliest British record of the ruddy shelduck *Tadorna ferruginea* (Pallas), was rediscovered in 1995 in the Hancock Museum, Newcastle upon Tyne, after being mislaid since 1945. Scrutiny of the specimen revealed that it has previously been misidentified, and that it is a female South African shelduck *Tadorna cana* (Gmelin), (also known as the Cape, or African ruddy shelduck).

Following a close examination of the late-18th and early-19th century documentation relating to the specimen, its hitherto-accepted provenance is shown to be unreliable. Some uncertainty remains as to the origin of the bird.

INTRODUCTION

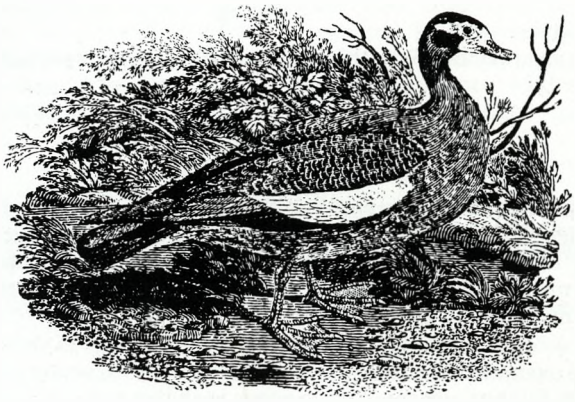
During 1995, twenty-six mounted birds figured by Thomas Bewick were rediscovered in the attic of the Hancock Museum, where they had probably lain since 1945 (Jessop 1999). One of the specimens has hitherto been identified as a ruddy shelduck *Tadorna ferruginea*, and was supposedly shot at Mr Portman's seat at Bryanston near Blandford in Dorset in 1776. It represents what has been, up to now, the earliest accepted British Record of *Tadorna ferruginea* (Dymond, Fraser and Gantlett 1989).

Examination of the specimen showed that it had been misidentified and that it is a female South African shelduck *Tadorna cana*. If *T. cana* had been a British species or even a rare but established vagrant, investigation might have ceased at that point. However, the species is restricted to southern Africa and is most unlikely to occur naturally in Europe. The possibility of its occurrence as a wild bird in Britain is very remote indeed and there are no known records of it in this country. It was therefore necessary to investigate the validity of the record.

The early published documentation of the specimen was subjected to detailed scrutiny, and considerable confusion was revealed. It became necessary to consider the interpretation of several vernacular names used in documenting the specimen, and the reliability of the provenance data provided by early authors was also brought into question.

The results of the investigation are inconclusive. There is a very remote possibility that the bird represents the only British 'record' of *Tadorna cana*, in which case it was almost certainly an escaped bird rather than a record in the usually accepted ornithological sense. It is, however, much more likely that the locality data were applied to the wrong bird, and that the true origin of the *T. cana* specimen is unknown.

Note: To distinguish between English vernacular names currently in use and those that are either no longer commonly used or that were misapplied by older authors, the latter are placed between single quotation marks: for example, *Aythya nyroca* (Güldenstädt) is now known as the ferruginous duck, but Bewick, in referring to our specimen, used the name 'ferruginous duck' for a species that he believed to be *Tadorna ferruginea,* but which actually was *Tadorna cana*. Where further clarification is necessary, the currently accepted Latin binomen is added in square brackets.



THE FERRUGINOUS DUCK.

RUDDY GOOSE, LATH.

(*Anas rutila*, Faun. Suec.)

Figure 1 Bewick's figure (*History of British Birds*, 1826, p. 313).

HISTORY OF THE SPECIMEN

1800 to present: from George Allan to the Hancock Museum

The specimen almost certainly came to Newcastle among the bird collection of George Allan (1736-1800) of Blackwell Grange near Darlington, County Durham. Following George Allan's death in 1800 his collections remained at his house for twenty-two years. His family decided to sell the contents of Blackwell Grange by auction in July 1822, and a sale catalogue was produced (Anon 1822), but the contents of Allan's museum were bought by George Townshend Fox by private treaty the day before the auction, on behalf of the Literary and Philosophical Society (Fox 1827, p. xv).

The Literary and Philosophical Society of Newcastle upon Tyne was founded in 1793, and acquired sundry items for its museum from its earliest days, but had no systematic bird collection before it acquired that of George Allan in 1822. The possibility of the specimen being acquired by the Society from another source is unlikely, as Fox, who was responsible for acquiring Allan's collection and documenting it, also took a keen interest in this specimen and would almost certainly have been aware of its existence had it been in the Society's collection prior to 1822.

From 1822 onwards Allan's collection comprised the major part of what was then known as the Newcastle Museum. A detailed catalogue of the collection was prepared by Fox, and published in 1827. Fox clearly distinguished, in his catalogue, between items from Allan's Museum and specimens previously, and subsequently, acquired by the Society.

The care of the natural history collections in the Newcastle Museum was the responsibility of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne (later renamed the Natural History Society of Northumbria) from 1829 onwards. In 1884 the collections of the Newcastle Museum were moved to a new building, which has been called the Hancock Museum since 1891.

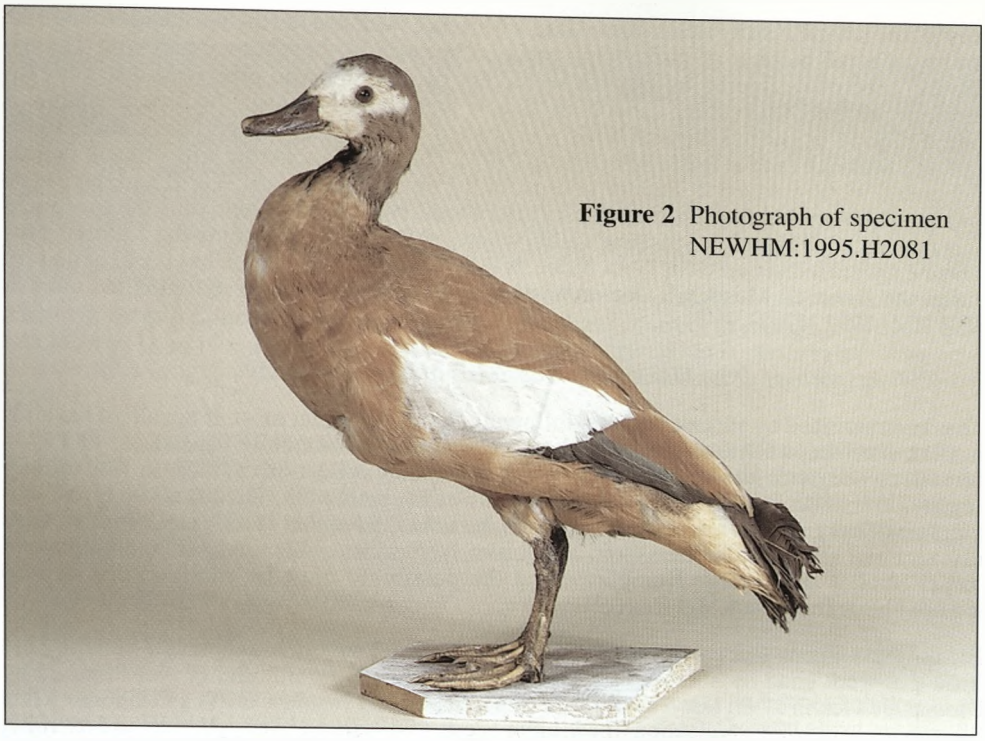


Figure 2 Photograph of specimen NEWHM:1995.H2081

Figure 3 Engraving in Brown's *New Illustrations of Zoology* (1776).

Most of the natural history items from Allan's Museum were lost during the course of the 19th century, a small number of birds being retained because of their association with Thomas Bewick: specimens figured by Bewick were kept by curators who otherwise discarded the remainder of the 18th century collections as new and 'better' material became available. A special display of Bewick-figured birds was erected in 1870 and was on public show in the Hancock Museum until at least 1939 (Jessop 1999). These birds, together with other important specimens, were removed to country houses for the duration of World War II and there is no evidence that they were returned to display afterwards. At some unknown time the specimens were moved to the Hancock Museum's attic, where most of them, including the *Tadorna cana* specimen, were rediscovered in 1995. Since its rediscovery, the specimen has been catalogued within the Hancock Museum's documentation system, and has been assigned the number NEWHM: 1995.H2081.

Pre-1790: a specimen from Marmaduke Tunstall's Museum?

It has been assumed by various authors, following Fox (1827), that most, if not all, of the birds in Allan's collection came originally from the collection of Marmaduke Tunstall (1743-1790). Tunstall owned, *inter alia*, one of the few major systematic collections of birds in 18th century England (Whitehead 1969). After his death part of his collection, including the birds, was bought by George Allan for £700. It is known, however, from Fox (1827, p. 179), that Allan also acquired ethnographic items and antiquities from other collections, including those of Daniel Boulter and George Humphrey, and the possibility must be admitted that he also acquired birds from them and from elsewhere.

The only specimens that can be assigned to Tunstall's collection with absolute certainty are those that were cited by authors (e.g. Brown 1776) during his lifetime or were figured by Thomas Bewick in 1791, between the time of Marmaduke Tunstall's death and George Allan taking possession of the collection (these latter species were listed in an appendix to Fox 1827, pp. 287-288). As for the *Tadorna cana* specimen, we know (from Fox 1827, p. 288) that it was "engraven since the receipt of the Museum in Newcastle", i.e. after 1822, so it can not be said with certainty to have been part of Tunstall's collection.

There is is no evidence that the bird was acquired from either of the two other collectors named above: there is no matching specimen in the catalogue of Humphrey's or Boulter's museums (Humphrey 1779; Boulter [1793]). Conversely, there were *T. cana* specimens in other 18th century hands, e.g. in Sir Ashton Lever's museum and Thomas Pennant's collection (see below), but there is no way of knowing whether these were acquired by George Allan: Fox's indication (1827, p. 286) that the bird figured by Peter Brown from Pennant's collection was present in Allan's collection is pure conjecture without any supporting evidence.

DOCUMENTARY HISTORY OF THE SPECIMEN

Early manuscript documentation

Both Tunstall and Allan compiled manuscripts about the birds in their collections, some of which were later used by Fox in preparing his *Synopsis of the Newcastle Museum*. Tunstall prepared a set of notes in manuscript relating to his bird collection, which was called the *Tunst. ms* by Fox: this dated from 1783-84, was addressed to Dr Latham and gave notes on the natural history of various bird species.

While the collection was in his hands, George Allan compiled a manuscript catalogue of it, of which two volumes referred to the birds and a third to the antiquities and ethnography items. Part of Allan's manuscript survives to the present in Durham University Library, but the portion covering the Water Birds is missing: it was, however, extensively quoted by Fox (1827), who gained access to it during the later stages of production of his *Synopsis*.

Fox could find no entry relating to the *T. cana* specimen in the *Tunst. ms* (Fox 1827, p. 142). The relevant entry in Allan's manuscript is discussed below.

Bewick's History of British Birds

The earliest published citation of the *T. cana* specimen was by Thomas Bewick, who described and figured it (Figure 1) in the second volume of the 1826 edition of *A History of British Birds*, the last edition to be published in his lifetime. Bewick used the vernacular names 'ferruginous duck' and 'ruddy goose' for the specimen, and applied to it the Latin binomen *Anas rutila* [Pallas] [now known as *Tadorna ferruginea*]. Previous editions of Bewick's *History* had contained a description of the ferruginous duck *Aythya nyroca*, derived from Pennant's *British Zoology*, but gave no figure. Having in 1826 decided that the concept 'ferruginous duck' was applicable to the *T. cana* specimen, Bewick needed to find a name for *Aythya nyroca*, and used the vernacular name 'the castaneous duck'.

Although he misapplied the available names, Bewick was correct in recognising the *T. cana* specimen as being not an *Aythya nyroca*. His use of the trivial name *rutila* rather than *cana* introduced a long-standing error in ornithological literature concerning the specimen he figured.

Although Bewick commented that his figure was taken from a stuffed specimen once in Marmaduke Tunstall's collection, his sketch was taken in Newcastle thirty-six years after Tunstall's death and this statement cannot therefore be regarded as reliable. Following a description of the bird he noted his belief that the specimen was killed in Lincolnshire – a hypothesis that was later shown to be false (see below).

Fox's Synopsis of the Newcastle Museum

A year after Bewick's published description and figure, Fox discussed the *T. cana* specimen at length in his *Synopsis of the Newcastle Museum* (Fox 1827), but merely succeeded in compounding the confusion surrounding it. There were four separate entries relating to the specimen, and taken together they indicate various stages of Fox's thought about the identity and origin of the bird.

First, on page 125, Fox discussed the 'ferruginous duck of Pennant' [*Aythya nyroca*] among the *desiderata*, i.e. those British species not represented in Allan's collection. Uncertain about the true identity of the ferruginous duck, he discussed the identification of a bird described by Pennant in his *British Zoology* as being killed in Lincolnshire. Previously published opinions as to the specific distinctness of the ferruginous duck, the 'castaneous duck' [also *Aythya nyroca*] and wigeon were considered, Fox concluding that Pennant's bird was probably a ferruginous duck rather than a 'ruddy goose' [*Tadorna ferruginea*] "our specimen of which has been conjectured to be Pennant's bird" [i.e., by Bewick].

At this stage, therefore, Fox questioned Bewick's contention that the *T. cana* specimen was Pennant's bird from Lincolnshire or even that it was conspecific with it, and considered it to be a 'ruddy goose'.

Secondly, on pages 142-143, among a list of the non-British birds in Allan's collection, under the heading 'grey-headed, or ruddy goose', Fox took the reader through the recent history of the specimen and his thought-processes at that time, which were:

I When he first found it, in June 1826, he tentatively identified the bird as *Anas casarka* Linnaeus [= *Tadorna ferruginea*], which he correctly equated with the 'ruddy goose' of Latham.

II The tentative identification was strengthened by reference to Temminck's *Manuel d'Ornithologie*.

III The taxidermist Richard Wingate, who re-set the mount, conjectured that it was the "long-lost ferruginous duck of Pennant [*Aythya nyroca*]".

IV The bird was loaned to Thomas Bewick, who figured it.

V Fox changed his first opinion on seeing Brown's figure of the 'grey-headed duck' [*Tadorna cana*]. On consideration he decided that the the specimen agreed closely with

Brown's figure, but also that the 'grey-headed duck' and the 'ruddy goose' [*Tadorna ferruginea*] were synonymous (obviously, an error). Pennant's ferruginous duck [*Aythya nyroca*] was added to the synonymy with a query.

VI It was suggested that the bird might be the actual specimen of the female 'grey-headed duck' figured by Brown: "I know of no other specimen than this, nor can I find, on enquiry that it is to be found in any collection in London".

VII Fox "dare not, however, without further evidence" suggest that it is the ferruginous duck from Lincolnshire described by Pennant.

Thirdly, at a late stage of production of the *Synopsis,* Fox gained access to Allan's manuscript catalogue, and prepared an appendix containing *addenda* and *corrigenda*. The specimen was discussed yet again, on pages 213-214, under the name 'grey-headed duck'. Fox decided that he was at last able to provide a provenance for the specimen, by quoting Allan's manuscript: "None of the birds have caused more uncertainty about the identity of the species than this. *This specimen was shot at Mr. Portman's seat, at Bryanston, near Blandford, in Dorsetshire, in the severe frost of 1776*".

Fox felt he could rule out the bird in the Allan Museum as being the one figured by Brown, as Brown's engraving was dated 11 January 1775, a year before this specimen was shot. The data also confirmed that it was not Pennant's Lincolnshire bird, Fox concluding that "our specimen, as a British one, is consequently unique".

Fourthly, on pp. 284-286, the specimen was listed among those from the collection that were figured by Peter Brown and Thomas Bewick.

A PERSISTENT MISIDENTIFICATION

Because of citation by Fox and Bewick, the *T. cana* specimen has long been accepted as the first British record of the ruddy shelduck. It is surprising that nobody has previously noticed that the specimen has been misidentified: Bewick's figure (Figure 1) has been available for 170 years, and the specimen (Figure 2) was on display in Newcastle for at least 122 years (1827-1939), between 1870 and 1939 forming part of a display of birds figured by Thomas Bewick, clearly providing a link between specimen and figure.

The record has passed unchallenged through the 19th and 20th century literature, and persisted to the present. Dymond, Fraser and Gantlett (1989), for instance, said of the ruddy shelduck that "The first British record was of one killed near Blandford, Dorset, during winter 1776".

Identification of *Tadorna* species is not particularly difficult today, with reference to the variety of identification guides (e.g., Madge and Burn 1989) that were lacking in the days of Fox and Bewick. *Tadorna ferruginea* and *T. cana* can be separated by their head colour, and the head of female *T. cana* (which has a dark slate-grey coloration with distinct white patches) is particularly distinctive. The dichotomous key provided by Salvadori (1895) used head colour alone to separate the two species, but his key was backed up by descriptions of both species. In no stage of life does the colour of either sex of *T. ferruginea* approach that of a female *T. cana*: Allan's bird is not an immature ruddy shelduck.

IS THE PROVENANCE RELIABLE?

Because the *T. cana* specimen represents the only record for this species from Britain, possibly from Europe, the reliability of its provenance requires clarification.

A confusion of grey-headed ducks

The comment by Allan "*See Brown's* Illustrations, 102" in his account of the 'grey-headed duck' caused Fox to assume that this entry in Allan's catalogue referred to the *T. cana* specimen: Brown's figure of a female 'grey-headed duck' is clearly recognisable as *Tadorna cana* (Fig. 3)

However, Fox himself had indicated earlier (on pp. 125 and 143) the confusion that can arise from using the phrase 'grey-headed duck'. The name had been applied to three species: by Edwards to the king eider, by Brown to *Tadorna cana*, and by Pennant (1768) and Latham (1785, p. 537) to the 'glaucion' or 'morillon' (terms at one time applied uncertainly to several species, including the goldeneye, tufted duck and ferruginous duck).

Bearing this in mind it is instructive to refer again to the entry in Allan's manuscript catalogue. As cited by Fox, it reads:

> Grey-headed duck – (*Allan* Cat.)
>
> (Anas Glaucion) *Pen.* ii. 498. – *Lath.* iii. 537. – *Edw.* 154.
>
> Mr Allan's original remarks on this curious bird are as follows:
>
> None of the birds have caused more uncertainty about the identity of the species than this. *This specimen was shot at Mr. Portman's seat, at Bryanston, near Blandford, in Dorsetshire, in the severe frost of 1776.* Qu. if not the Morillon? – *See Brown's* Illustrations, 102.

Of the literature sources cited under the name, two (Pennant and Latham) referred to the 'morillon' and the third (Edwards 1750) to the king eider. Allan's first sentence is so close to the words used by Latham as to suggest a mere paraphrase, and the words 'Qu. if not the morillon' also imply a reference to Latham. It is suspicious that Allan should refer to Latham's 'grey-headed duck', but not to his 'grey-headed goose' (which actually is *T. cana*) described on page 458 of the same volume of the *General Synopsis of Birds*. All of these factors raise doubts as to whether the bird shot at Mr Portman's seat was *Tadorna cana*, a king eider or one of the species referred to as 'morillon'. The reference to Brown's *Illustrations*, which was taken by Fox to indicate that Allan's entry referred to the *T. cana* specimen, could possibly be interpreted as a reminder to check the figure rather than an indication that it had been checked: its separation from the works cited at the head of the entry is also a cause for suspicion.

Allan is known to have generally labelled his specimens clearly: "All the specimens under glass were labelled by him ... with their common and scientific names, and references were made to the works of Pennant, Latham and some others" (Fox 1827, p. ix), although some of the labels had suffered and become illegible by 1827. If Allan had correctly identified the bird and followed Brown (1776) it would have been labelled as a grey-headed duck. If he had used the later work of Latham (1785) the bird would have been labelled 'grey-headed goose' [*not* duck], and it is certain that there was no bird in Allan's collection that was so-labelled: there is no entry for a 'grey-headed goose' in the sale catalogue of Allan's possessions (Anon 1822). If a clearly labelled bird was among the specimens brought to Newcastle the confusion in Fox's mind could not have arisen.

Other candidates for being the 'grey-headed duck' of Allan's manuscript

If the entry for the 'grey-headed duck' in Allan's manuscript catalogue did not refer to the *T. cana* specimen, then to which other bird in his collection did it refer? Allan had two other birds that could have once been labelled as 'grey-headed duck':

I A tufted duck, which was in poor condition in 1827 and therefore discarded. Under the entry for this bird (p. 125), Fox gave the references "Anas fuligula, *Lin. & Gm.*– canard morillon, *Temm.*– *grey-headed duck, Penn.* Brit. Zool. 1st 8vo ed." This specimen was listed as bird number 8 in the Allan sale catalogue (Anon 1822).

II A 'morillon', listed as bird number 15 in the Allan sale catalogue. This was identified by Fox as a female velvet scoter (Fox 1827, p. 100), by reference to Temminck's *Manuel d'Ornithologie*. The light face spots on a female velvet scoter could possibly lead to a specimen being labelled as 'grey-headed'.

No king eider was listed in the sale catalogue, and none was present among the specimens transported to Newcastle, the species being listed by Fox among the *desiderata*.

If Allan's catalogue entry for a 'grey-headed duck' shot in Dorset referred to either a tufted duck or velvet scoter, then we must look elsewhere in the sale catalogue (Anon 1822) for the *T. cana* specimen. There is no recognisable entry for it, but it may be represented by one of the few entries for 'nondescript' birds: if it was unlabelled it is unlikely that a provincial auctioneer compiling the catalogue could identify it.

WHAT WAS THE BIRD SHOT AT BRYANSTON IN 1776?

Assuming that the entry for the 'grey-headed duck' in Allan's manuscript catalogue did not refer to the *T. cana* specimen, then it is unlikely that we will ever really know the specific identity of the bird shot at Mr Portman's seat at Bryanston near Blandford in Dorset in the severe frost of 1776.

Independent evidence that the bird may have been a tufted duck was provided by Pulteney (1813) in a catalogue of the birds of Dorset. Pulteney noted that the tufted duck "was shot at Bryanstone, and elsewhere, in the winter of 1776, among many others, but is seldom seen so far up the country". However, it is not known whether Pulteney himself interpreted an old record of 'morillon' *sens. lat.* (which *might* have been Allan's specimen of a velvet scoter) as being a tufted duck.

ORIGIN OF THE *T. CANA* SPECIMEN

If the *T. cana* specimen is not the bird shot at Bryanston in 1776, its origin is probably untraceable. Fox claimed in 1827 that "I know of no other specimen than this, nor can I find, on enquiry that it is to be found in any collection in London". However, there were a few specimens of this species known for certain to have been in British collections in the 18th century.

They were:

I A male and female, figured by Brown from the collection of Thomas Pennant (Brown 1776). In a separate work, Pennant (1793) claimed to have written the descriptions in Brown's work, so we can be reasonably certain that the birds were in his collection until at least 1776.

II Four specimens, described by Latham (1785). All were apparently seen by Latham in Sir Ashton Lever's Museum. Latham thought he saw one male and three females, but confused the sexes: there was one female and three males. [A search of the sale catalogue of Lever's Museum (Anon 1806) has failed to reveal any specimens listed as *Anas cana* among the 7194 lots auctioned.]

In addition to describing the birds he saw, Latham (1785) also cited Brown's description and figures. Because Gmelin's Latin binomen *Anas cana* (Gmelin 1789) was subsequently based on the descriptions and figures provided by Latham and Brown, the specimens described by them were syntypes.

Comparison between the specimen in the Hancock Museum and Brown's figure proves inconclusive: there are simply not enough distinctive points of agreement or disagreement to decide whether it is one of the syntypic specimens he figured. Despite the claim on page 286 of Fox (Fox 1827), there is no evidence that the bird figured by Brown from Pennant's collection is the one that survives in the Hancock Museum.

Although George Allan corresponded with Pennant, and may have acquired ethnographic specimens from Lever's museum during the 1790s (Fox 1827, p.179), it is unlikely that Allan acquired the bird directly from either Pennant or Lever, otherwise his manuscript would probably have made this clear. It is possible that Marmaduke Tunstall had acquired one of Pennant or Lever's specimens prior to 1790, which later passed to Allan as part of Tunstall's collection, unlabelled. However, given the position of the Cape of Good Hope on a prominent trading route between Britain and India, it is probable that there were other, undocumented,

specimens of *T. cana* in Britain in the later part of the 18th century. It is unlikely that evidence will emerge to provide firm evidence of the specimen's movements before 1800.

CONCLUSIONS

The record of a ruddy shelduck shot at Mr Portman's seat at Bryanston near Blandford in Dorset in the severe frost of 1776, long cited as the first British record of *Tadorna ferruginea*, must now be set aside. That bird was probably either a tufted duck or velvet scoter, is less likely to have been a king eider, or it may possibly have been a ferruginous duck or goldeneye. It is unlikely to have been a South African shelduck: this species does not occur naturally in Britain, nor would it be expected to occur as a vagrant as it is restricted to southern Africa, is fairly resident and undertakes only relatively short-distance migrations. There are few extra-limital occurrences and no pattern of long-distance vagrancy. There is not enough evidence, therefore, to introduce *Tadorna cana* to the British List.

The *Tadorna cana* specimen in the Hancock Museum, which was almost certainly collected in the 18th century, is of unknown origin.

ACKNOWLEDGEMENTS

I am very grateful to Dr David Gardner-Medwin, who drew my attention to the true identity of this specimen, and to Alan Knox (*via* Michael Walters of the Natural History Museum, Tring) for a valuable critique of an early draft. David Noble-Rollin and David Gardner-Medwin gave freely of their ornithological expertise in discussion of the specimen. Kate Hebditch (Dorset County Museums) provided the Pulteney reference. June Holmes kindly set time aside from cataloguing to provide bibliographic assistance. The Sub-Librarian (Special Collection and Services) of Edinburgh University Library kindly gave permission for a photograph of a plate in their copy of Brown's *New Illustrations* to be published.

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NORTHUMBERLAND'S BIRDS IN THE 18TH AND EARLY 19TH CENTURIES: THE CONTRIBUTION OF JOHN WALLIS (1714-1793)

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SUMMARY

The background to John Wallis's work on Northumberland's birds, published in 1769, is described including a brief biography of the author and the manner in which his accounts were constructed. From a detailed review of Wallis's chapter on birds, including fifty accounts, some sixty-eight taxa are identified of which fifty-one are covered in sufficient detail to indicate that they appear to be species found in Northumberland at that time. A systematic list, constructed for these species, is divided into a number of groups covering seabirds, waterbirds, birds of prey, gamebirds and rails, waders, landbirds (non-passerines) and passerines. Within each group is included an analysis of some of the factors that appeared to be affecting population levels from the 17th-19th centuries. A concluding discussion examines the changes found in bird populations between Wallis's time and the 19th century in terms of the intensification of agriculture and industry and the exploitation of natural resources.

INTRODUCTION

In his account of the natural history of Northumberland (Wallis 1769), John Wallis made a very significant contribution to the ornithological history of Northumberland. In his contents list, he cites Chapter IX as 'Of Birds. The most curious and uncommon, both native and migratory'. This selective approach results in an incomplete list, covering notionally just fifty species, and has caused the work to be discounted to some extent by subsequent writers such as Bolam (1912). Yet Wallis's work covers many key species, particularly birds of prey and game birds, and was composed at a very critical time in the mid-18th century when guns were still primitive weapons; when there were still considerable thickets and woods in the uplands; when timber was still allowed to mature; and when large areas of mosses and fens were undrained. It therefore gives an insight into the state of bird-life in the county in a more *natural* form, that is less influenced by man, than has been possible in the subsequent 200 years. Some phenomena which are thought to be unusual today were the norm before the 19th century. For example, it has been claimed recently in the popular press that some species are behaving unnaturally such as the cormorant *Phalacrocorax carbo* feeding inland or are exceptionally abundant today such as the sparrowhawk *Accipiter nisus*. Judging by his accounts, Wallis would have regarded such features of the countryside as perfectly normal. He also provides some data potentially useful as baselines for modern decisions on conservation, although of course no baseline can be regarded as absolute.

There is little doubt that later writers such as Hancock (1874) and Bolam (1912) also found it difficult to relate to the geographical area that Wallis covered. He appears to have been equally at home recording birds in the North Pennines and in the Tweed and Farne Islands areas. After Wallis there is a marked geographical bias in ornithological recording towards the north of the county since observers such as Selby, Evans and Bolam were based mainly in this area. Indeed, to find 18th century information on the western part of the North Pennines to compare with Wallis, it has been necessary in the current work to make extensive use of the accounts for Cumberland by Heysham and Richardson in Hutchinson (1794-97) and by Macpherson (1892).

In other areas of historical studies, the integrity of Wallis does not seem to be in doubt. In the *Flora of Northumberland*, for instance, extensive reference is made to Wallis's work for information on historical plant distributions (Swan 1993). Concerning molluscs Blackburn (1932) said that 'While [Wallis's] descriptions are quaint and vivid they are, for those early days of conchological knowledge, fairly accurate'. For lepidoptera extensive use has been made of Wallis's section on insects for early county records of a number of species (Dunn and

Parrack 1986). Mennell and Perkins (1863-64) wrote 'An incomplete, but very interesting list of our Mammalia, is to be found in Wallis's delightful History of Northumberland (1769). In this work, none of the smaller species are alluded to, but of the larger ones much of interest is recorded, the more important parts of which we have transferred, generally in the author's own words, to our pages'. We know too that Hodgson (1832 p.viii) admired Wallis as a local historian: 'As an author he was remarkable for integrity and simplicity. He never borrows a fact without acknowledging where he obtained it'.

Wallis provides descriptions in many of his species accounts and gives extensive synonymy to clarify which species are being discussed. However, we should bear in mind the gaps in the ornithological knowledge of the mid-18th century and the difficulties in field identification without easily used optical equipment. There is undoubtedly confusion between different species in a few of Wallis's accounts and in this paper all the descriptions and synonymy have been examined critically, in the light of current ornithological knowledge, before assignment to a particular species is accepted.

Early Bird Studies in Northumberland

More recent accounts of the birds of Northumberland have tended to omit records made before the 1830s, in contrast with those for Cumberland and Scotland where Macpherson (1892) and Baxter and Rintoul (1953), respectively, very thoroughly examined and reported on all early records. Selby was the first writer to cover all of Northumberland's birds but his *Catalogue* (1831) makes very few references to earlier work and some of the accounts are very brief. Interestingly, more detail concerning Northumberland can often be found in Selby's *Illustrations* (1833), a source which has been overlooked to some extent in previous studies on the history of birds in the region. Also very much overlooked is Wingate's *Ornithology* (1825), including a small contribution from Bewick, which appears to cover particularly the period c1810. While a number of entries add very little to those of Wallis, others provide useful original corroboration of both Wallis and other early sources.

The first stage in rectifying this neglect of early records in Northumberland was Gardner-Medwin's (1985) analysis of the accounts by the earliest writers, mainly from the 16th-18th centuries, including Thomas Kirk, John Leland, Thomas Pennant, John Ray and William Turner. Except for Pennant, who was his contemporary, all these authors preceded Wallis. The aim of the present work is to continue the task of compiling a more authoritative ornithological history for Northumberland by considering in depth Wallis's work and relating it to contemporary environmental history and to subsequent changes in the status of the birds he recorded.

Biography of Wallis

Much biographical information on Wallis can be obtained from his entry in *Men of Mark Twixt Tyne and Tweed* (Welford 1895) and his obituary (Richardson 1842 pp. 355-7; Hodgson 1811-32 vol. III pp. 70-73) which appeared in the *Gentleman's Magazine*. He was baptised on 3 December 1714 at Kirkhaugh as 'John, son of John Wallace, of Castle Nook' into a family which had resided in the Knaresdale area of the South Tyne at least since the 16th century. Kirkhaugh, in Northumberland, lies between Slaggyford and Alston on the South Tyne. A note in the church there records that John Wallis was born at Castle Nook Farm on which Whitley Castle stands.

John Wallis matriculated to Queen's College, Oxford, aged eighteen, in February 1732-33 being described as 'John Wallis of Croglin, Cumberland, pleb.' His family had moved to Croglin at some stage in his youth. He graduated BA in March 1736-37 and MA in June 1740, and shortly afterwards obtained a curacy in the Portsmouth area. In 1745 he returned to Tyneside where he opened a school in Wallsend. Around 1748 he published his first work containing letters, poetry and sermons and was appointed curate at Simonburn, under Rev. Wastell. Simonburn was the largest, wildest and most unproductive parish in Northumberland, extending from the Roman Wall northwards to Liddesdale in Scotland. As curate, Wallis would have had ample opportunity for exploring all areas of the parish. It is not surprising therefore that it was here that he became very interested in botany, leading on to other aspects

of natural history. The results of his historical studies, made from about 1748 to 1769 during his appointment at Simonburn, were eventually published as *The History of Northumberland* in two volumes, the first of which describing the natural history was reckoned by Richardson (*ibid*) to be the more valuable. However, Hodgson (1811-32 vol. III p. 72), who was perhaps better placed to judge the second volume, says 'In the history of estates and families, in particular, its value is great'. The whole work attracted 294 subscribers.

Although his book was apparently well-received, Wallis did not prosper. He had earlier incurred some criticism in 1762 over his handling of the discovery of an unusual skull at Simonburn (Richardson 1842 p. 107). In the 1770s, more serious problems arose and in 1775 Wallis resigned as curate of Simonburn after a dispute with the rector. He then became curate in the Darlington area until his retirement in midsummer 1793 when he moved to the village of Norton. There, in his 79th year, he died on 23 August 1793, or 23 September according to Welford (1895), leaving a small but valuable collection of books, chiefly on subjects of natural history.

ARRANGEMENT OF WALLIS'S TEXT

Wallis (1769 pp. 309-346) gives thirty-seven accounts of *Fissipedes* (birds with separate digits) and thirteen of *Palmipedes* (those with webbed feet). Information on birds has also been found in other parts of volume 1, in for instance the descriptions of the lakes in the county and of mammals.

Wallis's accounts, in general, follow a pattern of starting with a statement on distribution in Northumberland, continuing with a lengthy description of the taxon and concluding with further information on occurrences in Northumberland. The descriptions of birds tend to follow those of Willughby and Ray (1676) and notes on breeding habits those of Linnaeus (1746). For instance, all the descriptions of seabirds follow closely those of Willughby and Ray (1676) except those of St. Cuthbert's duck and soland goose. A similar situation is found for small passerines where only the crossbill description is not readily attributable to Willughby and Ray (1676). It is not clear that Wallis made any truly original descriptions though those of some of the birds of prey, crows, game birds, plovers and corncrake appear to contain some original elements. These perhaps are the species with which he was most familiar at Simonburn. Although most of the terminology used is readily comprehensible, a short glossary is given below to define less obvious terms.

GLOSSARY

Cere	flesh around nostrils	**Livid**	bluish-leaden
Cinereous	ashen grey	**Saffron**	orange-red
Eyes	iris	**Sail feathers**	flight feathers
Eye-lids	eye-ring	**Short feathers of wings**	coverts
		Train	tail

Each account concludes with references which frequently cite: 1) *Will. Orn..:* Willughby and Ray (1676), 2) *Raj. Av.*: Ray (1713); 3) *Linn. Faun. Suec.:* Linnaeus (1746; 2nd ed. 1761); 4) *Charlet. Av.:*Charleton (1668); and 5) *Alb. Orn..:* Albin (1738). The cited sections in the first four of these sources have been checked to confirm that the species referenced are consistent with those claimed in Wallis's accounts. An example of a complete entry in Wallis's text showing a typical format is given in Figure 1. This account, which is transcribed and discussed later in this paper, is believed to refer mainly to the brent goose *Branta bernicla*.

SYSTEMATIC LIST

The systematic list below contains all species which it is believed are described by Wallis as the subjects of his accounts. The entries in the list are classified into groups as seabirds, waterbirds, birds of prey, game birds and rails, waders, non-passerines: landbirds, and passerines. The list follows the order given by Voous (1977) except that the sea ducks and auks are included in the seabirds group and within each group the order is sometimes varied for convenience to match that of Wallis. Each group is preceded by an introduction in which common trends and possible causes of population changes are discussed. To conclude each group, other species not mentioned by Wallis are introduced where the omission is significant or where new relevant information has been obtained.

For each species, the heading indicates, on the left, the current English and scientific names; and on the right the account numbers (F = *Fissipedes*, P = *Palmipedes*) and the main names used by Wallis. The subsequent text begins with an attempt to establish identification and then reviews the status established by Wallis in relation to earlier and later sources. In general Wallis's text is quoted only very selectively in order to make particular points. Species mentioned incidentally, for instance in descriptions as part of size comparisons, are not included in the systematic list but are itemized in Appendix 1. There is no certainty that Wallis actually saw these species in Northumberland though it would be unusual to make such comparisons without familiarity with the species concerned.

10. The *Bernacle (k)* is frequent near the river *Tweed*, and *Holy Iſlaad*, in winter. It is conſiderably ſmaller than a gooſe, and larger than a duck. The beak is ſhort, broad and black. The plumage of the head, neck, and lower part of the thighs, is black; the belly cinereous; the back variegated with black and grey; the ſail-feathers a dark grey; the ſhort plumage of the wings, white, black, and cinereous, in alternate variegations. The tail is black. The back-toe is ſhort, and ſlender. The caſe of one ſtuft was ſhewn Mr. *Ray*, at Sir *William Forſter*'s, of *Bambrough* *.

(k) Anſer Scoticus verus Bernicla. . . . . Bernicla ſ. Bernacla. *Will.* Orn. p. 274. *Raj.* Av. p. 137. Bernicla. BERNACLE. SCOTCH-GOOSE. CLAKE-GOOSE. *Charlet.* Av. p. 103. n. 4. Anas capite colloque nigris. *Linn.* Faun. Suec. p. 32. n. 91.

* *Ray's* Topograph. Obſervat. Vol. 1. p. 15.

Figure 1 Wallis's entry for the Bernacle (facsimile).

Seabirds

This section covers those species which are essentially maritime in character, including divers, shearwaters, petrels, gannets, cormorants, sea ducks, gulls, terns and auks. In Northumberland, such species are relatively well documented compared to other groups of birds. There is a clear

bias in existing works towards the Farne Islands with Hawkey (1991) covering the entire history of bird-life on the islands and Gardner-Medwin (1985) the early accounts by Ray in 1661 and 1671, Kirk in 1677 and Pennant in 1769. While the timing of Wallis's book in 1769 is contemporary with that of Pennant's visit to the Farne Islands, it is apparent from Wallis's account of the Razor-bill on the Farne Islands (*Palmipedes*-8) that he had actually visited the islands much earlier:

> The common sea-birds breed on the same cliffs in great numbers (See Ray's Select Remains. Itin. ii. p.181, to p.185). I had the curiosity about twenty years ago to visit this famous bird-island, towards the middle of July, when there is the greatest shew of birds and eggs, and saw the latter lie as thick upon the rocks, and among the marine herbage, as represented by Holingshead (Hol. Chro. Vol.1), and Leland (Lel. Itin. Vol.6 p.60). The birds on being disturbed, rise, as it were, in battalia, and darken the very air, except the Coulternebs, and the beautiful Sheldrakes, Cuthbert-Ducks, and Cormorants, which take refuge in their subterrene or cavernous retreats, if they can reach them

Besides the obvious healthy state of the Farne Islands colony at this time, this would imply that Wallis's observations should be dated in the 1740s rather than the date of his book of 1769. Later many seabird populations in Britain underwent dramatic population declines through the 19th century due to excessive egg collecting at colonies and the increased and much more effective shooting of adults for sport (Holloway 1996). However, the lack of quantitative historical data makes it difficult to draw firm conclusions on trends in Northumberland through this period. It is likely that considerable population fluctuations also occurred as egg collecting and shooting varied in their intensity, further complicating the picture. Looking at the following accounts, it can be seen that three species (shag, eider and great auk) did decline at the Farne Islands between Wallis's time c1760 and the 1830s, while puffin also probably declined. Two more, the shelduck and razorbill, appeared to have declined by the 1870s when clearer status information became available. In the county as a whole, the cormorant/shag complex suffered a marked loss of range on the coast from c1760 to the 1830s and after the 1830s the cormorant is no longer noted from inland areas (Hancock 1874; Bolam 1912). An even earlier casualty at the Farne Islands may have been the black guillemot which appears to have bred there in the 17th century.

Gannet *Morus bassanus*
P11: Soland goose

This species was 'often shot in autumn in its way southward from Scotland, on the commons near the Tweed and Till, and sometimes in winter, both there and on the sea-coast, and in other parts of the country'. An adult is described by Wallis that was shot at Keepershield, near Haughton Castle, 'in the great snow' in March 1763. It was also recorded inland at Prestwick Carr by Maddison (1830) and Bolam (1912) noted that it 'is frequently carried far out of its course by a storm, and is then sometimes found in inland stations'. There is a clear impression that it was more frequent inland in the 18th and 19th centuries than today.

Cormorant *Phalacrocorax carbo*
P1,8: Cormorant

It was reported that this species was frequent in our larger rivers and lakes, especially in those towards the sea, and that it bred 'upon the islands of Farn and Coquet, and other solitary retreats on the sea-coast, in cavernous rocks and precipices; and sometimes upon trees, with the Heron'. A description is given of a first-year bird shot in 1762 on the North Tyne at Haughton Castle. Wallis's measurements are reasonable for this species (wingspan 54 inches (137cm), length 41 inches (104cm)) compared to those by Jonsson (1992) of 130-160 and 80-100cm respectively.

In the 19th century, persecution of the cormorant became intense (Bolam 1912) through shooting and through egg-collecting at the breeding colonies such as the Farne Islands (Selby 1826). This persecution, which started to abate in the late 19th century (Bolam 1912), undoubtedly led to a contraction of its breeding and wintering range in Northumberland resulting in a misunderstanding of its habitat preferences. Later writers were obviously

puzzled by Wallis's claim that the cormorant was frequent inland in his day and ignored this statement on distribution. Yet Selby (1833) reported it as frequently found in winter on 'our rivers and lakes at a considerable distance from the sea' and Maddison (1830) noted it inland at Prestwick Carr. Today, there is no reason to doubt the presence of the species inland in the 18th century given the high numbers found on reservoirs and rivers since the 1970s. Tree-nesting, which now occurs in some parts of Britain, also appears to be the revival of an old habit, with cormorants nesting 'in lofty trees in Norfolk' c1540 (Gardner-Medwin 1985) and, as indicated by Wallis, in trees on the Northumberland coast in the 18th century. Wallis also indicates a wider breeding range on the coast than that recorded since but, as seen in the next account, there was considerable confusion between the two *Phalacrocorax* species and it is probably only safe to attribute the greater range to cormorant/shag *Phalacrocorax* sp. An example of the problem here is Turner's report of cormorants nesting in the Tyne Estuary in the 16th century (Bolam 1912). Gardner-Medwin (1985) thought the original Latin text could equally well refer to shags.

Shag *Phalacrocorax aristotelis* P2: Lesser cormorant, Shag, Crane

This species is reported as 'frequent in the same waters with the former [cormorant]'. An adult is described as 'somewhat larger than a domestic duck' with wingspan of 44 in (112cm) and a 'body [that] is small, flat and depressed, like the dun-divers'. Dun divers appear to be red-headed sawbills (see red-breasted merganser/goosander in Appendix 1). The wingspan is slightly above the range of 90-105cm quoted by Jonsson (1992) for the shag but well below that given by him of 130-160cm for the cormorant. It was thought to breed annually 'on the island of Farn, and in other places among the rocks on the sea-coast, but most commonly upon trees'.

It is clear from the descriptions that Wallis was familiar with the differences between cormorant and shag. However, confusion in field observations between these two species is prevalent in early writings and the implication that shags were found inland and the statement that they bred upon trees are not acceptable today without further evidence. For instance, for Scotland, Baxter & Rintoul (1953) note that 'the Shag is more truly marine than the Cormorant ... its appearance on inland waters is rare' and make no mention of tree nesting. The statements on tree nesting appear to have been copied from Willughby and Ray (1676 p. 249) and there is no indication that they apply to Northumberland. Breeding on the Farne Islands in earlier times is supported by Pennant who found large numbers there in 1769 and by other writers in the 17th century (Gardner-Medwin 1985). The breeding of *Phalacrocorax* sp 'in other places among the rocks on the sea-coast' is supported by the current small colonies of shags at Needles Eye (near Berwick) and Dunstanburgh. Following Wallis, persecution reduced numbers very markedly at the Farne Islands by the 1820s (Selby 1826) and there was little recovery until c1940 (Hawkey 1991).

Shelduck *Tadorna tadorna* P4,8: Sheldrake, Bergander, Burrough-duck

A detailed description of a drake in breeding plumage is given. It was reported as a native of the Farne Islands, implying that it bred there in the 1740s. Earlier visitors to the Farne Islands in the 17th century did not report it but Pennant saw it there in 1769 (Gardner-Medwin 1985). Hancock (1874) noted it as 'resident, but not by any means common' hinting at a decline in the mid-19th century.

Eider *Somateria mollissima* P3,8: St Cuthbert's duck

The Farne Islands have held a breeding colony of eiders since at least the 7th century when they were associated with St Cuthbert (Gardner-Medwin 1985). It is no surprise therefore that Wallis reports it as a 'native of the island of Farn' and, in his razorbill account (see Seabirds above), indicates that they were one of the common species found at the Farne Islands on his visit in the 1740s. Wallis also mentions the earlier accounts by Willughby and Ray of St Cuthbert's ducks on the Farne Islands. Their accounts and those of Pennant from his visit in 1769 indicate a healthy population (Gardner-Medwin 1985). Problems, however, arose in the 19th century. Selby (1833) records that 'upon the Northumbrian coast many Eiders breed upon the group of Fern Islands ... and which with Coquet Island ... may be reckoned the most

southern breeding-stations of these birds' and adds in a footnote that 'in consequence of having been wantonly molested [at the Farne Islands] during the breeding season, the Eiders have of late years very much decreased'. The specific cause of the decline appears to have been indiscriminate egg collecting (Selby 1826). Hancock (1874) concurs with this decrease noting it as 'a resident, but not by any means abundant. Several pairs breed on the Farne Islands'. This decrease in the 19th century has not been emphasised by Hawkey (1991).

Very surprisingly Wallis says that 'in winter, they frequent the large rivers'. However, descriptions are given of both the drake and the female and it is stated that 'the male here described was shot in the river Tyne, near Hexham, in a hard frost, and presented to me'. This record presumably can be dated between 1748-69 when Wallis lived at Simonburn and, while there is no reason to doubt this instance, it may be that too much was read into it. Eiders have been extremely rare inland in Northumberland with only about six instances from this one in Hexham through to 1978 (Galloway and Meek 1978-83). There have been more records on the lower Tyne in recent years but it is possible that there is confusion with other species such as the goldeneye in Wallis's sight records.

Guillemot *Uria aalge* P7: Guillemet, Sea-hen

This auk was recorded as breeding annually 'on the steep cliffs of the island of Farn', presumably the Pinnacles. The brief description of an adult in summer plumage is satisfactory but the bill lengths for both this species and razorbill at 'near three inches', that is 7.6cm, are much greater than the 4.8cm of Cramp (1977-94 vol. IV). However, it does depend on how the measurements were made. Pennant, from his visit in 1769, wrote that the Pinnacles were 'entirely covered with Guillemots' (Gardner-Medwin 1985). The species appeared to survive the 19th century in better numbers than many other seabirds (Hawkey 1991) with a 'numerous colony' noted at the Farne Islands by Selby (1826).

Razorbill *Alca torda* P8: Razor-bill, Auk

This species, stated as 'another of the Farn-island visitants in the summer', is described satisfactorily in considerable detail. It is of interest that it is not noted as being scarce. Its population on the Farne Islands may then perhaps have been at a higher level than in the 19th century when only a few pairs nested there (Selby 1826). In 1876 egg-collectors are quoted as saying that the razorbill had formerly been more abundant (Hawkey 1991). Earlier writers than Wallis had noted the razorbill on the Farne Islands in the 17th century and Pennant found it there in 1769 (Gardner-Medwin 1985).

Great auk *Pinguinus impennis* P5: Penguin

This account is quoted in full because of its historical significance as the last record for this species in Northumberland:

> The Penguin, a curious and uncommon bird, was taken alive a few years ago in the island of Farn, and presented to the late John William Bacon, Esq; of Etherston, with whom it grew so tame and familiar, that it would follow him with its body erect to be fed.

The synonymy for the penguin was given by Wallis as *Anser magellanicus, Penguin nautis nostratibus dicta* and *Alca rostri sulcis octo; macula alba ante oculum.* This, and the circumstances described, led Hancock (1874) and Bolam (1912) to accept the record as a great auk and there appears to be no reason to dispute their conclusions. Wallis was clearly familiar with the common auks; the traditional name for the great auk until c1785 was the penguin (Lockwood 1993); the illustration by Willughby and Ray (1678) of a great auk is entitled penguin; great auks were known to be easy to tame (Yarrell *et al.* 1871-85 vol. IV) and the individual was clearly thought to be exceptional by all concerned. The record is also quite plausible in historical context: the great auk was still a rare and irregular breeder on Orkney and Shetland through the 17th and 18th centuries and ranged south as far as southern Spain in winter (Nettleship and Birkhead 1985 pp. 63-69).

The date for the record can be determined more precisely from the genealogy of the Bacon family (NCH vol. I pp. 227, 229). John William Bacon succeeded to the estate of Etherston

(Adderstone) in 1763 and died in 1767 so the record is most likely dated 1763-67. In much earlier times in the 9th and 10th centuries, the great auk appears to have been a more common visitor to Northumberland; its remains were found in the excavation of Green Shiel at Holy Island (Beavitt *et al.* 1987-90 p. 11). The description of the breeding habitat of the great auk as low-lying offshore islands with a gently shelving shoreline (Nettleship and Birkhead 1985 p. 177) is compatible with its having been a former breeder on the Farne Islands.

Puffin *Fratercula arctica* P6,8: Coulterneb, Pope, Tommy noddy

The coulterneb or pope was recorded as 'an annual visitant of the island of Farn, where it breeds'. A very detailed and accurate description is given. Pennant in 1769 also found puffins, under the local name of Tom noddies, at the Farne Islands and they were also noted breeding there in the 17th century (Gardner-Medwin 1985). The size of the population in the early 19th century is not clear: Selby (1833) said 'many resort to the Fern Islands' while Hancock (1874) reporting on a visit to the Farne Islands in June 1831 said 'we met with it breeding there, but in no great numbers'. It is probable that Hancock's report is the more accurate as other seabirds were reported as declining at this locality at this time (see shag, eider). From 1870 the Farne Islands colony appeared to be recovering (Hawkey 1991).

Other species: an interesting omission from Wallis's accounts is the **black guillemot** *Cepphus grylle*. Ray's description of the puffinet, recorded as breeding on the Farne Islands in 1671 (Gardner-Medwin 1985), can leave no doubt as to its identity as a black guillemot in summer plumage. Kirk in 1677 also made observations suggesting this species but Pennant in 1769 recorded the black guillemot without any further comment (*ibid*). In the Allan MS the black guillemot is noted as found 'in the Bass Isle of Scotland and St Kilda, and the Farn Islands' (Fox 1827). Selby (1833) was dismissive of recent claims asserting that in almost annual visits to the Farne Islands over the last twenty-five or thirty years he had not seen any black guillemots, although they did still breed on the Isle of May. Pennant's claim and the evidence of Fox should perhaps be treated with caution and indeed all Pennant's records for this species in England and Wales are questioned by Holloway (1996). It is probably safe to conclude that the black guillemot did nest on the Farne Islands in the 17th century but it is less certain that it continued to do so in the 18th century.

Waterbirds

This section covers those species typically frequenting estuaries, rivers and lakes, excluding the waders which have a section to themselves and those ducks which are found almost exclusively at sea or on the coast. It therefore includes herons, storks, swans, geese and ducks other than sea ducks. In spite of being very poorly drained in places, 18th century Northumberland actually held few large areas of open standing water. On old maps, however, we do see the loughs around the Roman Wall – Greenlee, Broomlee, Crag and Grindon Loughs – in the same form as they are found today. These ancient loughs are at considerable altitude but they appear to have suited the bittern, osprey and marsh harrier in Wallis's time. If open water was at a premium in historical Northumberland, fenland was not. Lowland fens were found in a number of areas including along the Tweed, around Newham and in the Matfen/Ponteland area. Many of these fens were drained during the 18th century.

Between the accounts of Wallis and Selby, therefore, vast habitat changes occurred involving the drainage of many fens and moors across the county (Bailey and Culley 1805). Only a few sites such as Prestwick Carr, the last remnant of the vast Matfen/Ponteland wetland, which was eventually drained in 1857 (Hancock 1874), and the loughs near the Roman Wall at Haltwhistle survived as viable wetlands. The bittern appears to have become extinct as a result of the drainage schemes and the marsh harrier and osprey also suffered loss of habitat. Around 1850 the first of a generation of large reservoirs was constructed at Whittle Dene but these waters lacked the extensive reed beds of the old fen lands.

Bittern *Botaurus stellaris* F20: Bittern, Bittour, Mire-drum

It was stated by Wallis that the bittern is 'frequent about mosses' and 'most of our alpine mosses have its company'. Detailed descriptions are provided, based on those of Willughby and Ray (1676 p. 207) and Charleton (1668 p. 103), of an individual shot at Widdrington Park and of the eggs. It is also mentioned that 'a moss to the north of Many-Laws, in the parish of Carham, is rarely without it, where it is called the Mire-Drum'.

On the mosses of Bewcastle in Cumberland, this species was still found in the 1790s (Hutchinson 1794-97) and it survived at Prestwick Carr at least until the 1820s (Maddison 1830). However, Selby (1831) reported that 'the Bittern is now but rarely met with in the northern counties, although, before the drainage of our bogs and mosses, it used to be common and well known' and listed additional sites of Newham Lough and near Berwick-upon-Tweed. Prestwick Carr and Newham Bogs were probably its last refuges as a breeding species in Northumberland around 1820-30. Baxter and Rintoul (1953) indicate that the major decline in Scotland was from 1790-1840 and a similar but perhaps slightly earlier period of decline appears to apply in Northumberland.

Grey heron *Ardea cinerea* F21,1,12, 20: Ash-coloured heron, Hernshaw

This was reported as common, building *gregatim* upon trees. It was also stated (see cormorant) that it sometimes nested in trees on the coast. The style of life in a 'fine hernery' on a farm of Sir Harry Grey's on the Glen, under Cheviot, is described in detail. In those days this species bred in large groups in high trees in a conspicuous manner. Since then and particularly from around the 1920s it has tended to move into casual, outlying sites (Bolam 1932). Although Hancock (1874) reported that it was 'a common resident, but less abundant than in former times', it has generally maintained its population levels despite occasional crashes due to cold winters and persistent persecution.

White stork *Ciconia ciconia* F37: White stork

This is described as an uncommon bird in England. One, killed near Chollerford Bridge 'in the beginning of the year 1766', is described in detail. It is reported that:

> The case of the bird killed here was fixed against the west front-wall of the inn [at Chollerford], where it remained for a long time, with the erroneous name of that more rare bird, the Flamingo, put up under it in writing; a bird of quite a different figure and colour. However, this wrong name drew together crowds of people from the adjacent parts to see it, who for some time returned satisfied that they had seen the Flamingo, the most remarkable bird hitherto known.

This would seem to be the first recorded mass birdwatch in Northumberland, made more noteworthy by an identification error.

Whooper swan/Bewick's swan *Cygnus cygnus/C. columbianus* P13: Swan

Wallis noted that 'in frosts and snows of a long continuance, the stately Swan sometimes repairs for refuge to the rivers Tweed and Till, and there receives from the sportsman the untimely fate it would escape'. The synonyms given by Wallis of 'Wild Swan' and 'Hooper' indicate that we are dealing with the whooper swan, It appears to have been a rather scarce hard-weather visitor. Selby (1833) reported a similar status: 'in England its appearance is not so certain, being governed by the state of the season.... It is, only, therefore, when the winter sets in with unusual vigour in the northern parts ... that they extend their equatorial migration to more temperate climates'. Selby cites peak seasons of 1784-85 and 1788-89 in the 18th century. Richardson (1842 p. 319) supports the latter date with an observation in January 1789 that a 'flight of swans, thirteen in number, alighted in the Derwent, near to Mill-house-burn. It is probable that they were a flock ... driven from the north by the severe weather'. Since Bewick's swan was not separated from whooper swan until 1829, we cannot say with certainty which of the two species was actually recorded in Wallis's time but analysis of old specimens suggests that whooper swans very much predominated (Selby 1833).

Bean goose *Anser fabalis* P12: Wild goose

Wallis's account provides evidence for the bean goose being the commonest grey goose in the county in the 18th century. He notes 'the Wild Goose, in its periodical flights southwards in autumn ... often alights on the commons near the Tweed and Till'. The description is given below:

> It is of the size of a domestic heath-goose, not fed in the grounds of better culture. The beak is above two inches long, dentated on the sides, black at the tip, and towards the base, and of a saffron-colour in the middle. The eyes are large, with a white line under them. The whole upper plumage is grey; the under one white, with a cast of grey on the breast. The legs and breast are of a saffron-colour, and the claws black.

The saffron bill with black tip and base and saffron legs matches very well the description of Cramp, (1977-94 vol. I) for bean goose. The size also appears right with Wallis's size of a 'domestic heath-goose, not fed in the grounds of better culture' matching well the 'averaging only slightly smaller than Greylag Goose but not so bulky' of Cramp (1977-94 vol. I). The status of the bean goose as the common grey goose of the 1760s is consistent with that given in the early 19th century as a periodical winter visitant, very numerous, and in large flocks (Selby 1831). Maddison (1830) also records this species at Prestwick Carr as the common wild goose *Anas sylvestris*, the latter being a synonym for this species. In other northern areas, the bean goose was also the common grey goose around this time being noted in Cumberland as 'very frequent ... in severe winters' (Heysham 1794-97) and in Scotland as historically until c1870 'the most numerous of the Grey Geese' (Baxter and Rintoul 1953). In Northumberland, the final years of plenty for the bean goose appear to have been the early 1930s (Bolam 1932). The subsequent decline coincided with a major reduction, through persecution and changes in forest habitats, in the Scandinavian breeding population (Cramp 1977-94 vol. I). Long before Wallis it may have been the case that the greylag goose *A. anser* L. was at least as common as the bean goose. Selby (1833) thought, from 'our older writers', that the greylag goose 'was formerly very abundant in Britain ... breeding annually in great numbers in the fens'.

Wallis thought that the wild geese visiting us in winter were of the same species as those breeding in the north of Scotland. Hancock (1874) reveals that this was not the case: 'It has been asserted that the bean goose breeds in Sutherlandshire; ... until our visit ... in 1849 when it became evident that the supposed Bean Goose was really the Grey Lag . We saw no trace of the former'.

Brent goose *Branta bernicla* P10: Bernacle

Wallis's account (Figure 1), provides some valuable fresh evidence to assist in the discussion over which forms of this species visited Northumberland in historical times:

> The Bernacle is frequent near the river Tweed, and Holy Island, in winter. It is considerably smaller than a goose, and larger than a duck. The beak is short, broad and black. The plumage of the head, neck, and lower part of the thighs, is black; the belly cinereous; the back variegated with black and grey; the sail-feathers a dark grey; the short plumage of the wings, white, black, and cinereous, in alternate variegations. The tail is black. The back-toe is short, and slender.

The description is clearly of a brent goose with the small size, black head and neck, and dark grey primaries. The variegated pattern on the short plumage of the wings suggests a juvenile/first-winter bird and the cinereous belly indicates the pale-bellied race *B. b. hrota* Müller. Moreover Willughby and Ray (1678 pp. 359-360) use the names bernacle, for the pale-bellied form with the underside of the body as 'white, with some mixture of cinereous', and brent goose for the dark-bellied form with breast of a dark grey. It therefore appears that the pale-bellied brent goose, one of Lindisfarne's most important winter visitors today, was also common in the Holy Island/Tweed area c1760. Selby (1831) said the brent bernicle 'resorts to the eastern and southern shores during winter, in immense flocks' and Hancock (1874) noted the brent goose as 'a common autumn and winter visitant. Great numbers of it are occasionally shot at Fenham Flats'. However, neither accounts give information on the race involved.

Selby (1833) gives more details: 'Upon the Northumbrian coast a very large body of these birds annually resorts to the extensive muddy and sandy flats that lie between the mainland and Holy Island.... This part of the coast appears to have been a favourite resort of these birds from time immemorial, where they have always received the name of Ware Geese'. A description is also provided indicating 'under parts of the body french-grey; with the feathers margined paler' and 'back, scapulars, and wing-coverts, clove-brown'. It seems reasonable to assume that Selby prepared the description from a specimen obtained at Lindisfarne or at least one representing the race with which he was more familiar. This suggests that the race found in Northumberland at this time had a french-grey (pale blue) belly and a clove-brown (dark brown) back corresponding to the pale-bellied form. Bewick (1804) also describes a brent goose of the pale-bellied race: 'the upper parts ... are darker than the belly, which is more mixed and dappled with paler cinereous and grey'.

The dominance of the pale-bellied form is extended to the late 19th century when Chapman (1889b p. 198) noted: 'These dark-breasted birds are the exception, the vast majority being pale grey or dusky below, all more or less conspicuously barred, especially about the flanks'. Further, all four plates by Chapman (*ibid.*) on brent geese show only the pale-bellied race and Chapman repeats the statement on the relative abundance of the races in the second edition of *Bird-Life of the Borders* in 1907. Muirhead (1889-95) reported: 'Immense flocks frequent Fenham Flats, near Holy Island ... The Brent Goose can at once be distinguished from the Barnacle Goose by its black head and the white patch on the side of the neck'. This indicates the pale-bellied race was present on Holy Island because, if the dark-bellied form *B. b. bernicla* L. had been present, another obvious difference would have been the shade of the belly.

It is not the intention here to adjudicate on the differences of opinion between Chapman (*ibid.*) and Bolam (1912) on which form predominated at Holy Island in the early 20th century. Meek and Little (1978) discuss in detail the conflicts between their accounts. However, it is worth stressing that, from Wallis in 1769 to Chapman in 1907, all writers agreed that the pale-bellied race was the predominant form. Around the end of this period, very major changes happened to the Svalbard population of brent geese. Chapman (1889a), in the description of his voyage to Spitzbergen in 1881, reported for *Bernicla brenta* that 'Spitzbergen is one of the principal breeding resorts of these Geese ... they were abundant, breeding, with the Eiders, on rocky islands.... Their summer plumage appears slightly ruddier than that of winter, owing to their upper coverts being fringed with brown'. By 1921 a very different status prevailed (Gordon 1922 p. 86):

> While the eiders have suffered the loss of their eggs only, and probably have succeeded by the end of the summer in raising belated broods, the brent goose, which, formerly shared with the eiders these far northern islands, has been a greater sufferer by far. Indeed, in certain of its former summer haunts, it has been almost wiped out, for the birds themselves, on account of their tasty flesh, are shot whenever possible and the eggs, of course, carried off also. Some of the geese are now nesting up the valleys where, although comparatively secure from molestation at the hands of their human enemies, they are, as I have previously mentioned, hunted and harried by the Arctic fox.

Such a bleak picture for the pale-bellied race must have affected dramatically the situation at Lindisfarne and a very complex transition period may have prevailed (around 1900-1925) before the dark-bellied race *B. b. bernicla* assumed a temporary majority (around 1925-1950) over the pale-bellied race while protection measures were being developed in Svalbard.

Barnacle goose *Branta leucopsis* P10: Bernacle

The bernacle was a name applied to both the brent and the barnacle goose (Lockwood 1993). All of Wallis's account on the bernacle appears to refer to the pale-bellied brent goose except for the note that 'the case of one stuft was shewn Mr. Ray, at Sir William Forster's, of Bambrough'. Subsequent authorities have considered quite plausibly that, because of its interest to the collector and to Ray, the specimen was more likely to be of the barnacle goose, which is scarce on the east coast, than of the brent goose (Selby 1833; Bolam 1912). However, as pointed out by Gardner-Medwin (1985), it is not certain that the specimen was procured in Northumberland.

Goldeneye *Bucephala clangula* P9: Golden eye

A drake is described that was shot on the coast, near Druridge, and presented to Wallis. The description follows closely that for the goldeneye by Willughby and Ray (1676 p. 282) rather than the glaucion cited in the synonymy. Its status was given as 'not unfrequent about the Farn-islands and on the sea-coast'. This appears to be the earliest mention of the species in the county literature. Maddison (1830) found *Anas clangula*, the golden-eyed ducker, at Prestwick Carr. Selby (1831) lists it as common, though not numerous, in winter.

Birds of prey

The eight accounts by Wallis of birds of prey are probably the most important of all his writings from an ornithological perspective. They establish a base-line of abundance against which current population levels can be compared and moreover one taken before the complete elimination of many predatory species in the 19th century. However, no base-line can be regarded as absolute and indeed for some species such as the red kite *Milvus milvus*, there is evidence that the persecution, which was intense from the late 18th century through almost to the present day, had started before Wallis's time (Thomas 1984 p. 274.). As early as 1565-66 a mechanism for bounty payments, underpinning the destruction of birds of prey, was established in an Act of Parliament (8 Eliz I c.15) which authorized churchwardens to raise funds to pay so much a head to all those who brought in corpses of species such as foxes, polecats, weasels, stoats, otters, hedgehogs, rats, mice, moles, hawks, buzzards, ospreys, jays, ravens and kingfishers. Many parishes continued to make payments under these and later acts until the 19th century, the persecution shifting from one species to another according to perceived priorities. Surviving parish records show that the destruction effected through the churchwardens was colossal, particularly from the late 17th century, when guns were increasingly used to shoot birds on the wing. Examples from the Churchwardens' Accounts Books for Corbridge are used in this article to illustrate the scale of the destruction. Bounties were paid on some 1,593 heads of seven species of animal from 1676-1745 including 163 red kites (Rossiter 1998a).

It does not appear, however, that the destruction was applied systematically enough for species actually to be rendered extinct by Wallis's time. There is evidence that the persecution, originally under the control of public bodies, was increasingly replaced by direct persecution by private estates towards the end of the 18th century. Munsche (1981 p. 41-44) indicates that at this time game preservation became much more systematic with much greater attention paid to the complete elimination of predatory fauna: 'Equally important was the protection which the game found on preservers' estates. Crows, stoats, weasels, hawks, owls, kites, polecats, magpies and other predators of game were proscribed animals on these estates after mid-century [1750] and landowners handed out liberal rewards to those who destroyed them. Indeed, vermin-catching developed into a relatively lucrative occupation in the second half of the 18th century'.

It is evident in the accounts below that this resulted in a very major drop in raptor numbers from Wallis's time c1760 to the 20th century. Some twelve species can be identified in Wallis's accounts of which four (red kite, common buzzard, golden eagle and osprey) were eliminated by the 1840s and a further two (marsh and hen harrier) by 1900. By 1910 the honey buzzard had become a very infrequent visitor and in the 1920s the white-tailed eagle made its last appearance for about seventy years. Substantial declines occurred for three more species (sparrowhawk, merlin and peregrine falcon). Only the kestrel maintained its status and even it suffered intense persecution at times. The pattern of elimination is clear. In general, broad-winged raptors were the first to become extinct as they were relatively easy targets for 'sportsmen' with primitive firearms. The harriers undoubtedly fared better into the mid-19th century and their removal was a protracted affair, perhaps because of their migratory habits. Falcons and accipiters fared at least as well as harriers for a while, perhaps being more difficult to shoot. Eventually, however, there were also severe declines in their populations.

Red kite *Milvus milvus* F3: Glead, Swallow-tail'd falcon

The account of the glead is one of the sections most often quoted from Wallis:

> We have the Glead or Swallow-tail'd Falcon; the only one hitherto known with that remarkable distinction, in the alpine, and some of the vale, woods. It is in the greatest numbers in the west and north-west parts, where many of them usually join company, and in towering undulating flights look out for young poultry, which is no sooner perceived by the old ones, than they warn their little offspring by a signal to take shelter under their wings; but the unwary wanderer is sure to be seized and carried off. It is a great destroyer of wood-pigeons, and in the scarcity of such dainties condescends to live upon mice.

The account clearly refers to the red kite, as do the synomyns swallow-tail'd falcon and *cauda forcipata*. Wallis shows that while the red kite was still present in alpine (upland) woods it was already becoming restricted to the western and north-western areas by c1760 and was found in some of the upland and vale (valley) woods. It was clearly unpopular with country people because of its predation on young chickens although other food sources quoted (wood pigeons and mice) would have benefited farmers.

There is clear evidence that the red kite was more widespread in Northumberland before Wallis's time. In the excavation of the Castle Ditch in Newcastle (Rackham and Allison 1981), the bones of a probable red kite were found in a layer dating from the early 16th century suggesting its presence there as a town scavenger in mediaeval times. By far the most detailed evidence though is provided by the Churchwardens' Accounts for Corbridge (NRO: EP 57/25-26) which record many mammal and red kite bounties from 1676-1745 (Rossiter 1998a). A total of ninety-one claims were made on 163 gleads from 1676-1723, suggesting that the red kite was a common species at this time in the lowlands. Moreover analysis of the time of the year at which glead heads were presented showed that persecution was highest in May, presumably of breeding birds which may have made tempting shooting targets. Such persecution is likely to have been far more serious in its effect on the red kite population than if persecution had been mainly of young birds in the autumn. Indeed the low numbers of glead heads presented in August in Corbridge could be taken to indicate an almost total lack of breeding success, since recently fledged juveniles would have been relatively easy to kill.

Wallis wrote his account in Simonburn some 15km to the north-west of Corbridge. His indication that the red kite was by then found mainly to the west suggests that it was already scarce to the east of Simonburn by Wallis's time and indeed it may have become almost extinct in the Corbridge area in the mid-18th century since the last bounty record for this species was in 1723. The red kite was clearly becoming scarcer in lowland areas through the 18th century and indeed Evans (1911) noted that since the time of Wallis there was not one record in the Tweed area. However, it still seemed to maintain a presence in upland areas. Using Cumberland as a guide for the end of the 18th century, Hutchinson (1794-97) itemized 'gleds' in his list of birds for the Parish of Bewcastle, Richardson (1794-97) reported that, in Ullswater, kites 'are found the whole year' and Heysham (1794-97) noted that 'the kite breeds, in the woods, near Armathwaite'. However, an extraordinarily fast decline nationally was now in progress as systematic game preservation became more widely and effectively practised. It appears the red kite was virtually eliminated from Northumberland around 1800-10 but managed to survive on a very local basis until the 1830s, for instance at Eglingham (Baker 1996).

Hen harrier *Circus cyaneus* F4: Dove-coloured falcon, Hen-harrow, Henharrier, Ring-tail

Wallis's account of the dove-coloured falcon appears to refer to two different species: the hen harrier and the peregrine falcon. A number of aspects refer to the hen harrier. The ring-tail is described well, the different plumage of the sexes is recognized and the nesting on the ground in heather on Cheviot is an expected feature: '[it] breeds annually on Cheviot ... She lays four eggs ... on the ground upon Cheviot among the *Ericae* ... as I found by an encounter I had with a pair of them in my younger days, on the north side of Cheviot'. The statement on their destructiveness of wildlife is interesting as a record of the harsh attitudes to birds of prey by this time: 'These birds make great destruction of the wild ducks, and other water-fowl, that breed in the lakes, and the mountain-rivulets. They also do great mischief to the game; and of the

domestic poultry they make sad havock in the spring'. Some parts of Wallis's description, including the dove colour, black wing tips, harsh notes, aggressive young and the excited behaviour of the male when the female is on eggs, could refer to either the hen harrier or the peregrine falcon.

There seems no doubt that the hen harrier was common on the moorlands of Northumberland in the 18th and early 19th centuries, breeding on uncultivated lands at any altitude. Hancock (1874) reported: 'The late Mr R. R.Wingate informed me that his father remembered when the hen harrier bred on the Newcastle Town Moor'. Since this Mr Wingate was the person who presented the paper establishing the new species of Bewick's swan in 1829, it would appear that this report relates to the 18th century. It also bred on lowland commons near Carlisle in the 1780s (Heysham 1794-97) and Maddison (1830) reported its presence at Prestwick Carr. Systematic persecution was, however, well under way from the 1790s with Heysham (1794-97) noting for Cumberland: 'The duke of Buccleugh's gamekeeper has destroyed some hundreds, and has frequently shot both male and female from the same nest: lord Carlisle's gamekeeper has done the same'.

Selby (1831) indicated some resilience by noting it as 'not uncommon, and a very destructive species to game. Roosts upon the ground in very long heath or ling, and generally in companies of 5 or 6 together'. In upland areas, the hen harrier was noted from 1825-78 on the moors of the North Tyne, Kielder Head Moors, Belford Moor, Eglingham, Edlingham, Alnwick Moor, Beanley, Bewick, near Wooler (Bolam 1912; Evans 1911) and the South Tyne valley in the Alston area (Macpherson 1892). However, the population did decline greatly from around 1830 and Hancock (1874) wrote of the hen harrier: 'It has now almost succumbed to the zeal of the gamekeeper.... I fear it can no longer be considered a resident in the district'. The migratory habits of the species, however, enabled occasional breeding attempts to be made until the late 19th century with possible attempts at Prestwick Carr from 1897-98 (Bolam 1912). The next breeding records were in 1957.

Peregrine falcon *Falco peregrinus* F4,8: Dove-coloured falcon

There is little doubt that part of Wallis's account of the dove-coloured falcon refers to the peregrine falcon, in particular the breast of the male with brown and white bars, the pointed wings and the nesting on precipices. He suggests that the peregrine falcon was breeding c1760 at two eyries: 'on the shady precipices under the Roman wall by Crag-lake, and on those of great Waney-house-crag near Sweethope-lake'. The former site was also mentioned by Wallis (pp. 11-12) when describing Crag-Lake:

> In the hollows, the dove-coloured falcon with black pointed wings annually rears up its young, making the rocks and water echo on the approach of danger with a harsh sonorous note, somewhat resembling that of a goose.

Heysham (1794-97) also noted this site: 'The Peregrine Falcon breeds, consistently, every year ... in another high rock ... near a public-house, called twice-brewed ale, on the road from Carlisle to Newcastle' and reports a breeding female shot there in May 1781. Some thirteen different sites (eleven inland, two coastal) are mentioned by the various early writers but other hill sites must have been occupied to justify the statement: 'If we may judge by the scanty records of ancient days, most of the higher cliffs of our hill regions were tenanted by a pair of these birds, and the precipices of the Berwickshire coast by several others' (Evans 1911). As with the harriers, the main decline was recorded between the times of Selby (1831), who noted it as not uncommon, and of Hancock (1874) who found a decline, saying 'formerly, it bred, every year ... but now it can scarcely be said to do so'. The formidable hunting skills of this species appear to be described in the merlin account.

Sparrowhawk *Accipiter nisus* F7,9: Sparrow-hawk

Wallis's description, indicating a dusky brown plumage and conspicuous dark brown wavy transverse lines on the belly, appears to be of a juvenile although it could conceivably refer to an adult female. The eggs are described reasonably well but the nest site of 'hollows of inaccessible rocks shaded with brushwood' appears unusual and is discussed later (see merlin).

The sparrowhawk is recorded by Wallis as 'the most common Falcon we have'. Selby (1831) provides some support for this claim by recording the sparrowhawk as 'a very common species'. In Cumberland Richardson (1794-97) reported that they 'are frequent in this country, and breed here'. It appears that it was not until the mid-19th century that the kestrel became commoner than the sparrowhawk.

The reputation, noted by Wallis, of being 'very destructive to partridges', was obviously going to lead to problems with shooting estates. Persecution is likely to have been as persistent as with the broad-winged birds of prey but by 1874 Hancock could still describe it as 'a common resident; but not nearly as plentiful as formerly'. It appears that it survived through the ability for first-year birds to breed. Bolam (1912) reports that the routine was for nests to be shot-out each spring when the sitting female would be killed. However, in a number of cases, successful re-lays occurred with a new female that was often immature. The nadir for this species occurred around 1960 when the combined effects of pesticides and persecution meant that the sparrowhawk was perilously close to being extinct in the county. Legal protection was granted in the early 1960s and it is possible that today it is regaining its historical position as our commonest raptor.

Common buzzard *Buteo buteo* F5: Buzzard

Wallis states that 'we have the small, brown, red-eyed Buzzard, with a yellow Cera and eye-lids, and a train shorter than the wings'. In effect a small brown buzzard is described with red iris, a yellow cere and eye ring, and a tail shorter than the wing-width. Synonymy from Linnaeus (1746 no 64) of Falco pedibus cera palpebrisque flavis, capite fusco, nucha alba, abdomine albicante maculis oblongis indicates a small pale-phase buzzard with yellow feet, cere and eye-lids, dark brown head, white nape and a whitish body with oblong spots. We appear to be dealing with the common buzzard although the eye colour of red is not quite right – it should be brown in dark-phase birds or yellow in pale-phase birds – but the eye colour is less reliable if derived from dead specimens. In terms of dimensions, Wallis seems to be making a reasonably accurate comparison of the common buzzard with the honey buzzard which was considered by him in the same account. The common buzzard is indeed 'small' and with a 'short train' as it is 4% shorter in wingspan and 10% shorter in tail-length than the honey buzzard (Cramp 1977-94vol. II). Further, as aptly noted by Wallis, the common buzzard's tail is shorter than the wing-width, giving a very useful distinction from honey buzzard.

The rather terse information on buzzards suggests that they did occur but were neither very common nor very scarce. It is also clear that Wallis recognised that two species occurred but that they were separable only as specimens, through cere and eye colour, rather than in field observations. It would appear that a number of specimens were available making it likely that broad-winged hawks were already being shot on some scale by Wallis's time. It is considered that persecution of buzzards began as early as the 17th century (Cramp 1977-94 vol. II). Bolam (1932) provides anecdotal evidence for the greater abundance of the common buzzard in historical times commenting that 'in the days of our fathers, it had many nesting places, especially amongst the hills'.

In the late 18th and 19th centuries persecution intensified and a rapid national decline occurred. In Scotland, for instance, Baxter and Rintoul (1953) note: 'In the early part of the 19th century the common buzzard bred plentifully over the greater part of Scotland from the Border northwards. About 1830 or so, persecution of the species became intense, and in the next fifty years the numbers were seriously diminished'. There is far less evidence for the plentifulness of the species in Northumberland in the early 19th century. Wingate (1825) did describe the 'slothful and cowardly common buzzard [which] builds its nest in trees or rocky eminences' and mentions one shot at Wallington, Maddison (1830) reported it from Prestwick Carr and Tristram found it nesting near Eglingham (Baker 1996) and Beanley in the 1830s (Evans 1911). However, Selby (1831) said it 'cannot be considered, as a common species. I have occasionally met with it during summer in the neighbourhood of the Cheviots'. The final breeding records come from Hancock (NEWHM: H326 p. 21) who reported the receipt in 1849 of twenty-three eggs of the common buzzard collected from time to time by a Mr Cowper of Alston in the Cumberland Hills. This suggests that the common buzzard survived in the South

Tyne area into the 1840s. The overall conclusion is similar to that for the red kite: the common buzzard was scarce after 1800 and only survived on a very local basis into the 1830s and 1840s.

Honey buzzard *Pernis apivorus* F5: Honey-buzzard

In his account of buzzards, Wallis adds: 'also the rusty brown, yellow-eyed Honey-Buzzard, with a black Cera, and a grey head, about mountainous, woods and heaths'. The dark cere, grey head and yellow eyes indicate that the description is of an adult. The rusty-brown colour is normally associated only with a particular morph of juvenile (Cramp 1977-94 vol. II) suggesting some amalgamation of descriptions of different individuals, as found in Ray's account (1713 p.16). The synonymy given of *Buteo apivorus s. vespivorus* is pertinent, indicating a bee- and wasp-eating buzzard.

The presence of honey buzzards, in upland wooded areas, is a very interesting claim for c1760. Before sheep became firmly established in upland areas of south-west Northumberland, it is likely that there was considerably more scrub in steep-sided valleys (cleughs) than we are used to today (see black grouse, nightjar and red-backed shrike). The presence of thickets in the uplands would encourage hymenopterous insects, an important food source for this species. There are early records nationally for this species. Willughby and Ray (1678 p. 72) note: 'It hath not as yet ... been described by any Writer, though it be frequent enough with us' and provide a satisfactory description. Yarrell *et al.* (1871-85vol. I) cite two breeding records from 1766-80 and Heysham (1794-97) reported it breeding in Cumberland: 'this bird is very rare in Cumberland. I have only been able to meet with one specimen, ... I am informed it makes its nest in high trees, and breeds in the woods at Lowther'. Macpherson (1901) adds that it was claimed in 1835 that at least three more honey buzzards had been killed at Lowther and preserved there.

The species does appear to have been rare nationally in the early 19th century when Selby (1831) noted it as 'one of the rarest and most elegant of the British Falconidae'. However, there was then a significant recovery perhaps made more obvious by more effective collecting techniques. Hancock (1874) noted that 'it is certainly now, according to my experience, one of the commonest larger birds of prey. Since 1831, and up to 1868, twenty five specimens have come under my notice, all taken within the two counties [Northumberland and Durham]'. Besides commenting on the one proven instance of breeding in 1841 at Newbiggin, near Hexham, Hancock also makes the interesting observation that 'Young birds very much predominate and usually two or three are taken about the same time and near the same place, as if they belonged to the same brood'. This would suggest that breeding was more frequent than indicated by the one well-documented record. An analysis of honey buzzard records in Northumberland, from the 18th century to the present time (Rossiter 1998b), provides support for Hancock's view. This analysis indicates that relatively high numbers (0.95 birds/annum) were present in the 1830s and 1840s and the lowest numbers (0.15 birds/annum) occurred from the 1910s to the 1960s. Out of a total of fourteen birds obtained in autumn from 1829-49, for which the age has been published, as many as nine were juveniles indicating a not insignificant breeding population at this time.

Golden eagle *Aquila chrysaetos* F1: Eagle

The account of the eagle by Wallis begins with well-known early evidence for eagles in the county:

> On the highest and steepest part of Cheviot, so called from its being the chief of the mountains round it, the Eagle sometimes has its airy. Two beautiful ones were bred there a few years ago, one of which was shot by a gentleman's servant. A sportsman afterwards killed one of the parent-birds. In the beginning of January, 1735, a very large one was shot near Warkworth, which measured, between the points of the wings extended, eleven feet and a quarter. There was another killed, 1761, near Tindal-house, by William Carr, of Etall, Esq; ... It builds in the most retired, inaccessible places, and lays four eggs.

However, detailed analysis of the whole account does not appear to have been attempted before. In particular, the probability of one of the specimens being a white-tailed eagle and the

suggestion of this species in a number of features in the account appears to have been overlooked. The part that appears to refer solely to the golden eagle is considered first.

Wallis clearly indicates an eagle breeding site c1760 which was successful in at least one year with two young raised. However, the birds were clearly suffering persecution with one youngster and one of the parents being shot. The choice of breeding sites in 'the most retired, inaccessible places' seems right for golden eagle but the clutch size of four eggs is very much on the upper limit. The eagle's breeding site is reported as being on the highest and steepest part of Cheviot. Some interpretation is required here as the top of the Cheviot is fairly flat. The most likely actual site is at Bizzle Crags or Hen Hole on the north/north-west side of the Cheviot at 500-600m rather than the summit at 815m. A letter to *The Northumbrian* (1995 no. 30 p. 43) from M. Morrison indicates that the crags above Hen Hole are called Eagle Crags. This is very likely to be the site mentioned by Wallis. At this altitude inland the assumption is that the species involved is the golden eagle which nests in Scotland at up to 990m (Cramp 1977-94 vol. II) or most frequently in the range 900-2000 feet (270-620m) (Baxter and Rintoul 1953). There seems no doubt that in Wallis's time the golden eagle still maintained a firm breeding presence in northern England and southern Scotland (Richardson 1794-97; Macpherson 1892; Bolam 1912). However, from 1780-1830, the golden eagle faced continual harassment at sites in the Lake District (Macpherson 1892) and southern Scotland (Yarrell *et al.* 1871-85 vol. I). The tiny Northumberland population, already under pressure in the 1760s, probably succumbed around the start of this period. The comment by Bolam (1932) that the golden eagle has 'not been resident in Northumberland for more than a century and a half' seems very apt. The reasons for the unsuitability of the Cheviot site for breeding white-tailed eagles and the identification of three other early golden eagle breeding sites are given elsewhere (Rossiter 1993-97 part 10).

White-tailed eagle/Golden eagle *Haliaeetus albicilla/Aquila chrysaetos* F1: Eagle

Wallis's account of the eagle is an assemblage of information on both white-tailed and golden eagles. The eagles which he quotes as being in such plenty in the Orkneys in the 18th century were white-tailed eagles (Booth *et al.* 1984). The iris colour of a greenish flame-colour cannot be assigned definitely to either the golden eagle, described as dark brown to hazel, chestnut, yellow-brown, and red-brown, or the white-tailed eagle described as yellow, yellow-brown and brown-black (Cramp 1977-94 vol. II). The prey described, leverets, would be favoured by the golden eagle and that of 'the finny race' (fish) by the white-tailed eagle.

While Wallis's breeding records refer to the golden eagle, the breeding of white-tailed eagles at a lowland site near Hexham around the year 700 is suggested by an examination of the history of Erneshou, now called St John's Lee (Rossiter 1993-97 parts 10,13). Love (1983 pp. 109-111) considers that the white-tailed eagle was once widespread, if not common, in lowland Britain and Ireland, surviving comfortably until after the Anglo-Saxon period. The Saxons at Lindisfarne in the 7th century did appear to be familiar with eagles which in drawings looked in some respects like white-tailed eagles (Gardner-Medwin 1985).

There is clear evidence that the identification of non-breeding eagles in historical times has been lacking in perspective. The popular notion was that all eagles were golden eagles; so many initial reports, for example in the press, cite an eagle as a golden eagle when proper scientific investigation shows that it was a white-tailed eagle. Bolam (1912 p. 276) undoubtedly realized this as he said 'but where proof was possible most of them have turned out to be Ernes'. However, his classification system of eagle records is not consistent with this view as, while all known white-tailed eagle records are succinctly reported as such, his golden eagle category includes with the few positively identified specimens a number of unassignable records. Nationally also the evidence is that in historical times vagrant eagles have been white-tailed eagles. Bannerman (1956) says 'the reports of *golden eagles* which appear from time to time in the press usually turn out on closer investigation ... to be white-tailed eagles, which are more likely to occur as overseas migrants at rare intervals'. Bolam (1932) quotes one instance of this: 'on December 2nd, 1923, an immature Erne (recorded in the newspapers and elsewhere as a golden eagle) was shot at Newsham, near Blyth, where I have since seen it'.

Authoritative statements on the relative abundance of the two eagles come from Selby (1833):

> The Cinereous Eagle [white-tailed eagle] is more numerous than the preceding species [golden eagle], and is found in all the northern and mountainous maritime districts of Scotland and Ireland ... It is also of a more roving disposition, and has frequently been killed in England.... In Northumberland, the Cinereous Eagle has frequently been seen during the winter months.

Later Selby (1841) reiterated: 'the frequent appearance of this species [white-tailed eagle] in lowland districts, as compared with that of the golden eagle ..., may be attributed to its maritime and coasting habits, the latter affecting the mountainous island districts, from which it rarely strays'.

This lack of perspective in identification called for a re-evaluation of old eagle records in Northumberland. The method adopted and the full results are given elsewhere (Rossiter 1993-97 parts 10,13). The conclusion was that, from 1730-1949, twenty-one confirmed and five probable individual white-tailed eagles were recorded, all between November and March. Twelve of the confirmed and all of the probable records were on or near the coast. Only one of the eleven individuals aged was close to adulthood. Information on historical movements and populations (Love 1983 pp. 74-77) suggests that some of the visitors to Northumberland were from Scotland, particularly when significant numbers bred close to us, but there is likely to have always been a component from the Baltic which continued into the 1920s after the Scottish population had become extinct. Apart from the breeding birds which Wallis noted on Cheviot, only four confirmed and one probable golden eagle were noted in the same period, all in upland areas. Thirteen to fourteen undetermined individuals were recorded inland during 1730-1949, all but one between October and April. The result of the re-evaluation is that the appropriately qualified ratio 16:12, for historical occurrences of white-tailed and golden eagle derived by Galloway and Meek (1978-83) from the classification of Bolam (1912), becomes 21:4 on review according to current criteria.

Included in the above analysis are the records by Wallis of the eagles killed at Warkworth in January 1735 and at Tindal House (near Etal) in 1761. The former is assigned as a probable white-tailed eagle because of the coastal location and the reported massive size; the wingspan is exaggerated, making the record too unreliable for a definite assignment. The 1761 record is considered as undetermined. Records of eagles appear to have been much less frequent in the 18th century than in the 19th but this may simply be due to less effective firearms.

Osprey *Pandion haliaetus*
F2: Bald buzzard, Bastard-eagle

The name bald buzzard is ambiguous, meaning either the osprey or the marsh harrier (Lockwood 1993). It is interesting that Bolam (1912) instinctively took the view that both these species were involved in Wallis's account of the bald buzzard. He included details from this account under both species without any explicit comment on the apparent confusion. Wallis's account includes a description citing Willughby and Ray (1676 p. 37) and the following information pertinent to Northumberland:

> We have the Bald Buzzard, so called from its yellowish-white crown, which at a distance looks like baldness, about the alpine mosses; where it is known to the shepherds and many of the common people, by the name of the Bastard-Eagle ... It lives upon water-fowl; and upon fishes. It breeds annually on the mosses near Greenly-lake, among the tall herbage and *junci*. It lays four eggs, white, of an elliptic shape.

Earlier, in the section on lakes Wallis writes:

> (p. 12) Greenley-Lake, so called from its lying at the foot of a fine green slope, is a mile and a half long, and about a quarter of a mile over in the broadest part, towards the middle. The bottom is of white sand and pebbles; the south-west end adorned with the double white, and the yellow, water-lily; an abundance of reeds and rushes by them cross the lake. That beautiful falcon, the bald buzzard, called by our shepherds, the bastard-eagle, breeds annually on the mosses near it. It is partly in view from the terrace above Crag-Lake. A boat was

formerly kept in it for the pleasures of angling by its late owner, Sir Edward Blacket, of Hexham, Baronet.

(p. 15) these lakes are all well stored with pike and perch, and some of them with dace and roach; the largest perch in Crag-lake.

It appears that both species named above are involved in the full accounts by Wallis, only parts of which are quoted above. The osprey is indicated by the use of its traditional Northumbrian name – the bastard eagle (Heslop 1892), by the names *Halyaetus, Cyanopoda* and blue-legged falcon and by the synonym *Balbusardus* meaning 'bald-buzzard, osprey 1544' according to the *Revised Mediaeval Latin Word-List* of the British Academy. Other features suggesting osprey are the synonym *Falco pedibus ceraque caeruleis* indicating blue legs, the eagle-like appearance and the fish-eating habit. In addition the *Balbusardus* depicted on plate VI of Willughby and Ray (1676), which is cited by Wallis, appears to be an osprey. As discussed below, the marsh harrier is indicated by the remaining features in the accounts including the specific nesting details.

Wallis's statements provide no specific evidence for breeding of the osprey in Northumberland in the 18th century. However, it is known today that ospreys are in general fleeting visitors outside their breeding areas. If the Northumbrian shepherds in the Greenlee Lough area did indeed know this species well, the chances of it being a former breeder in Northumberland are strong. Macpherson (1892) indicates that the osprey probably bred until the end of the 18th century in Cumberland at Ullswater and also in similar habitat to Greenlee Lough at Whinfield Park 'a wild heath or moss. It is situated in a low-lying district, between the waters of the Eamont and the Eden Rivers'. In Northumberland, Maddison (1830) recorded the 'osprey, or sea eagle' at Prestwick Carr but Hancock (1874) reported that, since the draining of Prestwick Carr, it was now only a casual visitant.

Marsh harrier *Circus aeruginosus* F2: Bald buzzard

Evidence for this species in Wallis's bald buzzard account comes from the yellowish crown, the feeding on water fowl, the nest site and the description of the eggs. Indeed there is little doubt that Wallis noted marsh harriers breeding in the Greenlee Lough area c1760.

Other writers confirm that the marsh harrier, often then called the moor buzzard, was formerly a widespread breeder in northern England. In Cumberland Heysham (1794-97) noted it as 'very frequent upon our moors. It lays 4 or 5 eggs, of a dirty white colour, upon the ground, among heath or rushes' and Richardson (1794-97) reported it from Ullswater. However, it had become rare by 1830 and extinct 'some years prior to 1880' (Macpherson 1892). In Northumberland, Wingate (1825) noted it as a 'lively, bold, and active bird, [which] is frequent upon the extensive moors in the western district of the county' while Selby (1831) thought it was 'not uncommon throughout the northern counties, in low and marshy districts' and added that it 'breeds annually at Newham Lough, making its nest ... in the middle of reeds and other aquatic herbage'. Tristram found its nest near Eglingham (Baker 1996) in the 1830s and he is also reported by Evans (1911) as finding it at Kimmer Lough. Interestingly Maddison (1830) did not report it from Prestwick Carr.

Hancock (1874) noted that: 'This fine species, which, a few years ago, was common on our swampy moorlands, where it bred, has now almost disappeared under the policy of the game-preserver, and is fallen, or is fast falling from the rank of a resident, to that of a mere casual visitant'. He reports a nest with four eggs being found a few years earlier near Haydon Bridge. The actual site may have been Grindon Lough. Additional sites mentioned by Bolam (1912) are the North Tyne (before 1860), Alnwick Moor, Coldmartin Moss, the Allendale Moors and Longframlington, the last breeding attempt being noted c1880 at Newmoor Hall.

Kestrel *Falco tinnunculus* F6,9: Kestrel

An accurate description is given of an adult male. Wallis was clearly very familiar with this species as it was found near his home at Tecket in Simonburn parish. The status of 'not unfrequent about alpine hedges and woods, but its most favourite recess is in the solitary ruins of the old castles and towers' applies to some extent today. The kestrel is indeed common on

moorland edges with small plantations but the loss of ruined towers since Wallis's day has reduced the number of nesting sites in this habitat. The earliest mention of the kestrel in Northumberland is in 1544 when Turner said: 'It nests in hollow trees, church walls and lofty towers ... in England at Morpeth' (Gardner-Medwin 1985). The kestrel became the commonest bird of prey, overtaking the sparrowhawk, in the middle of the 19th century when Hancock (1874) claimed it as 'the commonest Falcon in the north of England' but adds 'it is still very generally slaughtered by the gamekeeper'. Up to this time, it would appear that the kestrel could tolerate the level of persecution and this situation appears to have been maintained until the early 20th century when Bolam (1912) mentioned the large numbers found both in vole-plague years and on the south Northumberland moors. Later, however, Bolam (1932) noted it as 'our commonest diurnal bird-of-prey, but always liable to fluctuate in numbers owing to the exigencies of game-preserving'. It is difficult to determine when persecution largely ceased but it is likely to have been around the second world war when gamekeepers' activity declined.

Merlin *Falco columbarius* F8: Merlin

A reasonable description is given of a male with a greyish-blue back and yellowish-white breast. An accurate size comparison is given: 'It is not much larger than a blackbird'. Wallis's description follows closely that of Willughby and Ray (1678 p. 85) including the observation that 'Age, as in all other birds, alters the colours in this; the variegations on the upper part vanishing to a dusky blue'.

Two features of the account indicate possible confusion with other species. It is stated that 'the merlin, is frequent in woods, where it breeds'. It is tempting to accept Wallis's opinion as to the nest sites of the merlin. After all, in many parts of their European range, they do breed naturally in woods and have recently taken to such habitat in the Border Forests. However, it is possible that the sparrowhawk and merlin nest sites have been confused. Selby (1831, 1833), Hancock (1874) and a number of early Scottish sources all indicate that the merlin nested on the ground among heather or stones. This claim of Wallis is therefore not accepted as it stands although, with thickets in upland areas at this time (see, for instance, red-backed shrike), it is possible that some tree-nests occurred.

Wallis also states that it is 'very destructive to the game, at which it flies with most amazing courage and celerity, giving them a mortal wound in the neck, with one instantaneous stroke'. This claim seems very exaggerated and may be due to some confusion with the peregrine falcon. Such ideas, however, took a firm hold in the estates of northern Britain and while Selby (1833) stated: 'in the first-named county [Northumberland], it resorts, during summer, to the extensive and upland moors, where it breeds, and where I have frequently met with its nests', Hancock (1874) reported it was then 'rapidly disappearing by the hand of the gamekeeper'. Persecution may well have started in the mid-19th century as Baxter and Rintoul wrote for Scotland in 1953: 'Though so widely distributed it is not very abundant, having decreased sadly owing to persecution during the last hundred years'.

Other species: the **goshawk** *Accipiter gentilis* is not specifically mentioned by Wallis. Nor is there any suggestion of this species in any of his accounts, which look as if they form a complete record of the birds of prey in the county of which he was aware at the time. It is established that this species bred in Scotland until the late 19th century (Baxter and Rintoul 1953) and it is likely that it did breed in Northumberland when extensive forests survived, perhaps up to the 17th century (Swan 1993 p. 55).

Game Birds and Rails

Game birds and rails are very good indicators of habitat quality as they like rough land which is often damp with plenty of fruit, seeds, buds and insects. Their numbers and distribution are very sensitive to agricultural practices. Game birds, in particular, have also long been of interest to country dwellers for food and the sport of shooting. Their numbers are useful indicators of hunting pressures by both human beings and predators, and also of land management. To understand historical trends in grouse populations, it is necessary to examine

moorland management through the ages in some detail. For red grouse, this is because it is generally thought that population levels are related closely to the distribution and health of heather. For black grouse, it is because they require a diverse moorland edge.

The view that moorlands, in their present form, are a natural feature of our environment is of course false. Wildwood dominated the moors before active farming of such habitat started (Rackham 1986 pp. 68-72). In this study, the moorland of south-west Northumberland is considered as an illustration of historical developments. It should not be assumed that the same historical development applies elsewhere in Northumberland, for example in the Cheviots. A study of place names in Hexhamshire (Sobell 1988), most of which seem to have been established by the 16th century, indicates a very diverse habitat with deciduous woods of many kinds and open areas with moorland shrubs. The early presence of game birds is suggested by names such as Hen Hill, Hen Sike, Henshaw Burn and Growsey Field. The name Whapweasel Burn, meaning curlew-whistle burn, indicates that the curlew *Numenius arquata* L. has long been a prominent inhabitant of this area.

Heather moorland was clearly an important feature of the landscape by the 16th century. Turner in 1551 wrote 'The hyest hethe that ever I saw groweth in northumberland which is so hyghe that a man may hyde hymself in' (Swan 1993 p. 186). A parliamentary act of 1609 indicates concern over the effects of burning the moorland heather (Rackham 1986 pp. 320-1). This act (7 Jas I c.17) forbade 'raysinge of Fires in moorishe Grounds and mountanous Countries' in the north of England between May and September on pain of a month's imprisonment. It was alleged that: 'there happeneth yerelie a greate distruccion of the Broode of Wildfoule and Mooregame, and ... the Aire is soe distempered'. This statute indicates that, even at this early date, game birds were important. The name 'Mooregame' refers to red grouse (Heslop 1892) but 'Wildfoule' is not assignable with certainty, simply meaning wild fowls or birds.

Specific information on the management of the commons around Hexham has been obtained by Anna Rossiter, in a study on the Government of Hexham in the 17th century (Rossiter 1996, 1997), from the Hexham Manor Borough Books (NRO: 672/1/BB 1-47). Two common keepers were appointed to Hexham East Common each year from 1637-39. In October 1644, an order was made that no man shall set fire to any part of the fell commonly called 'moore burne' contrary to the statute upon pain of £3 6s 8d. This statute is the one mentioned above (7 Jas I c.17). In 1663 and 1665, highly significant orders were made showing how the commons were managed in the 17th century. In these orders, one of which is reproduced elsewhere (Rossiter 1993-97 part 15), it was found that diverse abuses had been done in the moors belonging to Hexham in setting moor burns at unseasonable times in the year contrary to the laws of this kingdom and to the great damage and loss of the inhabitants of Hexham by burning heather which was used both for thatching and as a fuel: 'the thatch lynge and the burneing lynge'. Four common keepers were appointed to preserve the commons with powers to allow moor burn only in March and in places approved by the keepers. It is interesting that Hexham had in the 1660s adopted the Scottish system of permitting burns only in March (Muirhead 1889-95 pp. 168-69) rather than the early English system of banning burns from May to September.

It is clear that the moors belonging to Hexham were very far from being unmanaged in the 17th century. The management regime would have given diversity with areas of tall heather used for thatching and burning as a fuel, areas of short heather grazed by livestock and areas that had been subject to moor burn in March left to regenerate. This is ideal habitat for red grouse and indeed many other moorland birds such as merlin, with long heather for nesting purposes and short heather and burnt areas for feeding purposes. The 1665 order on moor burns was renewed at virtually every court up to 1702.

Grazing was tightly controlled on Hexham's commons. Grazing rights belonged to the freeholders and copyholders who were allocated stints, allowing them to graze a certain number of animals on the common. Cottagers had limited rights and foreigners (people from outside the parish) were not allowed any grazing at all. A number of orders in the late 17th century were made to preserve the East Common from being full, that is overgrazed, and to

ensure that drovers crossed the commons quickly. There are grounds for believing that cattle predominated on the commons until at least the early 18th century although in other parts of Northumberland, particularly the Cheviots, sheep predominated as described below. Orders regularly mention horses, cows, cattle and beasts (commonly known as black cattle *alias* the Kyloe ox (Bewick 1790)) through the 17th century and there is little mention of sheep on the commons until 1721-22 when they are itemized in allowances for herdsmen. Further evidence for the growing importance of sheep comes from a petition for a fortnightly fair for cattle and sheep in Hexham presented in 1741 (NCH vol. III p. 268-9). Previous applications had mentioned cattle only.

There are indications from the Hexham Manor Court Books that, from the late 17th century, the commons were becoming overgrazed. An order made regularly from 1686 to at least 1717 noted how, to the disadvantage of the copyholders, the commons and pastures belonging to this town were very much 'overcharged'. In 1719 trespassers (on grazing rights) were a major problem for the common keepers and they were offered monetary rewards for taking such persons. In this later period of the Borough Books, from 1717-28, no orders have been found on moor burns, nor on fire hazards from stacks of heather. It would appear that the demand for heather for thatching purposes had substantially declined.

By Wallis's time (c1760), it appears that, in Northumberland as a whole, sheep were an important component of the uplands economy. Wallis writes (vol. I p. 405): 'The most valuable of all our domestic animals are our sheep. Our mountains and hills are almost covered with them. The largest, with the finest wool, are on the hills of Floddon, and by the rivers Till, and Tweed'. He continues (p. 407): 'Great improvements have been made of late years in the breed of our sheep, by changing the males, sowing grass seeds, &c'. So by the 1760s it appears that sheep predominated in parts of the north of the county and were increasing in importance elsewhere. A factor in this development in upland areas was the production of the hardy black-faced forms, called heath sheep (Bailey and Culley 1805 p. 148), which could withstand cold wet weather.

Another important effect on the landscape was enclosure whereby open commons were subdivided into fields, owned by private individuals and separated by boundaries such as walls and hedges. Common grazing rights were generally extinguished although in some areas stinted pastures were maintained albeit with grazing restricted to private individuals – the stint holders. As an early example, an Act to enclose the West and East Commons of Hexham, whose management is described above, was published in 1747 and enacted in 1753 (NRO: ZG1 XXXII/1,2). Bailey and Culley (1805) show on a map the remaining 'heathy mountains' in 1794 and Lunn (Swan 1993 p. 26) indicates the uncultivated areas in 1976. These areas represent about 45% and 40% of the county respectively. Studies of enclosure awards in the 18th century suggest about 50% of the county was upland moorland around 1750 (Rossiter 1993-97 part 15) when Wallis lived at Simonburn. The major change in the uplands since 1800 has been the conversion of open moorland to coniferous forest (Swan 1993 pp. 55-56). This move had been forecast by Bailey aand Culley (1805 p. 127): 'There are also many excellent situations for planting; and of all other purposes to which such [waste] lands are convertible, this ... improvement seems to us the most promising to make the greatest returns'. Small-scale plantations soon became a feature of enclosed land as stock could be excluded. However, it was not until 1926 that a substantial planting programme began (Swan *ibid*).

Habitat is not the only factor that affects game bird populations. Other techniques for improving them include better control of hunting pressure through the introduction of a close season and the employment of gamekeepers to discourage poachers and eliminate predators. Game wardens had been appointed on a limited scale in the 17th century. For instance in 1691, the order of former courts touching the preservation of game within the manor of Hexham was renewed and four game wardens appointed (NRO: 672/1/BB 1-47). However, their profile seems to have been a low one and over the next 150 years strenuous efforts were made to increase their effectiveness. The 1671 Game Law made all game the sole preserve of qualified sportsmen, no matter where it was located: poachers therefore could be farmers, on whose land the game lived, as well as peasants (Munsche 1981 p. 13). The Game Association, formed in 1752 (*ibid* pp. 109-111) by a group of noblemen and gentlemen, increased pressure on all

classes of poachers by offering rewards for informers. Poaching seems to have continued as a threat for a number of years, in spite of draconian penalties such as transportation for night-time raids. However, when discussing quadrupeds, Wallis (pp. 410-411) also indicates another cause of their decline in the mid-18th century, namely that qualified sportsmen placed no realistic limitations on their bags of grouse:

> Hares with us have been as plentiful as in most counties, but they are like to be as scarce as the admired birds of our heaths and mountains, the Gor [red grouse] and Grey [black grouse]; unless our young sportsmen would have more regard to their preservation, and their own pleasure, and not hunt them down annually, like wolves and bears, to be extirpated without mercy. The consideration of their own healths, promoted by the exercise of the chace, should prevail with them, methinks, prudently to save, and not in a precipitate fury of desire destroy an useful and innocent race of beings, intended by providence to give us both food and pleasure, and some part of our ornamental and necessary cloathing, for the pitiful and brutal ambition only of boasting among their companions of their killing their twenty, their thirty, and their forty brace, in a season. Savage and inhuman butchery! Away with it from Northumberland. Let posterity enjoy the same blessings, so contributive to health, as our forefathers have done, with moderation.

In the mid-18th century, the effects of excessive hunting pressure on grouse stocks by those entitled to hunt legally were recognized nationally, resulting in two acts in 1762-73 (Munsche 1981 pp. 41, 174) establishing for the first time close seasons in which certain game could not be taken. For instance the close seasons for black game and red grouse were 10 December-20 August and 10 December-12 August respectively from 1773. However, grouse populations in the 1770s and 1780s were still at a low ebb. For instance, in the Tunstall MS (Fox 1827), it is stated that '[numbers shot] are now miserably fallen off ... and in the same state are most of the moors in the North'. Possible reasons for the decline were given as 'great improvements of late years in the art of shooting flying [birds]; moors and commons taken up; the hurt sustained by burning the ling ... commonly done by stealth in the night ... when once fired will reach miles ...; lastly, the facility of carrying them to London' (*ibid*). The decline therefore appeared to be due to improvements in guns, high grazing pressures on commons, excessive burning of the heather and a ready market for the dead grouse.

By the 1790s game preservation was performed very systematically (*ibid* p. 44) with the elimination of predators (see Birds of Prey), a reduction in overgrazing and strenuous attempts to combat poachers. As will be seen in the subsequent accounts, the effects of systematic game preservation were dramatic. Red and black grouse populations, which were at a relatively low level in the mid-18th century, responded quickly to controls over the shooting season and poachers and the elimination of predators. However, the black grouse population appeared to take longer to recover than that of the red grouse and may eventually have been greatly assisted by enclosure which encouraged afforestation in upland areas. The populations of pheasant and grey partridge (see Appendix 1) also appeared to rise sharply around the end of the 18th century. Only the quail appeared to suffer a decline, perhaps due to loss of rough grassland and excessive shooting bags.

Red grouse *Lagopus lagopus* — F23: Gor-cock, Heath-cock, Gor, Moor-cock, Moor-hen, Moor-pouts, Red-game, Gor-fowl

Wallis's account of the gor-cock clearly refers to the red grouse. The names used correspond well to those given by Heslop (1892) for the red grouse in Northumberland of gorcock, moor-cock, moor-game, muir-fowl and moorhen. The description includes the lack of a fork in the tail and highlights the distinctive features of the male: a small white area around the lower mandible, the relatively plain coloration of the neck and larger scarlet eye-brows. However, the relatively more rufous ground colour of the male is not brought out, both sexes being indicated as having a yellowish-red ground colour. In his synonymy Wallis cites incorrectly the account by Willughby and Ray (1676 p.126) of the hazel hen *Gallina corylorum* which appears to refer to the hazel grouse *Bonasa bonasia* L. rather than that for the red game *Lagopus altera plinii* (*ibid* p. 128) which appears to refer to the red grouse. The same error is found in his references to Ray (1713 p.55) and Linnaeus (1746). However, obvious

characteristics of hazel hen like a black throat in the male are missing from Wallis's description which notes a 'deep unmixed yellowish-red on the throat'.

The early presence of grouse in Northumberland is indicated by the results of excavations. Remains of indeterminate grouse species (either red or black) were found at Newcastle Quayside in a layer dating from the 14th century (Gidney 1989), and at Black Friars, Newcastle from the 17th-18th centuries (Rackham 1987). Remains of red grouse specifically were discovered in the excavation of the Castle at Newcastle where the bones of three individuals were found in layers dating from the 17th century (Rackham 1983). Other evidence includes place names in upland areas and the statute on moor burns as described above.

However, grouse populations appear to have been at a low ebb in the mid-18th century when Wallis (quoted above) noted that hares 'are like to be as scarce as the admired birds of our heaths and mountains, the Gor and Grey'. The pressures by sportsmen on red grouse may have been less severe than those on black grouse because of their lack of conspicuous leks and their ability to thrive in open elevated commons and wastes, further away from human activities. Wallis confirms that 'The Gor-Cock ... is more frequent than the former [black cock] in mountainous places'. The loss of scrub resulting from the increased grazing by sheep through the 18th century will not have affected red grouse which can survive well without any tree cover. However, the excessive moor burning and the increased grazing pressure would have reduced the quantity and quality of the heather upon which this species depends. As stated earlier, a close season was introduced for red grouse from 1762. The Tunstall MS shows no recovery for the red grouse in the 1770s and 1780s: '[it] has been much diminished these late years' (Fox 1827).

The red grouse population appears to have recovered well by the 1790s when game preservation had became much more systematic. Using Cumberland as a guide at this time, we find red grouse 'in great plenty' at Bewcastle (Hutchinson 1794-97), 'in great abundance on the moors and hills adjacent' in the Ullswater area (Richardson 1794-97), and 'plentiful on most of our heaths and mountains' (Heysham 1794-97). This status appeared to be ubiquitous by the early 19th century when Selby (1833) described the red grouse as 'plentiful in the elevated heathy parts of the northern counties of England' and Wingate (1825) noted that the 'moors about Wallington, Elsdon, &c. abound with those valuable and beautiful birds'.

Black grouse *Tetrao tetrix* F22,23: Black-cock, Black-game, Grey, Grey-game

In his account of this species, Wallis describes both the male and the female. The wingspan quoted of 33 inches (84cm) is just above the range quoted by Jonsson (1992) of 65-80cm and the weight of 44 ounces (1260g) is within the range of 1220-1320g quoted for black cocks in autumn (Cramp 1977-94 vol. II). The descriptions of both sexes are accurate although it could perhaps have been pointed out that the female has smaller scarlet eye-brows and less white in the wing than the male. The description of the cock was from a specimen killed on 5 August 1756. Wallis provides distribution details as follows:

> The Black-Cock is a native of our alpine wastes and forests.... These admired birds were formerly very frequent on our alpine commons among the *ericae*, but the eager pursuit of sportsmen after them, and the burning of the *ericae*, which afforded them both food and shelter, has made them take refuge on the most remote and solitary heaths and mountains, and even there they are become so extremely scarce, that he is reckoned very fortunate who in a whole week's search meets with a brood. They are now as rare at the better tables, as they used to be abundant. It is the opinion of many of our alpine people, that more are destroyed in the spring, when hymenaeal joy makes them fearless, than at any other time, by insidious and vigilant poachers.

It is therefore indicated that the black grouse had formerly been very frequent on upland commons. There are some early records for black grouse in the county. In excavations at Newcastle, black grouse bones have been found at the Castle Ditch, in layers dating from late 14th-late 15th and mid-16th centuries (Rackham and Allison 1981), and at the Castle itself from a 17th century layer (Rackham 1983). Such birds were presumably caught in the surrounding countryside. Wallis's accounts above of the black grouse and hare clearly confirm

the reduction in range and numbers of black grouse by the 1760s and attribute it to poaching at the leks, excessive shooting pressure and the burning of the *ericae*. He did not mention the effect of the increased numbers of sheep.

The introduction of the close season for shooting and energetic attempts to restrain poachers removed two adverse factors. However, the Tunstall MS show that in the 1770s and 1780s, the decline had not been reversed: 'Grown very scarce all over the North of England' although it is noted: 'I believe Northumberland has the most' (Fox 1827). Indeed if Cumberland is considered as a guide, little recovery in numbers had taken place by the 1790s, when Heysham (1794-97) noted 'the black cock is, at present, but a rare bird in Cumberland' and Hutchinson (1794-97) quoted 'Black game: rare' for Bewcastle. In Berwickshire, Muirhead (1889-95) considered that black grouse were scarce before the early years of the 19th century. It was not until the early 19th century that a remarkable improvement in the black grouse population occurred, reported by Selby (1833):

> In Northumberland it is very abundant, and has been rapidly increasing for some years past, which may be partly attributed to the numerous plantations, that, within that period, have acquired considerable growth in the higher parts of the county, as supplying it both with food and protection.

A recovery at this time was also reported by Charlton (1860-62) who noted that they had only been abundant in the North Tyne 'within the last forty years'. Enclosure of many upland areas was clearly of great benefit to the black grouse, enabling trees to be planted and providing many fields at high altitude of marginal agricultural value. Bailey and Culley (1805 p. 125) confirm this: 'Plantations, on an extensive scale, are rising in every part of the county; and are almost in every instance doing well'.

Quail *Coturnix coturnix* F29,24: Quail

At the end of his corncrake account, Wallis briefly mentions this species: 'The quail is fourteen inches between the tips of the wings extended. The rail [corncrake] and it, on the approach of winter, leave us for a milder climate'. The wingspan of 14 inches (36cm) is just above the upper limit given by Jonsson (1992) of 32-35cm for this species. Bolam (1912) thought that Wallis's account showed he was fairly familiar with the quail in Northumberland. Indeed, Wallis does use the colour of the quail for comparative purposes in his description of the female pheasant. Large annual fluctuations in quail numbers make it difficult to determine long-term trends but many writers think it was relatively abundant in the 18th and early 19th centuries. Selby in his *Illustrations* (1833) said 'but they now visit us in much fewer numbers than they formerly did' and in his *Catalogue* (1831) noted that 'the quail is now a bird of rather rare occurrence in the northern counties, and few bevies are now seen, even upon grounds where formerly they used to be abundant'. Bolam (1912) thought that the *Old Statistical Books* for Scotland in the 1790s showed it was relatively plentiful then in the Borders. Holloway (1996) attributes the decline in the 19th century to loss of rough grassland and over-zealous shooting of the species both in Britain and in the Mediterranean area.

Baxter and Rintoul (1953) emphasise how seasonal patterns have changed: 'The most remarkable thing about the quail in Britain is its change of status. From being a not uncommon resident it not only decreased in numbers but became much more migratory and is now a scarce summer visitor, very irregular in its visits to some parts'. The climate of Northumberland is perhaps too harsh for the quail to have ever been common in winter, as it was in western areas such as Ireland (Yarrell *et al.* 1871-85 vol. III). Wallis indicates that they 'leave us for a milder climate' and Selby (1831) does not mention any winter records. However, Wingate (1825) noted one shot at Gosforth on 23 January 1821 and Bolam (1912) records eight individuals in November-February from 1871-95 in Northumberland. Bolam concluded 'it has, therefore, perhaps some claim to be included as a resident'. For Cumberland, Macpherson (1892) also records four wintering individuals in November and December from 1618-1885. It appears that in Northumberland the quail may have been a partial resident in historical times on a very small-scale.

Pheasant *Phasianus colchicus* F24: Pheasant

The description of a male includes the statement: 'The crown and neck are of a changeable glossy green, deeper on the latter, the sides of which have a purple glow'. This would indicate that the form found in Wallis's time was not the ring-necked *torquatus* but the nominate *colchicus*. The comment that 'the rest of the upper plumage is of a glossy black or purple', however, does not match any obvious form although melanistic individuals do occur. Selby (1831) noted that 'in Northumberland, the ring-necked variety is now the prevailing breed'. Yarrell *et al.* (1871-85vol. III) confirm this: 'Up to the end of the last century our Pheasant had departed but little, if indeed at all, from the typical *P. colchicus* but about that time the introduction of the Chinese Ring-necked bird *P. torquatus* commenced'. Bolam (1932) reported that the original race, in which the cock lacks the white ring round his neck, has been so much crossed as to have almost disappeared. The female is described accurately by Wallis as 'nearly of the colour of a quail'.

Its status is quoted as 'less frequent than formerly; owing perhaps as much to the destruction of our woods, which gave it both food and shelter, as to the unwearied pains taken by sportsmen to bring it to the table'. This confirms the excessive hunting pressures on gamebirds around the 1760s mentioned above for the red and black grouse. It also reveals a serious loss of woodland, presumably in the lowlands where this species is mainly found. Selby (1833) reported a strong recovery: 'It would appear, indeed, that the northern parts of the kingdom are particularly suited to them, as they are making considerable progression, and have, within a comparatively short period of time, spread themselves over the whole county of Northumberland'.

Corncrake *Crex crex* F29: Land-rail, Corn-crake, Daker-hen, Crake crake

The land-rail of Wallis is clearly this species. The wing span at 19 inches (48cm) is in the middle of the range given by Jonsson (1992) of 46-53cm and the plumage is described accurately, particularly the wings and throat. The livid colour of the beak and legs indicates a juvenile. The earliest account of the corncrake in Northumberland is that by Turner of the daker hen in 1544 (Gardner-Medwin 1985). Wallis indicates that in the 1760s the corncrake was 'frequent in our vale-meadows ... and of the quail-species, reputed their leader and guide in their migratory expeditions'. Yarrell *et al.* (1871-85 vol. III) agreed that in Britain its habitat included the long grass of meadows near rivers but Chapman (1889b p. 77) also suggests some use of rougher ground in Northumberland with their presence in 'rough grass on the fell edges till the middle of September or later'. The decline of the corncrake appeared to start in Northumberland in earnest after 1917 (Bolam 1932), probably associated with increased mechanisation of hay production and more intensive sheep farming.

Other species: no evidence has been found in the present research for the presence of the **capercaillie** *Tetrao urogallus* in early times in Northumberland. However, the evidence for the species being found earlier to the south has been strengthened by the discovery of six fragments of this species in an excavation of three Saxo-Norman tenements in Durham City dating from the late 10th to the early 13th centuries (Rackham 1979). Taken with other archaeological evidence relating to prehistoric times from Upper Teesdale and the mention of one *gallus de bosco* (cock of the wood) in Durham monastic records from the 14th century (Temperley 1951a), it is difficult to disagree with Bolam (1912) who thought the 'Forest of Chevyot' would have held this species when it was a great waste. However, the Durham evidence suggests that the North Pennines, which include south-west Northumberland, may have provided equally suitable habitat when they were covered by wildwood.

Waders

While both birds of prey and game birds are covered fairly comprehensively by Wallis, the waders are given much more cursory treatment, perhaps because Wallis lived a long way from the coast. There are indeed four accounts referring to this group but it appears that only two species are involved, one of which is the golden plover, a valuable indicator of the state of

upland habitats. Wallis's accounts indicate that both the dotterel and the golden plover appeared to thrive before the advent of systematic game preservation.

Dotterel *Charadrius morinellus* F28: Dotterel

An adult, in breeding plumage with a yellowish-red breast, is described that was shot on the common between Presfen and Carham 'near a large morass, much frequented by fen-birds'. The status is given as 'a migratory bird, exceedingly coveted by sportsmen for the table, ... an annual visitant in the spring, about the middle of April'. It appears to have been particularly well-known around the Tweed where the specimen mentioned above was taken: 'Most of the commons on Tweed-side have its company, particularly those of Carham and Heton'. In Scotland the dotterel was a common migrant in the Borders judging by accounts written in 1684 through to the 1790s but it had declined through persecution by the 1840s (Baxter and Rintoul 1953). Wallis's comments extend the dotterel's period of relative abundance as a spring migrant in Northumberland back to c1760 from the early 19th century when Selby (1831, 1833) reported that considerable flocks occurred annually in certain haunts near the coast of Northumberland in the month of May, with Scremerston being particularly favoured. The period of abundance ended c1870 when Bolam (1912) reported that 'its numbers have much diminished, while in many of its old haunts it is no longer known'. Its decline is attributed to persecution, particularly for its feathers which were used in fly-fishing (Holloway 1996).

No indication of breeding is given by Wallis. Certainly the dotterel bred in small numbers in the 1840s in the Pennines around Cross Fell (Macpherson 1892) and Hancock (NEWHM: H.326 p. 21) reported the receipt in 1849 of thirteen eggs of the dotterel collected in the last three or four years by a Mr Cowper of Alston from 'the Hills in Cumberland'. However, there is no indication that it did breed in Northumberland in historical times other than the statement from Bolam (1932) that it 'formerly nested on our hills and yet continues to do so, *longo intervallo*'.

Golden plover *Pluvialis apricaria*
F26: Whistling plover; F27: Green migratory plover,
F25: Grey plover, Stone-plover

No fewer than three of Wallis's accounts appear to refer to this species. Account no. 26 is obviously this species in breeding plumage:

> The small black-breasted Whistling Plover is in considerable plenty on the wastes towards Cumberland. In the breeding season it deludes the boys in searching for its nest by running before them, and then taking short broken flights, alternately, till it has allured them to a great distance, when on a sudden it flies out of the reach of their observation.

Lockwood (1993) equates whistling plover with both golden plover and grey plover *Pluvialis squatarola* L. but the latter can be discounted on habitat preferences. The description of the behaviour will strike a chord with anybody who has tried to search for the nests and young of this species. It is tempting to consider that account no. 27 for the green migratory plover refers to the lapwing *Vanellus vanellus* L. as green plover is a name that has been used for it in Northumberland (Heslop 1892). The full account is:

> The green migratory Plover is frequent on mountainous heaths. It comes in the spring, and leaves us at the end of autumn. It is of the size of a pigeon. The beak is an inch long, black, furrowed at the nostrils, strong and obtuse at the points. The neck is short, and the body slender. The ground-colour of the breast and of the upper plumage is black, variegated with yellowish-green spots. The belly is white. The legs are black, long, slender, and naked for a small space above the knees. It wants the back toe.

However, the description indicates golden plover in breeding plumage rather than lapwing: no crest is mentioned, the habitat is not lapwings' first choice and the leg description fits golden plover which has greenish-grey to greyish-black legs with no hind toe and a bare area on the lower tibia (Cramp 1977-94 vol. III). Further, Lockwood (1993) says that green plover was an early name for golden plover, last used by Pennant in 1768, and Charleton (1668 p. 109)

considered that green plover and whistling plover were synonymous. Account no. 25 might be thought to refer to the grey plover:

> The Grey Plover, or Stone-Plover, is frequent on our alpine heaths, above mosses; feeding, gregatim, in August, on the fruits of heath and moss-plants, small beetles and other insects. It is of the size of a pigeon. The head and eyes are small, the iris of a hazel colour. The beak is black, strong at the base, and obtuse at the extremity; the mouth large. The head and neck are of a greenish-grey, shaded with brown, and variegated with numerous black spots. The rest of the upper plumage is of a dark brown, tipped with a greenish-grey, with some white on the edges of the sail-feathers. The breast, belly, tail, and rump, are white. The tail is about three inches long, and variegated with transverse bars of black and white. The legs are of a greenish-grey, with transverse incissures or indentings; the claws black, small, and obtuse.

Indeed, much of the wording is taken from the decription by Linnaeus (1746) of *Tringa nigro-fusca subtus alba* (the grey plover). Again, though, close examination shows that the description with green components in the legs and on the plumage strongly point to golden plover in post-breeding plumage rather than grey plover as claimed. Wallis's treatment of golden plover was not unusual for the 18th century. Selby (1833) gave grey plover as a synonym for golden plover and noted that the differences in breeding and non-breeding plumages of the golden plover had led them to be described as distinct species. The traditional name for the golden plover in Northumberland was the yellow plover (Heslop 1892).

Wallis indicates that the golden plover was a common breeder in upland areas before the development of systematic game preservation. Indeed the flocks of this species which now vacate moorland areas in mid-July seem then to have had longer stays on the moors into August or late autumn than they do today. It is also interesting that, as today, the golden plover occupied some of the most inhospitable habitat in the county, nesting in the wastes towards Cumberland. Thomas Kitchin's map of Northumberland c1750 shows large parts of the area between the Rede, Irthing and Roman Wall as wastes, labelled for example 'Mountainous and Desert Parts Uninhabited' and 'The Wasts' including Chirden, High Humbleton, Whitside, Flights Fell, Butterhaugh and Christianbury Cragg. These will have been the waste areas towards Cumberland occupied by the golden plover c1760. The mountainous and alpine heaths of Wallis, well-occupied from spring to late autumn, presumably included a wider range of moors such as the Cheviots and the North Pennines. The post-breeding flocks appear to have been numerous indicating a healthy county population. Selby (1833), in noting that in spring they 'begin to separate into smaller parties, and retire to the uncultivated grounds of the northern counties of England', shows that they continued to breed on the Northumberland moors in the early 19th century. Hancock (1874) reported it as 'common in both counties, breeding on the upland fells' and, like Wallis, noted large post-breeding flocks.

Woodcock *Scolopax rusticola* Woodcock

After the main entries in his *Fissipedes* section, Wallis says (vol. I p. 337): 'I might name some other migratory *Fissipedes*, as the Woodcock, &c. but as they are common, I pass on to the *Palmipedes*'. This suggests that this species was then a common winter visitor to Northumberland. Archaeological excavations in Newcastle indicate that the woodcock has been a common visitor for a long time. The finds include the remains of one at the Mansion House from the 13th-14th century (Davis and Bullock 1995), of three at Castle Ditch from the 16th century (Rackham and Allison 1981), of two at the Castle itself from the 17th century (Rackham 1983) and of one at the Black Friars from the 17th-18th centuries (Rackham 1987). Richardson (1842 p. 190) reports what appears to be the first known breeding record of the species in the county: '1770. A young Woodcock was taken in a nest near Prestwick Carr, and was shewn at Newcastle as a great curiosity. The old ones were seen, but escaped'. Wingate (1825) reports that a nest was 'lately found near Whitfield Hall'.

Non-passerines: landbirds

This section includes species in the order of Voous (1977) from the pigeons through to the woodpeckers. These species are fairly comprehensively covered, perhaps because of their

striking plumages and habits. The nightjar account is particularly interesting from a moorland management perspective as it indicates the presence of considerable scrub in the uplands in Wallis's time.

A significant finding from the study of the woodpeckers in this section is the major fluctuations in their populations due to changes in timber management in the 18th and 19th centuries. The loss of woodland is indicated by Wallis's woodpecker accounts which report on the felling of timber at Dilston Park and by his pheasant account which reports losses of the vale woods. In addition Bewick (1975 pp. 22-23) noted c1765 that 'the country between Wylam and Bywell was beautified with a great deal of wood [with very large oak and ash trees], which presented the appearance of a continued forest – but these are long since stubbed up'. The bare nature of Northumberland around Wallis's time is supported by Hutchinson (1778 p. 451) who thought that 'for so large a tract of land, there are few considerable woods of timber trees'.

As discussed earlier (see game birds and rails), it would appear that many of the old deciduous woods and some of the recently enclosed commons were eventually replanted with conifers and other species in the late-18th and early-19th centuries (Bailey and Culley 1805 pp. 124-5). These were intensively managed supplying the rapidly expanding coal, railway and lead industries of north-east England with timber such as pit-props and sleepers. They were felled at a young age giving a dearth of mature timber in the county. Bailey and Culley *(ibid)* provide contemporary evidence: 'The demand by the collieries and lead mines for small wood, has induced the proprietors ... to cut them at an early age. From twenty-five to thirty years growth is the general term for oak, elm, and ash; but birch, willow, and aller [alder] are cut sooner; and hazle [hazel] for corf-rods [wicker-work baskets] once in three or four years'. Tolan-Smith (1997), who studied the history of Horsley Wood, supports Bailey and Culley's analysis. She found that the enormous demands of the coal industry for timber caused initially the large-scale destruction of ancient woodland but in the long term it preserved wooded areas because of the continuing need for timber. It appears that the populations of green and great spotted woodpeckers and wryneck all declined rapidly in Northumberland from the 1830s to around 1870 due to this shortage of mature timber. 'The resulting scarcity of such striking species is likely to have attracted collectors who further reduced their numbers' (Holloway 1996).

Long-eared owl *Asio otus* F11: Lesser horned owl

The only owl described by Wallis is this species with a description of a specimen shot at Ashington. Although the colour of the iris of 'a beautiful yellow' could also apply to the short-eared owl *Asio flammeus* Pontoppidan, the red colour of the interior feathers on the face, the one-inch (2.5cm) long ear tufts, the synonymy including *capite aurita* (head with long ears) and the woodland habitat all indicate long-eared owl. More exotic species can be excluded through the dimensions as Wallis's wing-span of three feet (91cm) is in the middle of the range of 84-95cm given by Jonsson (1992) for long-eared owl. The status of this owl was given as 'a native of our woods, and solitary desert places' indicating that in the 1760s it was a resident breeding species in Northumberland.

Wallis's statement that it 'has been supposed not to be an English native till of late years' probably reflects the difficulty in detecting this species by casual observation. Certainly in Scotland it had been recorded as long ago as 1684 by Sibbald and the late 18th century by Pennant (Baxter and Rintoul 1953). Examination of traditional bird names in Northumberland confirms the low profile of the species. Heslop (1892) does not mention it and Bolam (1912) considered that the name horny hoolet had only recently been developed for the long-eared owl to separate it from hoolet, a general term for owls. There is therefore no convincing evidence that the long-eared owl was ever established in the minds of country people as a traditional inhabitant of the county but Wallis's account indicates its presence. Selby (1831) reported it as 'a common species, and very generally dispersed in all wooded districts'.

Nightjar *Caprimulgus europaeus* F12: Churn owl, Goatsucker

The account of the churn owl or goatsucker undoubtedly refers to the nightjar which has traditional names in Northumberland of goatsucker, fern-owl and night-hawk (Heslop 1892). Two 'young ones' shot in Redesdale were sent to Wallis by 'Christopher Reed, of Chipchace,

Esq;' one of which is described in detail. This was clearly not a male as there was apparently no white on the tail. However, there is nothing to suggest that it was not an adult female as opposed to a juvenile as the wings and underparts on the specimen appear to be well-marked (Cramp 1977-94 vol. IV). The Christopher Reed mentioned above was born as Christopher Soulsby, succeeded to Chipchase Castle in 1754 and died in 1770 (NCH vol. IV(2) p. 347), shortly after Wallis completed his work in 1769, so the record is dated 1754-69.

The status of the nightjar is given by Wallis as 'frequently observed and shot on our wastes and forests where it breeds'. Its nest was 'frequently found in thickets, and among brushwood'. The conclusion is that c1760 the habitat of thickets and brushwood, which would be called scrub today, was still readily available on wastes or commons and the nightjar had a thriving population in Northumberland. The nightjar was also formerly numerous in Scotland and Baxter and Rintoul (1953) stated that there were many records of the nightjar in former times as far back as Sibbald's *List of Scottish Birds* in 1684, through Pennant c1790 to Gray c1870 who said it is a 'common bird in almost every Scottish county'. The nightjar maintained a healthy population in Northumberland through the 19th century when Wingate (1825) noted that this 'curious bird of passage ... visits different parts of Northumberland', Selby (1831) recorded it as 'not uncommon in retired woody dells, moors, and commons, abounding in fern beds' and Chapman (1889b p. 76) found that they 'still skulk in the heaviest brackens or long shaggy heather, especially among rocks ... they are common enough'. Some decline then seems to have set in around the end of the 19th century; Bolam (1912) wrote it 'occurs sparingly throughout the district' and (1932) was 'not very numerous'.

Some of the persistent decline in Northumberland was probably due to persecution even though the species was not explicitly regarded as harmful to game interests. A number were shot as indicated above by Wallis and others were caught on pole traps (Bolam 1912). Macpherson (1892) considered in 'Lakeland' that the night hawk 'would be a good deal commoner if spared by keepers'. However, loss of thickets and brushwood was also probably a major cause of decline.

Kingfisher *Alcedo atthis* F18: Alcyon, King's-fisher

A detailed and accurate description is given of this species which was described as 'not unfrequent on the shady banks of our larger rivers' and, later in the account, in more detail: 'We have it frequently on the banks of the rivers of North and South Tyne, where it burroughs, usually about half a yard under the surface of the earth, and lives upon small fishes. The banks of our other large and shady trout-streams also have its company'. Selby (1831), in reporting a similar status, noted it as common at Mitford and Angerton and not infrequent on the Ouse Burn. Hancock (1874) also found its status unchanged, reporting it as 'not uncommon'.

Hoopoe *Upupa epops* F36: Hoopoe

A satisfactory description is given, based on that by Willughby and Ray (1676 p.100), of a bird shot in 'the latter end of September' on the sea-banks near Chibburn and presented to Wallis, presumably in a year between 1745 when he returned to Northumberland and the year of his book, 1769. Wallis regarded the hoopoe as 'a curious and uncommon bird, [which] comes to us in the spring, and leaves us in September'. Indeed he describes its breeding habits, using the account of Linnaeus (1761 p.37), and cites as evidence that 'Mr. Ray refers us to Northumberland and Surrey for it'. However, there is no supporting evidence from other writers and Selby (1831) describes it as a rare and occasional visitant.

Green woodpecker *Picus viridis* F15: Green woodpecker; F17: Pick-a-trees, Rain-fowl

This species is described accurately, in considerable detail. It was reported that it 'has been observed in some of our vale-woods, but is not common. It was frequent in Dilston-park before the wood was cut down'. The last part of the account of the lesser spotted woodpecker, dealing with the habits of woodpeckers in general, also appears to refer mainly to this species, mentioning pick-a-trees, a Northumbrian name for the green woodpecker (Heslop 1892) and rain-fowl, a more widespread term for this species (Lockwood 1993). Selby (1831) reported a similar status to Wallis, finding it near Alnwick and on the Wansbeck. Temperley (1951b),

however, in a study of historical trends in this species, found a decline starting c1840 attributed to the 'scarcity of decaying trees and the persecution which every bird considered somewhat rare encounters at the present day'. Yarrell *et al.* (1871-85 vol. II) also found that an important cause of the decline in the national range of this species was through 'removing trees that have attained their full growth, without suffering them to decay'.

Great spotted woodpecker *Dendrocopos major* F16: Great spotted woodpecker

A detailed and accurate description, following closely that of Willughby and Ray (1676 p.94), is given of one shot in 'Countess's wood upon North Tyne' and presented to Wallis. This appears to have been a male as Wallis notes that 'the chaps [are] streaked with white, met on each side by a transverse crimson-line from the neck in the male, but not in its mate'. This species was reported as 'a native of the same woods', indicating a similar range to that of the previous species considered by Wallis – the green woodpecker. Selby (1831) thought that this species was more frequent in Northumberland than the green woodpecker and Wallis's comment above that the green woodpecker 'is not common' perhaps indicated a similar situation in the 18th century. However, Hancock (1874), while agreeing that the great spotted appeared to be commoner than the green woodpecker, noted the former almost exclusively as an autumn and winter visitor and could only cite one breeding record. Like other birds favouring mature timber, this species appeared to suffer a substantial decline in the 19th century.

Lesser spotted woodpecker *Dendrocopos minor* F17: Lesser spotted woodpecker

From the description of a woodpecker shot in Dilston-park, near Hexham, Wallis claims that the lesser spotted woodpecker 'has been observed and shot in woods with the former'. The preceding account is of the great spotted woodpecker and Wallis continues with a description comparing these two pied woodpeckers. He claims that, compared to the great spotted, the lesser spotted woodpecker 'is like it in shape, but considerably less; in the same rich plumage; the head and rump of the male of a splendid crimson, a peculiarity which the females of both are without, being only distinguished with white'. While the size difference is recognised, the plumage comparison is not accurate. The lesser spotted woodpecker does not have the same rich plumage as the great spotted woodpecker, being a duller bird, particularly the female. Wallis's account follows closely that of Willughby and Ray (1678 p.138) but he appears to have misunderstood their statement: 'This [lesser spotted woodpecker] is for shape and colour like the last described [great spotted woodpecker], but much less'. This statement was presumably intended to indicate that both woodpeckers were pied rather than sharing the same plumage exactly. Further, Wallis's citation to Linnaeus (1746 no. 82) refers to the middle spotted woodpecker *Dendrocopos medius* L. It is therefore difficult to accept this record, as size comparisons on their own are often unsatisfactory guides to identification. Bolam (1912) did include this record as one of four fully authenticated occurrences but later (1932) he justifiably discounted it. The end of the lesser spotted woodpecker account deals with names and habits normally ascribed to the green woodpecker. To add to the three remaining historical records, Macpherson (1892) reports that 'Blackett Greenwell obtained a specimen near Alston, but on the Northumberland side'. This record is not dated but the collector was active c1850.

Other species: although the woodpecker family is covered by Wallis, there is no mention of the **wryneck** *Jynx torquilla.* The evidence for the wryneck being a former regular visitor to Northumberland comes from two writers in the early 19th century. Selby in his *Catalogue* (1831) notes it 'is found in Northumberland, as far north as the woods upon the banks of the Wansbeck' and in his *Illustrations* (1833) that he 'has traced it as far as Morpeth in Northumberland, where a few are seen every year'. Wingate (1825) reports it as 'a most elegant and beautiful bird of passage ... It inhabits decayed trees'. This does seem compelling evidence for extending the former breeding range of this species, given by Holloway (1996), into south Northumberland from Durham and Cumberland. Hancock (1874) reports that the wryneck is 'far from common in Northumberland' and does not cite any breeding records but describes it as a 'spring-and-autumn migrant'. It should be emphasised that the status given by earlier writers of *bird of passage* or *spring-and-autumn migrant* has been misunderstood by some

later writers. For instance Hancock (1874 p. xxiii) defines a spring-and-autumn migrant as a species that 'arrives in spring, breeds in the district, and departs in autumn. Of this, the Swallow is a type'. This is a very different meaning from passage migrant which is the obvious modern interpretation. However, it does appear that the wryneck had declined almost to the point of extinction through the mid-19th century.

Passerines

With his concentration on the larger birds, it is not surprising that few passerines were described by Wallis. Indeed only eleven accounts are given of this large group. The shrike descriptions are of particular interest because they indicate that the red-backed shrike formerly bred in the uplands in thickets. Enclosure of the uplands and other areas enabled many plantations, often coniferous, to be established from the end of the 18th century and numbers of the siskin and common crossbill appeared to increase rapidly in the early 19th century. Goldcrest and coal tit also appeared to benefit from the new timber planted between the times of Wallis and Selby. However, the common redstart and nuthatch suffered with the woodpeckers in the 19th century from a lack of mature timber as trees were felled at an early age for industrial uses. The dipper may have benefited from the transport revolution starting around Wallis's time in which many more artificial nesting sites will have become available. The rapid decline of the jay's population in the mid-19th century was attributed to persecution by gamekeepers.

Tree pipit/Meadow pipit *Anthus trivialis/A. pratensis* F32,33: Titlark

Wallis's description, with slender body, small head, black upper plumage, yellowish-green rump, white throat and belly and yellowish-white breast and sides under the wing, might indicate a female or non-breeding male grey wagtail *Motacilla cinerea* Tunstall (Cramp 1977-94 vol. V). However, the synonym given by Wallis, *Alauda pratorum*, indicates a meadow pipit and the name titlark was applied by early writers to any species of pipit (Lockwood 1993). Wallis's description of the titlark follows closely that of Willughby and Ray (1676) which appears to involve both the tree and meadow pipit. In Wallis's description, the tree pipit is indicated by the season: '[it] visits us in the beginning of May ... and leaves us in the beginning of September' and by the song: 'It is a merry active bird, sings upon trees; its note like the canary bird's, but shorter, and not so variously modulated'. Meadow pipit is indicated by the green tint to the plumage: 'The upper plumage is black and a yellowish-green with a cast of grey, in elegant variegations' and by the yellow leg colour. The wing-span of ten inches (25cm) is very similar to those given by Cramp (1977-94 vol. V) of 25-27cm for tree pipit and 22-25cm for meadow pipit but the tail length of three inches (7.6cm) is somewhat greater than those given by Cramp (*ibid*) of 5.5-5.9cm for both tree and meadow pipits.

The meadow pipit has long been known as a common bird in Northumberland, with many early names besides titlark, including titlin, mosscheeper, cheepy, grey-cheeper, sandy and sooty willy. Its name was also used in the phrases, cuckoo's-titlin and gowk-an'-titlin, meaning in common parlance an incongruous pair of any kind (Heslop 1892). In connection with this association, Selby (1833) thought that the nest of the meadow pipit was the one almost always chosen by the cuckoo *Cuculus canorus* in which to lay its eggs in Northumberland. Only one early name, field-lark, was apparently specific to the tree pipit (Heslop 1892).

Dipper *Cinclus cinclus* F19: Water-ouzel

A generally satisfactory description is given although the size comparison as 'of the size of a blackbird' is not particularly apt because of the different proportions but Wallis does acknowledge the dipper's shorter body and thicker neck. This species was found in 'mountainous rivulets, about cataracts and water-falls, but it is not common'. It is also stated that it 'makes its nest in the concave parts and hollows of large rocks ... there was lately one on the shadowy dropping rock at Tecket-water-fall [at Simonburn]'. Before Wallis, Turner in 1544 reported the dipper at Morpeth and Willughby and Ray in 1678 noted that it frequented 'Stony-Rivers and Water-courses in the Mountainous parts of ... Northumberland'

(Gardner-Medwin 1985). Following Wallis, Selby (1831) noted that the dipper was 'common upon all our mountain rivulets'. It is possible that there was a genuine increase in the late 18th and early 19th centuries due to the transport revolution at this time giving improvements in the road network. Galloway and Meek (1978-83) thought it probable that its habit of building under bridges had benefited the species. Buckton and Ormerod (1997), in a survey in Wales, found that dippers showed a significant preference for streams with bridges and walls, which were often used as nesting or roosting sites. The dipper suffered severe persecution in Scotland during the mid-19th century from fishing interests who claimed it ate salmon spawn. Hancock (1874) showed, by examining the crops of some specimens from the North Tyne, that these claims were entirely false.

Common redstart *Phoenicurus phoenicurus*
F33: Ruticilla, Small redstart, Red-tail,

Fire-tail, Star-finch

A male is described accurately. It is noted that it 'entertains us all summer, and disappears on the approach of winter' and that it 'makes its nest in old walls and hollow trees'. Selby (1831) reported very similar habitat preferences: 'not uncommon ... particularly where stone walls and very old trees abound'. The same author (1833) also noted that for some years past it had become comparatively rare in Northumberland perhaps because of the 'deficiency of old and decaying trees' and 'stone walls having ... given way to ... hedges for enclosure'.

Goldcrest *Regulus regulus* F34: Golden-crowned Wren, Marigold-flower

It appears that a male is described with a rich orange-yellow crown-stripe: 'an oblong spot of beautiful saffron-yellow extended between them [the eyes] from the beak beyond the crown of the head'. It is described as of the size of the wren and the presentation of one shot near Felton is mentioned. It was noted as a 'summer-inhabitant of our alpine woods, [that] has been shot on the sea-coast in September, before its departure to a warmer climate'. This indicates that it bred in upland woods, much as it does today, and that it was regarded as mainly a summer visitor. In the Tunstall MS its presence in winter was thought to be remarkable (Fox 1827). In the early 19th century, Selby (1831) reported that it was benefiting from the new plantations made, being now 'common in all our plantations, particularly those abounding in larch or fir'. The individuals on the coast in September are much more likely to have been immigrants from Scandinavia rather than emigrating local breeders as Wallis thought. Selby (1833) describes a massive influx on the Northumberland coast of thousands of goldcrests on 24/25 October 1822 after a severe north-easterly gale with thick fog. The migration patterns of this species have therefore clearly been established for a long time.

Great grey shrike *Lanius excubitor*
F9: Great ash-coloured shrieke, Butcher-bird,

Murdering pie

The account of the great ash-coloured shrieke is clearly of this species: 'It is of the size of a Blackbird. ... About the eyes and auricles is an oblong list of black. The head, back, and wings are of a bluish-grey. The sail feathers are tipped with white, the outer ones shortest. The throat, breast, and belly are of a paler colour than the upper part, with a few dusky spots or undulating lines on the throat'. The only slight quibble is that the wings should be black not bluish-grey as claimed: it appears that Wallis has mistranslated *uropygium* in the account in Latin of Willughby and Ray (1776 p.53) as wings rather than rump. One of Wallis's names, murdering pie, is a traditional Northumberland term for this species (Heslop 1892).

Wallis said 'We have the Great Ash-coloured Shrieke ... in mountainous thorny thickets, and among furz'. This would indicate that there was still residual scrub in the North Pennines in the mid-18th century. As indicated earlier (see Game Birds and Rails), it is thought that this scrub had survived when black cattle were the dominant animal but had been rapidly eliminated as sheep became better established. Wallis therefore recorded shrikes in apparently different habitat to that found on the moors of south-west Northumberland today. Useful corroboration for Wallis's view is provided by Wingate (1825) who also noted the great grey shrike in upland

areas (see red-backed shrike). Wallis also indicated that this shrike bred in the uplands: 'It makes its nest of the heath and moss-herbage, and lines it with wool, and the downy parts of plants'. The case for the great grey shrike breeding in Northumberland must be considered with caution as it is not accepted nationally that the species has ever bred in Britain. Yarrell *et al.* (1871-85vol. I) state: 'the large size of the nest and the variable colour and markings of the eggs of the Red-backed Shrike have in some instances led to the belief that they belonged to the Great [Grey] Shrike'. Lack (1986) comments on the tendency for the same territory to be held by great grey shrike in the winter and red-backed shrike in the summer which may well have been a cause of considerable confusion.

Red-backed shrike *Lanius collurio* F10: Ash-coloured shrieke, Butcher-bird

The second shrike account of Wallis describes accurately the male of this species:

> It is of the size of a Bullfinch.... About the eyes and auricles is an oblong black list, and another above it of white. The head and rump are hoary; the middle of the back, and the middle series of the small feathers on the wings of a dusky greyish-red. The sail feathers are blackish, spotted at the insertion with white. The throat, breast, and sides of the body, are of a pale reddish white; the lower part of the belly white.

While the vernacular names used lack specificity, the synonym of *Lanius minor* is appropriate for the red-backed shrike. However, the description of the hen is problematical:

> The hen resembles the great butcher-bird [great grey shrike] in colour, and has often been taken for a distinct species. The head is cinereous. The back is of the same colour, variegated with transverse lines of black. The breast and belly are whitish, tinged with yellow, in beautiful wavy lines. The sail-feathers are mostly of a uniform blackish colour. The train is marginated with grey, and tipped with white.

The statement that the 'hen resembles the great butcher-bird in colour' is surprising. The grey marginated tail and wavy lines on yellow-tinged breast suggest that a female/first-winter red-backed shrike is being described. The transverse black lines on the back indicate that we are probably dealing with a first-winter bird but conversely the ashen-grey head suggests an older bird. However, the ashen-grey back seems a surprising feature for any red-backed shrike. An obvious interpretation is that some confusion in separating the two species has resulted from the variability of female red-backed shrikes. The overall conclusion is that on size, the fine description of the male and the synonymy, Wallis was familiar with the red-backed shrike.

Wallis found this species 'in the same mountainous parts [as the great grey shrike]' meaning in 'mountainous thorny thickets, and among furz'. He said that it 'builds in hollies, and the black and white thorn [sloe or blackthorn]. It lays six eggs, white, with a circle of reddish-brown at the obtuse end'. The nest site description follows closely that of Willughby and Ray (1676 p. 54) and is appropriate for red-backed shrike: 90% of nests in Hampshire were in thorns or spiky bushes and the eggs correspond closely to those shown for red-backed shrike in the literature (Cramp 1977-94 vol. VII). Eggs for great grey shrike have at most a weak concentration of markings at the obtuse end [*ibid*]. It does not need much extension to the breeding range of the red-backed shrike from that in the 19th century for it to include Northumberland. Peakall (1962) investigated the historical status of the red-backed shrike in Britain from 1830 onwards and showed that in the mid-19th century its northern limit extended into the southern Lake District and the central Pennines. Further, the northern limit moved southwards with time. It would appear that the limit shown by Peakall for 1850 was not the ultimate northern limit of the red-backed shrike's breeding range in Britain but that decline had already started from further north in Northumberland in the late 18th/early 19th century. There is no clear evidence to suggest that the historical breeding distribution of the red-backed shrike extended further north into Scotland (Baxter and Rintoul 1953).

Following Wallis, Wingate (1825) noted that 'the red-backed shrike is more rare than the former species [great grey shrike], of a less size, but similar in its manners and habits' and that both species of shrike occupied the 'mountainous wilds of this county'. However, from all sources, there are only four specific instances of breeding pairs of red-backed shrikes. A pair was on Newcastle Town Moor in the summer of 1829 (Selby 1831), a nest was found in 1890 at

Longframlington (reported as great grey shrike but Bolam (1912) thought the eggs and nest site indicated red-backed shrike), a pair was reported as having nested at Belsay in 1901 (*ibid*) and another was present at Tarset from 1938-41 (McCavish 1971 pp. 14, 44).

Jay *Garrulus glandarius* F14: Jay

The striking plumage of this species is described in detail. It was reported as being 'common in our alpine woods' with two or three coming into Wallis's garden at Simonburn to feed on soft fruits. Other writers support its former plentifulness. Richardson (1842 p. 139) reported that on 27 November 1765 a jay was caught in a hedge near Newcastle. Wingate (1825) said it was 'well known in this county' and Selby (1833) that it was very common in many parts of England and Scotland particularly wooded districts. However, Hancock (1874) commented that it had now been 'nearly annihilated ... where a few years ago it was by no means uncommon'. This rapid decline in the mid-19th century was attributed to persecution by gamekeepers.

Hooded crow *Corvus corone cornix* F13: Royston-crow

No description is given but the name of Royston-crow (Lockwood 1993) and the synonym *Cornix semicinereus*, indicating a half-grey crow, confirm that the form involved is hooded crow – the northern and eastern European form of *Corvus corone* L. This form has many other old Northumbrian names including grey-back, hoody and Scremerston crow (Heslop 1892). Wallis reports it as 'not unfrequent in woods, and on the sea-coast' and describes its habit of breaking open shells by dropping them from a height. He also indicates it moved inland to some extent: 'When it is tired of a fish-diet, it retires for a while into the country, and lives ... in the woods and hedges'. Maddison (1830) reported the grey crow *Corvus cornix* inland at Prestwick Carr but it did not generally penetrate as far as 'Lakeland' (Macpherson 1892). The plentifulness on the coast extended into the 19th century. Wingate (1825) noted that 'the Hooded, or Royston Crow, a bird of passage, is often found on our sea-coasts'. Selby (1833) indicated that the hooded crow is a winter visitor, probably from Scandinavia, to northern England where 'they resort most to the sea-shore'. A steady reduction has occurred in the last century in the numbers of hooded crows visiting Northumberland. This has been attributed to increasing supplies of winter food at rubbish tips within its breeding range in northern Europe and perhaps also to climatic amelioration (Cramp 1977-94 vol. VIII).

Wallis comments: 'It usually builds upon alder trees, and lays four eggs'. Galloway and Meek (1978-83) noted that it occasionally remains to breed in Northumberland and cite a total of eight instances, with a strong tendency to mixed pairings with carrion crow *C.c.corone* L. It is quite possible that it may have bred more frequently when numbers were high as in Wallis's time but it is not clear that his observation relates to Northumberland; indeed it seems to be quoted from Linnaeus (1761 p. 30).

Brambling *Fringilla montifringilla* F30,31: Mountain-Finch, Brambling

The bird described was taken in a snare at 'Weldon, near Harelow hill' [Welton, near Harlow Hill]. There can be no doubt that the description is of a male of this species. The combination of a 'glossy yellowish-red' crown and a 'beautiful glossy black' head, neck and upper part of the back indicates a male moulting into breeding plumage. The size is not quite right. It is given as 'of the sky-lark' but the latter is actually about 20% bigger with, for instance, a wingspan, of 30-36cm compared to 25-26cm for the brambling (Cramp 1977-94 vol. VIII). Wallis's description follows closely that of the great pied mountain finch by Willughby and Ray (1676 p. 187) which appears to refer to a brambling of an extraordinarily large size. Wallis describes it as 'one of our visitants in winter', a status maintained since then with Selby (1831) noting it as a 'winter periodical visitant, and frequently very abundant'.

Siskin *Carduelis spinus* F31: Siskin

A detailed description in Latin, taken from Charleton (1668 p. 79), indicates a juvenile bird with a yellow-grey body above and a yellow-white body below with spots. Wallis states that this species 'appears by our river-sides, among alder-trees, about the same time as the

brambling ... in great frosts and snows'. It was thus a winter visitor, the same status as in the early 19th century when Selby (1831) noted: 'The Siskin visits us during the winter, and is more or less abundant every year. They resort to the banks of rivulets, where alder and birch trees abound'. It was thought to have started breeding in Scotland only by 1840 (Baxter and Rintoul 1953). Selby (1833) adds that in the winters of 1820 and 1821 Northumberland was visited by considerable flocks of siskins. Interestingly he notes that 'for the last four or five years Siskins have visited my plantations in considerable numbers both in spring and autumn. This I attribute to the abundant supply of food furnished by the alder, birch, and also larch trees'. This suggests that, like the common crossbill, the siskin was responding rapidly to the increase in the number of plantations resulting from enclosure.

Common crossbill *Loxia curvirostra* F35:. Cross-bill

The first county record of this species was noted as one 'shot a few years ago, by Thomas Middleton, of River-Green, Esq; captain of Clifford's Fort, near Tynemouth, and younger brother to Sir John Lambert Middleton of Belsay, Bart.'. The attribution is supported by the synonymy *Loxia s. Curvirostra*. Hodgson (1811-32 vol. I p. 356), in confirming the genealogy, records a Thomas Middleton of River-Green baptised at Bolam in 1708, married at Meldon in 1759 and buried at Meldon in 1792. It is not obvious from Wallis's report where the crossbill was shot but Rivergreen by the Wansbeck near Meldon would have been suitable as to habitat; Hodgson (1811-32 vol. II p. 24) commented on its wooded banks and employment of woodmen's families. The common crossbill's status was given by Wallis as 'an uncommon extraneous bird' presumably reflecting the lack of conifer plantations at that time in Northumberland. Baxter and Rintoul (1953) found very few records for crossbill in Scotland before the 19th century. After the enclosures (see game birds and rails), the extensive afforestation must have benefited the common crossbill considerably. Wingate (1825) classified it as an occasional visitor but then noted a major influx in 1810 'about Heddon-on-the-Wall, Kenton, Blagdon, &c'. Selby (1831) reported that 'this species visits the northern counties almost every year, in considerable flocks, resorting to plantations, abounding with larch and other firs' and noted (1833) that in 1821 'this kingdom was visited by immense flocks of these birds'.

Other species: with the limited coverage of this group, some obvious omissions occur. The two below are selected because they are woodland species which offer additional perspective on the trends in timber management in the 19th century. The **nuthatch** *Sitta europaea* is not mentioned by Wallis although his coverage of woodpecker-type birds appears to be fairly comprehensive. Selby (1833) indicates that this species did breed in the southernmost part of Northumberland in the early 19th century: 'I have not been able to trace it further north than the banks of the Wear and Tyne'. Wingate (1825) noted that 'it inhabits some of our woods'. However, Hancock (1874) in saying 'I know of no instance of this bird in Northumberland' showed that, like other birds of mature woodland, it had suffered a severe decline. The **coal tit** *Parus ater* is also not mentioned by Wallis. Since it has traditional names in Northumberland of cole tit, cole head and black cole head (Heslop 1892), it is likely that it has always been found in some numbers. However, Selby (1831) reported that it 'is now a very common bird in Northumberland, which I attribute to the extensive plantations, particularly of the fir tribes, which have been made within the last twenty or thirty years'.

DISCUSSION

Gardner-Medwin (1985) identified some forty-nine taxa in his analysis of the earliest bird records for the county based on the accounts of the earliest writers from the 16th-18th centuries. It was thought that thirty-eight of these forty-nine taxa could be attributed to species recorded within Northumberland and Durham. The present work has looked in detail at Wallis's chapter on birds, including fifty accounts, and has identified some sixty-eight taxa of which sixty-three can be attributed to species. Of these sixty-three, fifty-one were almost certainly recorded in Northumberland and it seems reasonable to assume that a further ten, mentioned incidentally in Wallis's accounts and itemized in Appendix 1, also occurred in the county. The occurrence of the remaining two species, barnacle goose and lesser spotted

woodpecker, in the county is not thought to be fully substantiated. Subsequent writers increased the species list: Wingate (1825) reported on some 131 species for Northumberland and Selby (1831) and Hancock (1874) some 214 and 265 species respectively for the two counties of Northumberland and Durham.

The works of these early writers enable us to monitor key species over a long time scale and to observe their fluctuations in numbers and range in response to several radical changes in habitat and human activity. Wallis's work is significant because it was written before a number of very major changes in the environment. It will be useful to consider each of these in turn.

Agricultural Intensification

Nationally, a number of very significant changes in agriculture started to occur in the late 16th century such as the enclosure of open-field systems and the drainage of marshes. These changes intensified in the mid-18th century giving a period of remarkable expansion and improvement in agriculture (Chambers and Mingay 1966 p. 34). For instance, from 1760-1799, enclosures brought perhaps as much as 3 million acres (1.2 million hectares) of waste lands into production, mainly in the northern counties of England (*ibid* p. 35). Driving the need for enclosure was a constant rise in the prices of agricultural products such as grain from about 1760 through the Napoleonic Wars to 1813 (*ibid* p. 39). Besides bringing more land into production, farmers also developed new techniques. The flexible rotation of crops enabled the land to carry more stock and the improvement of livestock by selective breeding enabled better use to be made of pastures (*ibid* p. 54). Thirsk (1997 p. 147), in commenting on the intensification of agriculture from the 1740s, emphasises that human population growth was the main driving force behind the need for increased production; the population of England and Wales increased from 6.2 million in 1751 to 17.9 million in 1851. In this paper it has been shown, through consulting local sources, that the trends in agriculture in Northumberland were similar to those occurring nationally. The resulting changes in habitat account for a number of the differences in bird populations noted between Wallis's account in 1769 and those of Selby and other writers in the 19th century:

1) **Drainage:** many mosses and fens were drained, leading to a reduced and fragmented area of wetlands. The most visible effect of this change was the loss of the bittern but it was probably also a factor in the demise of the marsh harrier and the osprey.

2) **Plantation Establishment:** the enclosure of open commons and wastes facilitated the establishment of plantations, which appeared to comprise a wide variety of trees including larch and other conifers. These young plantations provided very suitable habitat for species such as black grouse, goldcrest, coal tit, siskin and common crossbill, which all increased rapidly in numbers.

3) **Improved Techniques:** selective cross-breeding enabled new strains of animals and plants to be produced. On the moors, particularly the North Pennines, this resulted in the development of the hardy black-faced sheep which could be kept at high altitude through virtually the whole year, eventually largely replacing black cattle. This caused the loss of scrub and thickets, particularly in cleughs, as sheep could graze areas inaccessible to cattle. Golden plover appeared to be unaffected by the change but the red-backed shrike appears to have lost its favoured habitat of upland thickets and the nightjar eventually suffered a severe decline.

Industrial Intensification

At about the same time as the agricultural intensification there was an enormous expansion of many industries in North-East England and in the supporting infrastructure.

1) **Increase in Heavy Industry**: there was a rapid expansion of the coal and lead mining industries and of the iron and steel industry. These industries had an enormous appetite for timber, resulting in the loss of much old woodland and the harvesting of new timber at a relatively early age. This caused declines in birds which favoured mature woods with decaying trees. The wryneck and nuthatch became virtually extinct, the green and

great spotted woodpeckers became rare and the common redstart less common. However, the demand for timber did encourage the allocation of a greater area of land to woodland, a change facilitated by enclosure as described above.

2) **Bridge Construction**: many bridges were built in the 18th and early 19th centuries as part of new turnpike roads or roads for carrying minerals. These may have provided more nesting sites for species such as the dipper.

Natural Resource Exploitation

While the changes in agriculture and industry were the driving force behind changes in the status of some species, it is also necessary to consider other more direct effects. Undoubtedly the continual advances in guns were highly significant because they enabled birds, regarded as troublesome, undesirable or suitable for sport, to be killed much more readily. Specimen collecting, both of eggs and adults, also became a fashionable pastime. The period from the 1790s to the 1860s saw such activities undertaken with no checks or restraints. Subsequent restraining legislation did not always achieve its objectives.

1) **Systematic Game Preservation:** potential predators on game were intensively persecuted and shooting was tightly controlled with close seasons and strict pursuit of poachers. This caused a rapid increase in populations of game birds such as red and black grouse, grey partridge and pheasant. Birds of prey were very severely reduced in numbers with the complete loss of red kite, common buzzard, golden eagle and osprey from the 1760s to the 1840s, of marsh and hen harrier by 1900, of the honey buzzard by 1910 and of the white-tailed eagle by the 1920s. Substantial declines also occurred for sparrowhawk, merlin and peregrine falcon. Only the kestrel appeared to maintain its numbers. Other birds regarded as vermin, such as the jay, also suffered severe losses. Game fishing interests drove out the cormorant from inland sites and appeared to be an important factor in the decline of the dotterel whose feathers were used in fly-fishing.

2) **Colony Exploitation**: colonies were subject to periodic excesses in egg collecting and the killing of adults. Globally, such activities made the great auk extinct. On Svalbard they severely reduced the brent goose population in the late 19th/early 20th century causing a dramatic fall in the numbers of the pale-bellied race visiting Lindisfarne. The bean goose was similarly affected in Scandinavia and ceased to be the commonest grey goose visiting Northumberland after the 1930s. At the Farne Islands excessive exploitation appeared to affect particularly the shag, eider and puffin, with declines also noted for the razorbill and the shelduck.

Subsequent Trends

After the free use of guns in the mid-19th century had had such a devastating effect on wildlife, restraints were applied, initially to the shooting of seabirds in the breeding season, from 1869, and much more recently to the elimination of birds of prey. These restraints have contributed to the recovery of populations of seabirds and birds of prey which now differ greatly from those in the late 19th century but which would not have been out of place in the 18th century. Another activity that has been restrained is the felling of trees before they become mature. As a result more valleys now hold mature and decaying trees to the great benefit of woodpeckers and the nuthatch. On farmland, however, the situation is far less encouraging for wildlife. Farming is in the throes of further major changes, based on intensive use of chemicals as fertilisers, herbicides and pesticides, and this is causing changes to bird populations on the scale of those in the earlier agricultural intensification.

The contribution of John Wallis to ornithology in Northumberland is that he documented the county's birds before the major effects of the agricultural and industrial revolutions in the late 18th and early 19th centuries. He provides a baseline against which current populations can be measured and a context for many recent dramatic changes in the bird life of the area.

ACKNOWLEDGEMENTS

I am very grateful for assistance in the literature searches to Hugh and Stella Chambers of the library of the Natural History Society of Northumbria, and for help in locating archive material to June Holmes of the Natural History Society of Northumbria and to the staff of the Northumberland Record Office. Thanks are also due to my wife Anna Rossiter for the many discussions on the social and economic history of Northumberland and for her help in locating manuscripts on moorland management and churchwardens' accounts from the 17th-19th centuries. The Northumberland and Tyneside Bird Club and particularly its bulletin editors, Alan Johnston and Graeme Bowman, are also acknowledged for their encouragement in publishing much of the material in this article in preliminary form in their monthly bulletins Finally I would like to thank David Gardner-Medwin and an anonymous referee for their very helpful comments on a draft of this article.

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Appendix 1: Bird species considered

The list below gives, in the order of Voous (1977), those species considered above together with additional species currently found in Northumberland but mentioned only incidentally, usually for comparison, in Wallis's accounts. For the former species, the section in which they are found is given. For the latter, each entry commences with the current English and scientific names followed in brackets by the accounts in Wallis which cite the species and his terms for the species. The subsequent text gives the relevant descriptive material and details of any checks made on attribution. Species marked by an asterisk were not mentioned by Wallis but have been included in the systematic list under *other species* as their consideration offers additional perspective.

Diver sp. *Gavia sp* (P6: Diver, Loon): The legs of the puffin (as coulterneb) are reported as being 'situated so far backwards, like the divers, or loons'.

Gannet *Morus bassanus* (L) – Seabirds.

Cormorant *Phalacrocorax carbo* (L.) – Seabirds.

Shag *Phalacrocorax aristotelis* (L.) – Seabirds.

Bittern *Botaurus stellaris* (L.) – Waterbirds.

Grey heron *Ardea cinerea* L. – Waterbirds.

White stork *Ciconia ciconia* (L.) – Waterbirds.

Bewick's swan/Whooper swan *Cygnus columbianus* (Ord)/*C. cygnus* (L.) – Waterbirds.

Bean goose *Anser fabalis* (Latham) – Waterbirds.

Barnacle goose *Branta leucopsis* (Bechstein) – Waterbirds.

Brent goose *Branta bernicla* (L.) – Waterbirds.

Shelduck *Tadorna tadorna* (L.) – Seabirds.

Mallard *Anas platyrhynchos* L. (P4,6,8: Common duck): In size comparisons, the shelduck is 'larger than a common duck' and the puffin and razorbill are 'less than the common duck'.

Eider *Somateria mollissima* (L.) – Seabirds.

Goldeneye *Bucephala clangula* (L.) – Waterbirds.

Red-breasted merganser/goosander *Mergus serrator* L./*Mergus merganser* L. (P2: Dun-diver): Wallis's account for the shag describes its body as 'small, flat, and depressed like the dun-divers'. Heysham (1794-97) states that dun divers have 'generally been considered as the female of the goosander' and indeed Selby (1831) takes this view but the detailed description given by Heysham suggests that they could equally well be red-breasted mergansers. It is safer to equate the term with red-headed (female/immature) sawbills.

Honey buzzard *Pernis apivorus* (L.) – Birds of prey.

Red kite *Milvus milvus* (L.) – Birds of prey.

White-tailed eagle *Haliaeetus albicilla* (L.) – Birds of prey.

Marsh harrier *Circus aeruginosus* (L.) – Birds of prey.

Hen harrier *Circus cyaneus* (L.) – Birds of prey.

***Goshawk** *Accipiter gentilis* (L.) – Birds of prey.

Sparrowhawk *Accipiter nisus* (L.) – Birds of prey.

Common buzzard *Buteo buteo* (L.) – Birds of prey.

Golden eagle *Aquila chrysaetos* (L.) – Birds of prey.

Osprey *Pandion haliaetus* (L.) – Birds of prey.

Kestrel *Falco tinnunculus* L. – Birds of prey.

Merlin *Falco columbarius* L. – Birds of prey.

Peregrine *Falcon peregrinus* Tunstall – Birds of prey.

Red grouse *Lagopus lagopus* (L.) – Game birds and rails.

Black grouse *Tetrao tetrix* L. – Game birds and rails.

***Capercaillie** *Tetrao urogallus* L. – Game birds and rails.

Grey partridge *Perdix perdix* (L.) (F7: Partridge): It was noted in the account of the sparrowhawk that it was very destructive to partridges. Wallis gives no status information but it is likely that as with other game birds its numbers were shortly to rise rapidly. By the early 19th century Wingate (1825) said it was 'well known in all parts of the county' and Selby (1833) indicated that it had benefited from the recent agricultural improvements and was now abundant.

Quail *Coturnix coturnix* (L.) – Game birds and rails.

Pheasant *Phasianus colchicus* L. – Game birds and rails.

Corncrake *Crex crex* (L.) – Game birds and rails.

Dotterel *Charadrius morinellus* L. – Waders.

Golden plover *Pluvialis apricaria* (L.) – Waders.

Woodcock *Scolopax rusticola* L. – Waders.

Guillemot *Uria aalge* (Pontoppidan) – Seabirds.

Razorbill *Alca torda* L. – Seabirds.

Great auk *Pinguinus impennis* (L.) – Seabirds.

***Black guillemot** *Cepphus grylle* (L.) – Seabirds.

Puffin *Fratercula arctica* (L.) – Seabirds.

Pigeon sp. *Columba sp* (F6,7,25,27 Pigeon, Pidgeon): In size comparisons, the kestrel and golden plover (as grey plover, stone-plover or green migratory plover) are the size of a pigeon and the sparrowhawk is the size of a small pigeon.

Wood pigeon *Columba palumbus* L. (F3: Wood-pigeon): The red kite (as glead) is a great destroyer of 'wood-pigeons'.

Cuckoo *Cuculus canorus* L. (F12: Cuckow): The nightjar (as churn owl or goatsucker) is 'of the size and shape of a cuckow'.

Long-eared owl *Asio otus* (L.) – Non-passerines: landbirds.

Nightjar *Caprimulgus europaeus* L. – Non-passerines: landbirds.

Kingfisher *Alcedo atthis* (L.) – Non-passerines: landbirds.

Hoopoe *Upupa epops* L. – Non-passerines: landbirds.

***Wryneck** *Jynx torquilla* L. – Non-passerines: landbirds.

Green woodpecker *Picus viridis* L. – Non-passerines: landbirds.

Great spotted woodpecker *Dendrocopos major* (L.) – Non-passerines: landbirds.

Lesser spotted woodpecker *Dendrocopos minor* (L.) – Non-passerines: landbirds.

Sky lark *Alauda arvensis* L. (F30,32: Sky-lark): The brambling (as mountain finch) is 'of the size of the sky-lark' although it is actually 20% smaller. The apparent reason for this discrepancy is discussed earlier (see brambling). The tree pipit/meadow pipit (as titlark) is described accurately as 'considerably less than the sky-lark'.

Tree pipit/Meadow pipit *Anthus trivialis (L.)/A. pratensis* (L). – Passerines.

Dipper *Cinclus cinclus* (L.) – Passerines.

Wren *Troglodytes troglodytes* (L.) (F34: Common wren): The goldcrest (as golden-crowned wren) is 'the size of the common wren but looks less from the feathers lying closer, and smoother'.

Common redstart *Phoenicurus phoenicurus* (L.) – Passerines.

Blackbird *Turdus merula* L. (F8,9,16,19: Blackbird): In size comparisons it was reported that the merlin was 'not much larger than a blackbird', the great spotted woodpecker was 'somewhat larger than a blackbird' and the great grey shrike (as great ash-coloured shrieke) and dipper (as water-ouzel) were the same size as a blackbird. The dipper did, however, have 'a shorter body and thicker neck' than the blackbird.

Song thrush *Turdus philomelos* C.L.Brehm (F28: Song-thrush): The dotterel is of the size of a 'song-thrush'.

Goldcrest *Regulus regulus* (L.) – Passerines.

***Coal tit** *Parus ater* L. – Passerines.

***Nuthatch** *Sitta europaea* L. – Passerines.

Red-backed shrike *Lanius collurio* L. – Passerines.

Great grey shrike *Lanius excubitor* L. – Passerines.

Jay *Garrulus glandarius* (L.) – Passerines.

Hooded crow *Corvus corone cornix* L. – Passerines.

Raven *Corvus corax* L. (F13: Raven): The hooded crow (as Royston crow) 'sometimes dines on grosser food with the raven'.

Brambling *Fringilla montifringilla* L. – Passerines.

Siskin *Carduelis spinus* (L.) – Passerines.

Common crossbill *Loxia curvirostra* L. – Passerines.

Bullfinch *Pyrrhula pyrrhula* (L.) (F10: Bullfinch.): The red-backed shrike (as the butcher bird) is of the size of a bullfinch.

Trans. Nat. Hist. Soc. Northumbria **59**: 137-148 (1999)

THE BRYOPHYTES OF MAGNESIAN LIMESTONE SEA CLIFFS, COUNTY DURHAM: A MULTIVARIATE ANALYSIS OF COMMUNITY-ENVIRONMENT RELATIONSHIPS

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SUMMARY

Bryophyte cover-abundance and environmental data were recorded from coastal Magnesian Limestone cliffs in County Durham, north-east England. Multivariate analyses suggested that mesotrophic grassland samples on the upper cliff slopes were characterised by soils of neutral pH and high organic content and the bryophyte vegetation was dominated by wefts of large pleurocarpous mosses, such as *Brachythecium rutabulum* and *Eurhynchium praelongum*. In contrast, open calcicolous grasslands on lower cliff slopes, prone to slippage, were characterised by soils of higher pH and lower organic content and the presence of small acrocarpous mosses (e.g. *Bryum capillare, Barbula unguiculata*) or tight mats of small pleurocarpous mosses (e.g. *Ctenidium molluscum*, *Campylium chrysophyllum*). In waterlogged hollows at the base of the cliffs, the bryophyte vegetation was dominated by thalloid liverworts (e.g. *Pellia endiviifolia, Aneura pinguis*) and desiccation-intolerant mosses, including the rare *Gymnostomum recurvirostrum*. The results are discussed with reference to general bryophyte life strategy and life form concepts.

INTRODUCTION

The coastline of County Durham in north-east England is of national importance in possessing the only extensive Permian Magnesian Limestone sea cliffs in Britain (Ratcliffe 1977), which are capped with variable deposits of glacial materials. Aspects of the geology, soils, climate and land use of the area have been summarised elsewhere (Mitchell *et al.* 1994) and will not be dealt with any further here. Along much of the coastline the cliffs are located 60-120m from high tide mark as a result of the presence of artificial raised beaches formed from the dumping of colliery wastes for over a century. Consequently, the cliff vegetation is notable for the scarcity of maritime species, being characterised by mainly inland or paramaritime vegetation types (Doody 1980; Graham 1988). These range from extensive calcicolous and mesotrophic grasslands to fragmentary scrub, maritime grassland, tall-herb, marshy grassland and calcareous flush habitats (Mitchell 1995; Mitchell *et al.* 1994). The area is particularly notable for the presence of numerous regionally rare vascular plant species including *Astragalus danicus*, *Astragalus glycyphyllos*, *Dactylorhiza traunsteineri*, *Geranium sanguineum*, *Hypericum montanum*, *Juncus subnodulosus*, *Lithospemum officinale*, *Primula farinosa* and *Samolus valerandi* (Doody 1981; Graham 1988; Mitchell *et al.* 1994; Wheeler 1980). A few bryophyte records for the cliffs have been listed in recent years (Graham 1988; Wheeler 1980) and a comprehensive bryological survey of Castle Eden Dene National Nature Reserve included records of bryophytes observed where the dene transects the coastal cliffs at its eastern boundary (Richards 1977). However, no detailed studies of the bryophytes of the sea cliffs have been attempted to date and it was the aim of the study reported here to relate species distribution to likely environmental factors.

STUDY AREA AND METHODS

The area chosen for study was a 10km stretch of steep, drift-covered cliffs between the industrial ports of Seaham and Hartlepool running from Hawthorn Dene in the north (NZ 443460) to Crimdon Dene in the south (NZ 483373) and divided approximately half way by Castle Eden Dene National Nature Reserve (NZ 457407), as shown in Figure 1. To sample the sea cliff bryophytes, $1m^2$ quadrats were placed in areas representative of the range of semi-natural habitats present, previously classified by Mitchell *et al.* (1994) according to

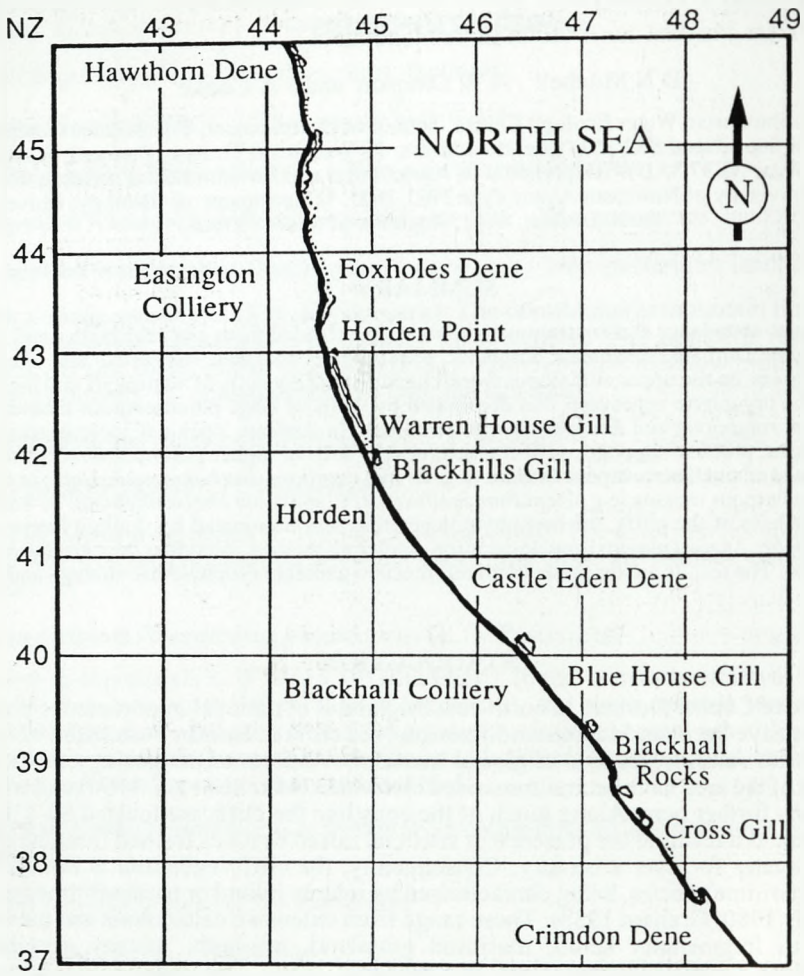


Figure 1 Sketch map showing location of study area, with key landmarks.

standard Phase 1 survey techniques (Nature Conservancy Council 1990). Consequently, fifty-seven replicate samples were taken from calcicolous, mesotrophic, maritime and marshy grassland habitats and areas of tall-herb, scrub and calcareous flush. Most bryophytes were readily identified in the field, although difficult specimens were collected and determined later by microscopic examination. Cover abundance values for bryophyte species in each sample were recorded using the Domin scale and the dominant vascular plant species for each sample were also noted. The locations of all fifty-seven samples are listed in Table 1 together with six figure Ordnance Survey grid references.

Measurements or estimates of ten readily assessed habitat variables considered likely to influence bryophyte community composition were collected for each of the fifty-seven samples. These included aspect, slope, height above sea, distance from sea, amount of bare ground, height of vegetation, substrate moisture and substrate texture (Hodgson 1974), with most variables being assigned to categories (Table 2).

Table 1

Location of fifty-seven quadrat samples on the Durham sea cliffs. Sample sites listed from north to south (see Figure 1 for location of key landmarks).

Locality & key landmarks	Ordnance Survey grid reference	Quadrat sample number
Cliff top south of Hawthorn Dene	NZ 443454	25, 26, 27, 40, 41, 42, 43
	NZ 443457	28, 29, 44, 45
	NZ 443459	34, 35, 36, 46
Cliff slopes south of Hawthorn Dene	NZ 443456	37, 38, 39
Cliff slopes at mouth of Foxholes Dene	NZ 446435	30, 31, 32, 33
Cliff slopes south of Blackhills Gill	NZ 452414	22, 23, 24
Cliff slopes north of Castle Eden Dene	NZ 453412	51, 52, 53
Cliff slopes at mouth of Castle Eden Dene	NZ 457405	11, 12, 13, 14, 15
Cliff slopes south of Castle Eden Dene	NZ 459403	16, 17, 18, 49
	NZ 458404	19, 20, 21, 50
	NZ 464400	47, 48
Cliff slope at mouth of Blue House Gill	NZ 465396	57
Cliff slopes at Blackhall Rocks	NZ 474385	1, 2, 3
	NZ 474387	4, 5
	NZ 468394	56
	NZ 473389	54, 55
Cliff slopes at mouth of Cross Gill	NZ 477382	8, 9, 10
Cliff slopes north of Crimdon Dene	NZ 483374	6, 7

A soil sample was taken from the centre of each quadrat by carefully digging off the top 5cm of substrate with a hand trowel and placing the sample into a plastic bag. Bagged samples were then stored for several weeks in a refrigerator set at 5°C to reduce microbial activity. Soil pH for each sample was determined in the laboratory by half filling a 50 ml beaker with soil and adding deionised water to fill. This mixture was then stirred and allowed to stand for ten minutes, after which a glass electrode buffered to pH 7 was used to record the pH value (Allen 1989). This procedure was repeated five times per sample and the mean pH value calculated. The total organic content was determined by quantitative ashing of each soil sample. These were first air dried at 40°C, then sieved to 2mm. A 1g sample was then placed into a weighed dry crucible, placed into a muffle furnace and burned at 550°C for two hours. After cooling to room temperature, each sample was re-weighed to calculate percentage loss-on-ignition from weight lost during combustion (Allen 1989). Only one sample per quadrat was used in this determination.

The bryophyte species data was collated with habitat data and analysed by CANOCO (Ter Braak 1987) to investigate vegetation-habitat relationships by performing a Detrended Canonical Correspondence Analysis (DCCA). Nomenclature of mosses and liverworts followed that of Smith (1978; 1989) and vascular plants were described according to Stace (1997). Autecological information and habitat preferences of all bryophyte species recorded on the cliffs were checked in Smith (1978; 1989) and Watson (1981).

Table 2

Summary of methods used for description of habitat variables.

VARIABLE	DESCRIPTION (Category codes shown in brackets)
Aspect (degrees)	0-45 (1), 46-90 (2), 91-135 (3), 136-180 (4), 181-225 (5)
Slope (degrees)	Measured with inclinometer. No categories.
Height above sea (m)	0-20 (1), 20-30 (2), 30-40 (3)
Distance from sea (m)	0-10 (1), 11-25 (2), 26-50 (3), 51-100 (4), 100-200 (5)
Average height of vegetation (cm)	0-5 (1), 6-15 (2), 16-30 (3), 31-60 (4), 61-120 (5), >120 (6)
Vegetation cover/bare ground	Estimated according to Domin scale.
Substrate moisture	Very dry & sandy (1), Dry soil (2), Normal soil (3), Damp soil (4), Waterlogged soil/peat (5), In water (6)
Substrate texture (Hodgson 1974)	Sand (1), Loamy sand (2), Sandy loam (3), Sandy silt loam (4), Silty loam (5), Sandy clay loam (6), Clay loam (7), Silty clay loam (8), Sandy clay (9), Silty clay (10), Clay (11)
Substrate pH	Measured in laboratory with glass electrode. No categories.
Substrate total organic content (Allen 1989)	Soil samples air dried at 40°C and sieved to 2mm. A 1g sample then burned at 550°C and re-weighed to calculate loss-on-ignition. No categories.

RESULTS

A total of thirty-one bryophyte species was recorded in fifty-seven quadrats and included seven liverworts and twenty-four mosses (Table 3). The most frequently recorded species were *Aneura pinguis* and *Eurhynchium praelongum*, which occurred in over 30% of the samples, followed by *Fissidens taxifolius*, *Brachythecium rutabulum* and *Barbula unguiculata*, each of which occurred in over 20% of samples. The remaining species each occurred in less than 20% of the total sample, with most of these in less than 10% of all quadrats examined.

An interpretation of bryophyte-habitat relationships was achieved by producing CANOCO ordination biplots in which the fifty-seven samples and thirty-one bryophyte species were plotted with the ten habitat variables (Figures 2 and 3). These biplots facilitate the interpretation of environmental gradients and allow individual species and samples to be related to habitat variables. The points represent individual species or samples and the arrows represent the direction of change of habitat variables, the length of each arrow being proportional to the magnitude of change in that direction. This was calculated by canonical correspondence analysis using the CANOCO programme. Those variables with longer arrows are much more important in influencing community variation and those samples or species nearest to the tip of each arrow are most strongly correlated with and influenced by that variable. In addition, the position of each arrow with respect to axes 1 and 2 indicates how closely correlated each ordination axis is with that factor. Thus the height and cover of vegetation and pH and organic content of the soil were highly correlated with axis 1, as were quadrats 18, 32, 35, 43 and 44 (Figure 2). In contrast, soil texture and moisture were highly correlated with axis 2, as were quadrats 47, 51 and 52 (Figure 2).

On the cliff tops and upper cliff slopes, as indicated by the high altitude and low slope axes towards the right hand side of axis 1 of the species ordination plot, mesotrophic grassland bryophytes were well represented in the flora (Figure 3). Here the substrates were of lower pH and were characterised by soils with the highest loss on ignition values (total organic content). The closed swards of tall, rank vegetation with little bare ground were dominated by competitive grasses such as *Festuca rubra*, *Brachypodium sylvaticum* and *Arrhenatherum elatius*. This represented a hostile microhabitat for bryophytes and the main species present were robust, pleurocarpous mosses and leafy liverworts, particularly *Brachythecium rutabulum, Eurhynchium praelongum*, *Eurhynchium striatum* and *Lophocolea bidentata.* Most of the other species were recorded from small gaps between the grass tussocks which provided a refuge for smaller, shade-tolerant species such as *Rhizomnium punctatum, Dicranella heteromalla*, *Fissidens bryoides*, *Fissidens taxifolius* and *Mnium hornum*.

In direct contrast to the previously described areas, steep-sloping, dry, sandy ridges at lower levels of the cliffs were important habitats for smaller, desiccation-tolerant calcicolous grassland bryophytes, which are shown towards the bottom of axis 2 of the species ordination plot (Figure 3). Here constant exposure to erosion and slippage had created significant vacant patches of bare ground for bryophyte colonisation and subsequent vegetative expansion. Characteristic species of open exposed patches of soil included small acrocarpous mosses such as *Barbula unguiculata* and *Bryum capillare*, whilst small pleurocarpous mosses growing attached to the substrate, such as *Ctenidium molluscum, Hypnum cupressiforme* and *Campylium chrysophyllum* had colonised the gaps in the vegetation characterised by vascular plant species such as *Festuca rubra* and *Carex flacca.* The higher pH and lower levels of organic matter in the sandy substrates had presumably helped to maintain nutrient poor soils which had not been invaded by taller, competitive grasses, which would eliminate these small bryophytes.

A distinctive assemblage of bryophytes was restricted to the damp hollows located at the bottom of the cliff slopes and shown towards the top of axis 2 of the ordination plot (Figure 3). Here, large patches of the thalloid liverworts *Pellia endiviifolia* and *Aneura pinguis*, together with dense cushions and mats of *Gymnostomum recurvirostrum* and *Cratoneuron commutatum*, had developed in response to the relative effects of stress and disturbance. Constant slippage of damp clay-rich substrates had resulted in the creation of open microsites for bryophyte recolonisation and vegetative expansion. In addition to disturbances resulting

Table 3

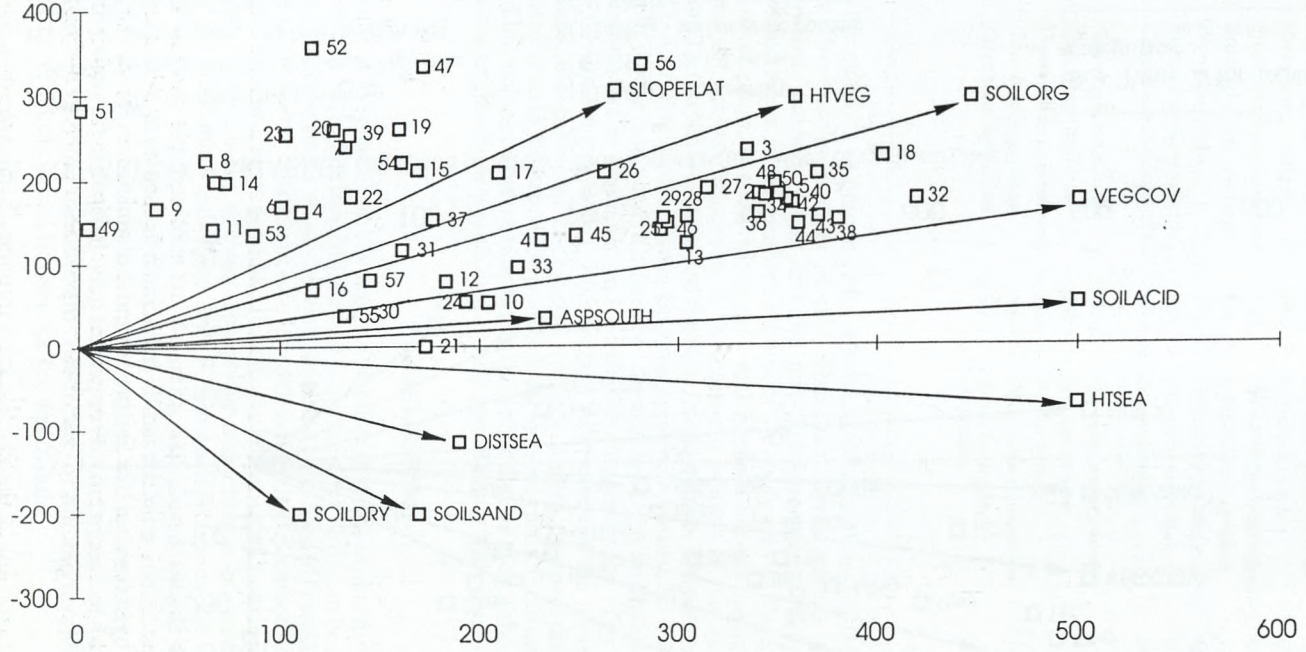
Frequency of bryophyte species recorded in the Durham sea cliff samples.

SPECIES	No. of quadrats	% frequency occurrence
MUSCI		
Amblystegium serpens	2	4
Barbula unguiculata	12	21
Brachythecium rutabulum	13	23
Brachythecium velutinum	6	11
Bryum capillare	4	7
Bryum pseudotriquetrum	3	5
Calliergon cuspidatum	3	5
Campylium chrysophyllum	2	4
Campylium stellatum	6	11
Cratoneuron commutatum	2	4
Cratoneuron filicinum	3	5
Ctenidium molluscum	4	7
Dicranella heteromalla	1	2
Dicranella varia	1	2
Eurhynchium praelongum	19	33
Eurhynchium striatum	5	9
Fissidens bryoides	3	5
Fissidens taxifolius	14	25
Gymnostomum recurvirostrum	11	19
Hynum cupressiforme	4	7
Mnium hornum	4	7
Pohlia carnia	2	4
Rhizomnium punctatum	5	9
Rhyncostegium confertum	1	2
HEPATICAE		
Aneura pinguis	19	33
Calypogeia fissa	1	2
Chiloscyphus polyanthos	1	2
Leiocolea turbinata	8	14
Lophocolea bidentata	9	16
Pellia endiviifolia	10	18
Plagiochila porelloides	2	4

from slippages, the combination of damp clay-rich substrates of high pH and low organic content had prevented invasion by taller marsh species and helped to maintain an open vegetation, characterised by species such as *Juncus articulatus* and *Carex flacca*. The small gaps between these species appeared to provide important microhabitats for a number of small, desiccation-intolerant bryophytes such as *Campylium stellatum* and *Leiocolea turbinata*.

Although it was not the main aim of the investigation to compile an exhaustive list of all bryophytes occurring on the Durham sea cliffs, a number of other bryophytes were found

Figure 2 Detrended Canonical Correspondence Analysis (D.C.C.A) ordination plot of bryophyte samples with main environmental variables overlaid as arrows.

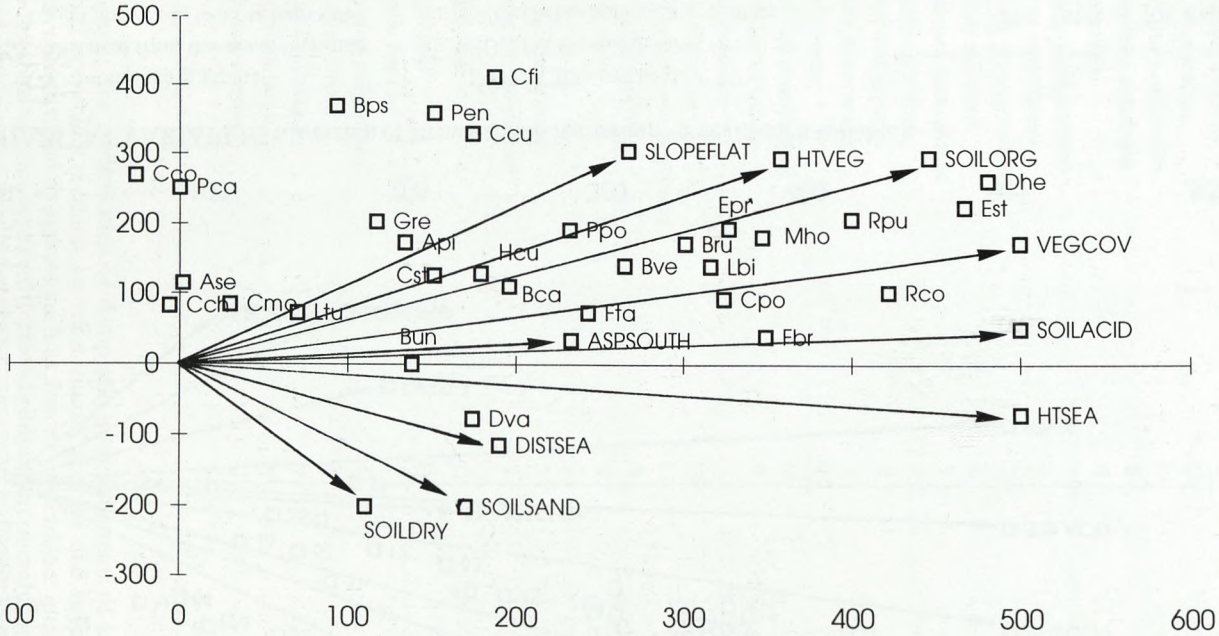


KEY TO HABITAT VARIABLES (direction of arrows shows increasing values of each variable):

ASPSOUTH - south facing aspect
DISTSEA - distance from the sea at high tide
HTSEA - height above sea level at high tide
HTVEG - height of vegetation
SLOPEFLAT - flatter slopes
SOILACID - soil acidity
SOILDRY - soil dryness
SOILORG - soil organic content
SOILSAND - soil sand content
VEGCOV - vegetation cover

See Table 2 for explanation of coded categories.

Figure 3 Detrended Canonical Correspondence Analysis (D.C.C.A) ordination plot of bryophyte species with main environmental variables overlaid as arrows. The key to species codes is shown on page 145.



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See Table 2 for explanation of coded categories.

KEY TO SPECIES CODES IN FIGURE 3:

	MUSCI		MUSCI		HEPATICAE
Asc	*Amblystegium serpens*	**Dhe**	*Dicranella heteromalla*	**Api**	*Aneura pinguis*
Bun	*Barbula unguiculata*	**Dva**	*Dicranalla varia*	**Cfi**	*Calypogeia fissa*
Bru	*Brachythecium rutabulum*	**Epr**	*Eurhynchium praelongum*	**Cpo**	*Chiloscyphus polyanthos*
Bve	*Brachythecium velutinum*	**Est**	*Eurhunchium striatum*	**Ltu**	*Leiocolea turbinata*
Bca	*Bryum capillare*	**Fbr**	*Fissidens bryoides*	**Lbi**	*Lophocolea bidentata*
Bps	*Bryum pseudotriquetrum*	**Fta**	*Fissidens taxifolius*	**Pen**	*Pellia endiviifolia*
Cch	*Campylium chrysophyllum*	**Gre**	*Gymnostomum recurvirostrum*	**Ppo**	*Plagiochila porelloides*
Ccu	*Calliergon cuspidatum*	**Hcu**	*Hypnum cupressiforme*		
Cst	*Campylium stellatum*	**Mho**	*Mnium hornum*		
Cco	*Cratoneuron commutatum*	**Pca**	*Pohlia carnea*		
Cfi	*Cratoneuron filicinum*	**Rpu**	*Rhizomnium punctatum*		
Cmo	*Ctenidium molluscum*	**Rco**	*Rhynchostegium confertum*		

outside the quadrats examined or have been listed elsewhere (Graham 1988). These were as follows: *Pseudoscleropodium purum*, *Thuidium tamariscinum*, *Neckera crispa, Barbula recurvirostra*, *Barbula fallax* and the rare *Trichostomum brachydontium* on calcicolous outcrops and ridges in the southern section of the study area at Blackhall Rocks (NZ 473387); *Barbula convoluta*, *Fissidens cristatus* and *Homalothecium lutescens* on steep, crumbling cliffs and calcicolous grassland in the northern section of the study area at the mouth of Hawthorn Dene (NZ 443460); and the rare *Trichostomum crispulum* on cliffs at Ash Gill (NZ 448423), near Fox Holes Dene. Species apparently restricted to flushes and seepages at Blackhall Rocks included *Calliergon cordifolium*, *Chiloscyphus pallescens*, *Eucladium verticillatum*, *Pellia epiphylla* and *Riccardia chamedryfolia*. The calcifugous acrocarpous mosses *Ceratodon purpureus*, *Polytrichum piliferum* and the introduced alien *Campylopus introflexus* had colonised compacted colliery wastes dumped directly onto the sea cliffs adjacent to several former colliery sites along the study area. Field observations suggested that these additional species were rare within the defined study area, although it is possible that very small acrocarpous mosses such as *Barbula* species may have been overlooked.

DISCUSSION

The results of the present survey suggest that the composition and distribution of the bryophyte communities on the Durham Magnesian Limestone sea cliffs can be explained by the relative effects of habitat stress (e.g. drought, waterlogging, high pH) and disturbance (e.g. slippage of glacial clays and creation of bare ground) on the dry, calcareous cliff ridges and damp cliff hollows. These processes have had the effect of depressing potentially competitive vascular plants and maintaining existing bryophyte assemblages or creating new microsites for bryophyte colonisation and expansion. Where such processes had not operated, notably on the cliff tops and upper reaches of the cliffs, tall closed swards of mesotrophic grassland vegetation have developed and excluded all but the most robust bryophytes. Aspects of the ecology of the major bryophyte groups identified will be considered in turn, with reference to morphological, physiological and regenerative 'strategies' of bryophytes (During 1979; Grime *et al.* 1990) and the different 'life forms' of bryophytes (Magdefrau 1982), as these provide a useful conceptual framework for discussion.

Large 'wefts' (Magdefrau 1982) of pleurocarpous mosses and leafy liverworts such as *Brachythecium rutabulum*, *Eurhynchium praelongum* and *Lopholocolea bidentata* dominated

the bryophyte component of the rank mesotrophic grassland areas at the top of the cliffs. Such species have been shown to have high relative growth rates (Furness and Grime 1982a,1982b) and greater morphological plasticity in the form of an active 'foraging mechanism' for resources (Rincon and Grime 1989a, 1989b). It is likely that these characteristics increase the survival and performance of such bryophytes in tall grassland vegetation where the resource supply is spatially or temporally patchy. As a consequence robust, weft-forming, ectohydric species, not growing in direct contact with the soil, dominate the bryophyte component of such vegetation and, although often of considerable biomass, bryophyte species richness in such tall, dense swards tends to be reduced (Watson 1960).

In direct contrast to the previous bryophyte communities, low growing 'cushion' and 'mat' formers (Magdefrau 1982), which rely upon direct rhizoidal attachment to the substrate for nutrient acquisition (e.g. *Ctenidium molluscum*, *Hypnum cupressiforme*), were particularly characteristic of the open, calcareous turfs on exposed cliff ridges and lower cliff slopes. Here the increased possibility of desiccation and nutrient starvation impose physiological stresses on the bryophytes. Such species have been shown to have low relative growth rates (Furness and Grime 1982b) and, consequently, adaptive mechanisms in these species are generally associated with physiological plasticity, in which there is an emphasis on the capacity to capture efficiently and conserve scarce resources by the development of quick, reversible physiological responses to environmental stresses (Rincon and Grime 1989a). Species of such exposed and seasonally dry habitats are able to withstand immediate drying to low water contents (Proctor 1984), although there is a price to pay in that these so-called 'stayers' (During 1979) or 'stress tolerators' (Grime 1979; Grime *et al* 1990) tend to grow slowly, are generally smaller in size and are easily out-competed by larger bryophytes if the supply of resources is improved. As a result of their poor competitive abilities such species were therefore generally absent from the taller, closed grassland communities on the cliffs.

Other important growth forms in the low-growing and open calcareous turfs were short lived 'shuttle' species (During 1979), such as *Barbula unguiculata* and *Bryum capillare*. These are characteristic of habitats that are intermittent in time but appear regularly, such as the bare patches resulting from cliff erosion and slippage. Several studies have noted higher bryophyte diversity in bare areas within calcicolous grasslands (During 1990; Watson 1960) and this presumably relates to frequent invasion and colonisation by vegetative propagules or wind dispersed spores. Such 'ruderal' strategists (Grime 1979; Grime *et al.* 1990) tend to channel their efforts into reproductive and dispersal plasticity at the expense of morphological and physiological adaptations. The production of numerous, widely dispersed spores is the key to their survival and field observations suggested that both *Barbula unguiculata* and *Bryum capillare* were generally common along the cliffs throughout the study area. No truly maritime cliff bryophytes have been recorded from these cliffs (Graham 1988), presumably due to the tipping of colliery wastes on the beaches which has forced the high tide mark seawards and reduced salt spray deposition on the cliffs.

Bryophytes of sporadic distribution along the Durham cliffs were mainly those restricted to damp or waterlogged cliff hollows and included *Cratoneuron commutatum*, *Bryum pseudotriquetrum, Campylium stellatum* and *Gymnostomum recurvirostrum*, the last of these species being rare in lowland areas of County Durham (Graham 1988). For such species of normally moist habitats, occasional periods of drought pose a potentially catastrophic hazard, interrupting normal metabolism and growth and liable to kill a significant proportion of the population before favourable conditions return (Proctor 1982). Such desiccation-sensitive species tend to suffer irreversible damage following rapid desiccation (Proctor 1984), although the extent of recovery may vary according to the rate of drying (Krochko *et al.* 1978; Seel *et al.* 1992). Presumably the predominantly north-eastern aspect of the cliff hollows in this study favours slow or minimal rates of desiccation and ultimately the survival of the desiccation-sensitive species. Where these conditions prevail, the bryophyte component of the vegetation was often extensive and a complex mosaic of bryophyte vegetation had developed in the mini-hollows and ridges formed by slippage of glacial clays as well as within and outside of dense tussocks of vascular species. This mosaic of bryophyte patches may provide important microhabitats for the germination of seeds and refugia for the establishment of seedlings of rare or localised vascular plants, such as *Primula farinosa*, *Samolus valerandi* and *Pyrola*

rotundifolia (Mitchell 1995; Mitchell *et al.* 1997). An understanding of the processes which influence the dynamics and survival of bryophyte patches may therefore assist with the conservation of important higher plant species.

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THE DISTRIBUTION, ABUNDANCE AND CONSERVATION MANAGEMENT OF BUTTERFLIES ON MAGNESIAN LIMESTONE GRASSLAND SITES IN NORTH-EAST ENGLAND

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SUMMARY

The spatial distribution and abundance of the butterfly community of Magnesian Limestone grasslands were recorded on three Sites of Special Scientific Interest in north-east England. Adult butterflies were recorded during 1990-92 using Butterfly Monitoring Scheme transect counts (Hall 1981) and a range of habitat variables, including the main larval hostplants, were measured on the transect sections. Nineteen species of butterfly were recorded. Abundance was highest on species-rich transect sections and there was little annual variation in distribution and abundance within sites. Both species richness and abundance were higher in sheltered calcareous grassland than other habitat types. Scrub development appeared to have no effect on species richness, though the proportion of mobile species increased and a decrease in abundance was noted. Sedentary species were generally constant and abundant, especially in calcareous grassland, whereas mobile species were irregularly recorded and usually at lower abundance levels. Plant cover, sward height, low level scrub and southerly aspects were all correlated with the butterfly variables suggesting lightly grazed or ungrazed swards were the preferred habitat. New management objectives and prescriptions to conserve the butterfly fauna are proposed.

INTRODUCTION

Magnesian Limestone has a restricted distribution in Britain occurring as a narrow strip rarely more than a few kilometres wide. The largest outcrops are in north-east England, where it is exposed on the coast. In the cool dry climate of lowland County Durham, the semi-natural grasslands which develop over magnesian limestone are mostly restricted to free-draining calcareous soils. The characteristic vegetation type is best developed on soils free of drift, particularly the steeper slopes of the western escarpment but also on a few isolated sites on the east Durham plateau. In addition, paramaritime magnesian limestone grasslands have developed on the east coast sea cliffs (Rodwell 1992).

Primary Magnesian Limestone grassland is a plagioclimax vegetation (plant communities maintained by management such as grazing or burning) derived ultimately from woodland clearance (e.g. Bartley, Chambers and Hart-Jones 1976) and maintained by stock grazing and rabbits (Rodwell 1992). Cattle, sheep and horse grazing have all been used recently in their management (Pritchard 1989). Secondary grasslands of more recent origin have developed in disused quarries and road verges (cuttings). The conservation importance of both inland and coastal Magnesian Limestone grasslands in Britain is well recognised (Ratcliffe 1977; Doody 1977; Pritchard 1989). Of most interest is the unique and rare vegetation type, with a total national resource meeting Sites of Special Scientific Interest (SSSI) standard of around 270 ha, of which 177 ha (65%) occurs in County Durham and Tyne and Wear. The grasslands contribute to the conservation of twelve plant and three animal species of regional or national importance (Pritchard 1989). English Nature recognises twenty-four Magnesian Limestone grassland sites warranting SSSI status in County Durham and Tyne and Wear, including two large coastal sites which account for over 50% of the regional resource.

There has been a wide range of phytosociological studies of the grassland flora (e.g. Heslop-Harrison and Richardson 1953; Shimwell 1968; Graham 1988; Rodwell 1992; Mitchell 1995), but ecological studies of the faunal communities are less common, with the butterflies receiving most attention (e.g. Dunn and Sheppard 1982; Selman, Luff and Monck 1973). Twenty species of butterfly were recorded during a recent review of existing distribution data for Magnesian Limestone grassland SSSIs (Ellis 1995). Records were unevenly distributed between the sites and butterfly species richness was correlated with plant species richness and habitat diversity but was largely independent of the site or the area of Magnesian Limestone grassland.

However, no quantitative data have been published which describe the butterfly community of Magnesian Limestone grassland. The aims of this paper are to (1) describe the spatial (local) and temporal distribution and abundance of butterflies on three key sites, (2) examine the effect of differences in habitat type on the butterfly fauna with particular emphasis on the relationships between species richness, abundance and a range of habitat variables and (3) propose new management objectives and prescriptions which take account of the butterflies' habitat requirements.

METHODS

Study sites

The three study sites were Cassop Vale National Nature Reserve (NNR) (western section) (NZ 328386), Sherburn Hill (NZ 331417) and Thrislington Plantation (NZ 316327). These were amongst the largest sites with large areas of calcareous grassland, a diversity of butterfly habitat and high butterfly species richness. They were also subject to a range of grassland management techniques during the study.

Transect counts

Detailed habitat maps of each site were prepared and drawn to a 1:2500 scale; locations and areas were determined by triangulation and pacing. Habitat classification was based on the Phase 1 survey methodology, with the additional category of grassland/scrub (a mosaic of open grassland amongst dense scrub). A distinction was also made between sheltered and open calcareous grassland and between extant and transplanted calcareous grassland. The latter was a feature of Thrislington Plantation where grassland 'turves' were relocated between 1982 and 1989 as part of Steetley's (now Redland's) transplantation project (Stanyon and Park 1987; Park 1988). Transect counts (Pollard 1977) were used to establish the spatial and temporal distribution and abundance of butterflies and the effect of differences in habitat on the butterfly fauna (Pollard 1982). This is an established method of assessing long term change in the relative abundance of butterflies in Britain and is used in the Institute of Terrestrial Ecology's Butterfly Monitoring Scheme (BMS) (Hall 1981) which deals with some eighty sites, as well as by numerous independent recorders (Pollard, Hall and Bibby 1986; Pollard and Yates 1993).

Transect routes were devised which sampled the range of grassland and scrub habitats on each site, utilising existing paths and sheep tracks, but where no established path existed the route was marked by posts. The total length of the transect varied between 1.3 and 2km within the three sites. Each route was divided into sections which corresponded to differences in habitat or habitat management: Cassop Vale 14 sections, Sherburn Hill 14 sections, Thrislington Plantation 15 sections. Transect sections varied from 30m to 250m in length, but the width was fixed at 5m.

Transect counts of butterflies in each section were made by walking the route and noting individuals seen up to 5m in front of the recorder. In the BMS, butterflies which cannot be identified are recorded as the commoner of the likely alternatives. In practice only *Pieris rapae* L. (small white) and *Pieris napi* L. (green-veined white) were sometimes difficult to distinguish in flight; such individuals were therefore recorded as *P. rapae*. However, this happened on very few occasions and did not, for example, influence measures of species richness for any section. Where the same individual was definitely encountered again it was recorded only once, otherwise a separate record was made.

Butterflies were recorded weekly during 1990 and 1991 from April to September (twenty-six weeks in total, week 1: 1st-7th April; week 2: 8-14th April etc) but due to time constraints only Thrislington Plantation was recorded in 1992. A degree of standardisation (Hall 1981) was provided by observing the following:

1. Time of recording was restricted to 10.45 am to 15.45 pm (BST).

2. Shade temperature, measured at the end of the transect, was above 13°C. Transects were walked only between 13°C and 17°C if 60% of the transect sections were 'sunny' (defined by 'shadows cast'). Above 17°C, transects were walked in any conditions provided it was not raining.

3. Windspeed did not exceed 5 on the Beaufort scale.

Habitat variables

Specific habitat variables reflecting differences in local topography (slope, aspect) and the structure (sward height, scrub) and composition (larval hostplants, successional indicators) of the grassland vegetation were recorded. These variables have all been measured in other studies of grassland butterfly communities (e.g. Butterflies Under Threat Team 1986; Mungira and Thomas 1992). Selected habitat variables were surveyed on each transect section in 1990 both along the route and from representative permanent quadrats:

Transect route:

1. Slope(°): clinometer.

2. Aspect (°): compass bearing.

3. Sward (vegetation) height (cm): defined here as the average height of the vegetation and measured using a standard drop or Boorman disc (30cm diameter, approximate weight 200gms) dropped from the top of a 1m rule (Butterflies Under Threat Team 1986); the mean value was calculated of samples taken at approximately 5m intervals, 1m from the route centre on alternate sides.

4. Scrub shoot density (n 100 m^{-1}): total numbers of individual scrub shoots were recorded along the central 1 m of the route and in three height categories : >30 cm, > 1 m, >5 m (after Rushton 1988).

Permanent quadrats:

One sample plot was selected for each section. 1m^2 permanent quadrats were marked at two corners with buried metal timber connectors and located by distance and bearing from above ground features (Smith, Wells and Walsh 1985). Quantitative parameters recorded were:

1. Plant cover (%): grass / herb cover, moss cover, litter / dead vegetation.

2. Bare ground (%): bare soil, stones/rocks.

3. Larval hostplants (% cover)[1]: *Holcus lanatus* L. (Yorkshire fog): foodplant of *Thymelicus sylvestris* Poda (small skipper); *Dactylis glomerata* L. (cocksfoot): foodplant of *Ochlodes venata* Bremer and Grey (large skipper); *Lotus corniculatus* L. (bird's foot trefoil): foodplant of *Erynnis tages* L. (dingy skipper) and *Polyommatus icarus* Rott. (common blue); *Helianthemum nummularium* Miller (common rockrose): foodplant of *Aricia artaxerxes* Fabricus (northern brown argus); *Festuca spp* (fescues): foodplant of *Coenonympha pamphilus* L. (small heath).

4. Successional indicators (Grime, Hodgson and Hunt 1988; Rodwell 1992) (% cover): *Thymus polytrichus* A Kerner ex Borbas (wild thyme): indicator of open grassland; *Brachypodium sylvaticum* (Hudson) P Beauv. (wood false brome): indicator of early subseral succession and alternative foodplant of *T. sylvestris*; *Ulex europaeus* L. (gorse) and *Crataegus monogyna* Jacq. (hawthorn): indicators of late subseral succession.

1 Nomenclature of butterflies and plants follows Emmet and Heath (1989) and Stace (1991).

Subseral succession is the sequential vegetation change to scrub and woodland following the abandonment of plagioclimax management.

Data analysis

Weekly counts were summed for the three sites to produce a measure of abundance for each species (an Annual Index Value or AIV), expressed as density (N km^{-1} transect). Estimates are normally made for weeks where transects are not completed due to poor weather by calculating the mean of the counts for the preceding and following weeks (Hall 1981). Clearly the use of estimated counts is undesirable; only nine estimates were made from a maximum 170 recording weeks, but these were omitted from the data. These were nearly all early or late season when there were few species on the wing and so their omission was considered unlikely to affect the results. The following were also calculated for each site:

1. Species richness (S): the total number of species recorded.
2. Density of individuals (N km^{-1}): the summed annual indices for all species divided by the total transect length.
3. Diversity (Simpson's Index): a measure of both species richness and the evenness (equitability) with which the individuals were apportioned between the species:

$$D = \frac{1}{\sum_{i=1}^{s} Pi^2}$$

where Pi=the proportion of individuals that each species (i)contributes to the total for the site. Thus the maximum diversity value is the same as S if the individuals are evenly apportioned between the species.

Section Index Values (SIV), expressed as density (N 100 m^{-1} transect), were calculated for all butterflies recorded and separately for each species by summing the weekly counts for each transect section (n = 43). Species richness (S $100m^{-1}$ transect) and diversity (Simpson's Index) were also calculated for each section.

A distinction is often made between two groups of butterflies according to broad differences in population structure (e.g. Thomas 1984; Warren 1992). 'Sedentary' or colonial species are those with more or less closed population structures, which regularly use a site for breeding and of which most individuals remain within colony. 'Mobile' species have open population structures and are locally mobile or semi-migratory, only occasionally using a site for breeding. The above analyses were performed on both the total species recorded and the sedentary species data set.

Differences in species richness and abundance between habitat types were analysed using t-tests. Relationships between species richness, density and diversity and the habitat variables recorded in 1990 (combined data set from all three sites) were examined by Principal Component Analysis and the significance of these relationships by Pearson Product Moment correlations.

RESULTS

The butterfly community: distribution, abundance and phenology

Nineteen species of butterfly were recorded from the transect counts (Table 1). One other species, *Argynnis aglaja* L. (dark green fritillary), was recorded off the transect at Thrislington Plantation. Ten species were classified as sedentary (closed population structure) and nine as mobile (after Warren 1992). A total of 6320 butterflies was recorded from the three transects. The most abundant species on all three sites were a group of sedentary grassland butterflies which included *A. artaxerxes*, *P. icarus*, *Maniola jurtina* L. (meadow brown) and *C.*

Table 1

Species composition and abundance for butterflies on three Magnesian Limestone grassland sites in County Durham during 1990-92

Note: Abundances are Annual Index Values expressed as numbers of individuals per kilometre of transect .Species in descending order of abundance.

SPECIES		CASSOP VALE		SHERBURN HILL		THRISLINGTON PLANTATION		
		1990	1991	1990	1991	1990	1991	1992
Sedentary species								
Small heath	*Coenonympha pamphilus* L.	89.4	49.9	60.6	98.9	314.2	362.2	306.3
Meadow brown	*Maniola jurtina* L.	132.4	308.4	53.7	89.0	95.9	216.9	208.0
Common blue	*Polyommatus icarus Rott.*	6.9	23.6	31.4	48.3	64.7	89.4	43.0
Northern brown argus	*Aricia artaxerxes Fabricus*	7.6	2.8	3.1	8.4	39.0	66.7	79.6
Ringlet	*Aphantopus hyperantus* L.	0	0	0	0	26.2	64.7	49.9
Wall	*Lasiommata megera* L.	1.4	14.6	8.4	29.9	12.4	4.5	5.9
Large skipper	*Ochlodes venata Bremer & Grey*	1.4	3.5	3.8	6.9	3.0	3.5	12.4
Dingy skipper	*Erynnis tages* L.	0.7	0.7	4.6	5.4	7.4	4.0	5.4
Small skipper	*Thymelicus sylvestris Poda*	0	0	0	0.8	0.5	6.4	19.3
Small copper	*Lycaena phlaeas* L.	0	2.1	0	2.3	0	0	0
Mobile species								
Small tortoiseshell	*Aglais urticae* L.	22.9	6.2	30.7	10.0	13.8	6.4	18.3
Small white	*Pieris rapae* L.	3.5	9.7	30.7	36.0	1.0	4.9	5.9
Green-veined white	*Pieris napi* L.	4.9	2.8	25.3	14.6	4.5	3.0	1.0
Large white	*Pieris brassicae* L.	0	4.2	3.8	12.3	1.0	8.9	4.5
Peacock	*Inachis io* L.	0	0	3.8	3.8	0.5	10.9	9.9
Orange tip	*Anthocharis cardamines* L.	0	0.7	3.1	2.3	1.0	0	0
Red admiral	*Vanessa atalanta* L.	0	0	0	0	2.0	0	4.9
Painted lady	*Cynthia cardui* L.	2.1	0	0	0	1.0	0	0
Clouded yellow	*Colius croceus Geoffrey*	0	0	0	0	0	0	0.5

Table 2

Species richness, abundance and diversity of butterflies on three Magnesian Limestone grassland sites in County Durham during 1990-92

Note: Dmax is the maximum potential diversity index and is the same as the species richness value.

	CASSOP VALE		SHERBURN HILL		THRISLINGTON PLANTATION		
	1990	1991	1990	1991	1990	1991	1992
TOTAL SPECIES RICHNESS	11	13	13	15	17	14	16
DENSITY OF BUTTERFLIES ($N\ km^{-1}$)	273	429.0	263.0	368.9	587.9	851.8	775.2
DIVERSITY OF BUTTERFLIES	2.847	1.751	6.873	5.87	2.736	3.124	4.106
(% of Dmax)	(26)	(13)	(53)	(39)	(16)	(22)	(26)
SEDENTARY SPECIES RICHNESS	7	8	7	9	9	9	9
(% of total)	(64)	(62)	(64)	(60)	(69)	(54)	(56)
DENSITY OF SEDENTARY BUTTERFLIES	239.8	405.4	165.7	289.9	563.2	818.2	731.7
(% of total)	(88)	(95)	(63)	(79)	(88)	(88)	(94)
DIVERSITY OF SEDENTARY BUTTERFLIES	2.244	1.575	3.583	3.853	2.534	3.381	3.601
(% of Dmax)	(32)	(20)	(43)	(43)	(28)	(38)	(40)

pamphilus plus *Aphantopus hyperantus* L. (ringlet) at Thrislington Plantation. A second group of sedentary grassland species composed *of O. venata*, *E. tages* and *Lasiommata megera* L. (wall), were also regularly recorded at lower densities. The two other sedentary species were *T. sylvestris* which colonised these sites during the survey period and is now abundant (pers. observation) and *Lycaena phlaeas* L. (small copper) which was only occasionally recorded on the transect routes. With the exception of *Aglais urticae* L. (small tortoiseshell), the mobile species were irregularly recorded and generally at low abundance levels.

Results of the preliminary analysis (Table 2) show that species richness and abundance for both total and sedentary species were generally higher at Thrislington Plantation than at the other two sites. Species richness did not vary greatly between years but butterfly density was

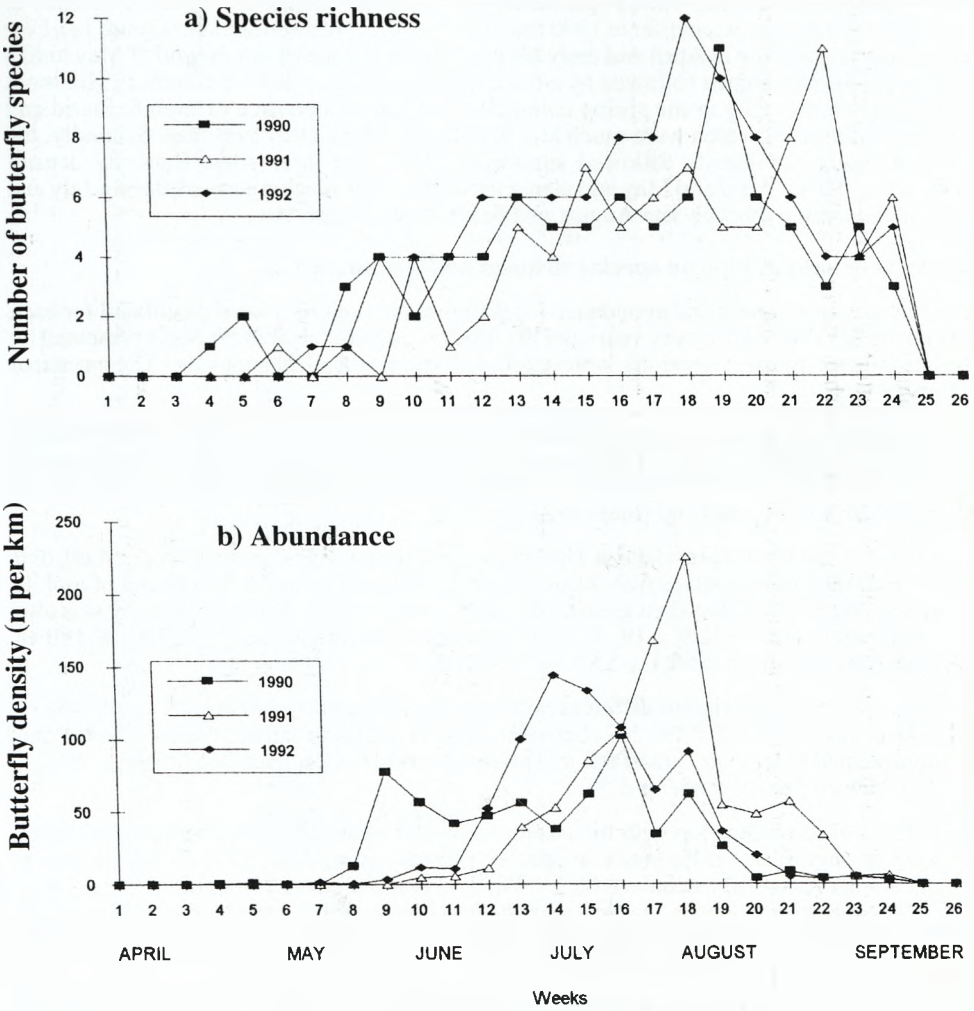

Figure 1 Phenology of butterflies during 1990-92 at Thrislington Plantation, County Durham.

much greater in 1991 than 1990 and was followed by a slight decrease at Thrislington Plantation in 1992. Although the proportion of sedentary species did not vary (54-69% of total), their density was much higher at Thrislington Plantation and Cassop Vale (88-95% of total) than Sherburn Hill (63-79% of total). Diversity was lowest at Cassop Vale and highest at Sherburn Hill, reflecting the greater abundance of mobile species at the latter site. Statistical analyses of SIVs by Ellis (1995) showed that for Cassop Vale (1990 only) and Thrislington Plantation (all years) there were significant correlations each year between species richness and abundance. In other words, abundance was highest on species-rich transect sections. A similar analysis showed that, with the exception of Thrislington Plantation in 1992, neither species richness nor abundance on transect sections varied much between years.

The maximum weekly species richness and abundance (N km^{-1}) recorded at the three sites were: Cassop Vale (A): 9, 94.9, Sherburn Hill: 9, 78.2 and Thrislington Plantation: 12, 225.8 respectively. Two major phenological changes were apparent during the recording period. Firstly, emergence patterns varied seasonally. In general, emergence of most species at Thrislington Plantation was earlier in 1990 than 1991, with 1992 intermediate (Figure 1a). Few species were on the wing in April and early May but they increased from the end of May until a peak was reached in August followed by a rapid decline in September. At Sherburn Hill more species were on the wing in the spring coinciding with the occurrence of mobile Pierid and Nymphalid butterflies which were much less in evidence at the other two sites. Secondly, the pattern of change in density followed similar trends on the three sites. Butterfly density remained low during April and May and increased during June reaching a peak during July and August and declined through late August and September (Figure 1b).

The effects of habitat type on species richness and abundance

The mean species richness and abundance for different habitat types were calculated for each site from the SIVs from all survey years and the results compared. Habitat types represented by only one or two transect sections were excluded from statistical analysis. The principal differences were:

1. Calcareous grassland at Cassop Vale was significantly ($t = 2.43$, $df = 19$, $P<0.05$) more species rich (mean = 7.03 ± 1.00) than neutral grassland (mean = 3.42 ± 1.10). Likewise density was significantly ($t = 3.31$, $df = 19$, $P<0.01$) higher in calcareous (mean = 51.1 ± 6.6) than neutral grassland (mean = 23.2 ± 5.2).

2. Sheltered calcareous grassland at Thrislington Plantation was significantly ($t = 4.60$, $df = 27$, $P<0.001$) more species rich (mean = 9.35 ± 0.49) with a higher proportion of mobile species than open calcareous grassland (mean = 5.52 ± 0.68). Butterfly density was also significantly ($t = 3.83$, $df = 19$, $P<0.01$) greater on sheltered (mean = 107.4 ± 9.4) than open sections (mean = 65.1 ± 5.8).

3. There were no significant differences in species richness ($t = -0.86$, $df = 29$, NS) or density ($t = -0.08$, $df = 30$, NS) between extant (not transplanted: 'open' above) and transplanted calcareous grassland at Thrislington Plantation (richness: mean = 6.24 ± 0.48; density: mean = 65.7 ± 5.5).

4. Patches of scrub develop with the onset of subseral succession. At Sherburn Hill there were no significant differences in species richness ($t = -0.61$, $df = 6$, NS) between calcareous grassland (mean = 8.08 ± 0.78) and grassland/scrub (mean = 9.61 ± 2.40). However butterfly density was lower in the grassland/scrub habitat (mean = 23.3 ± 7.1) than calcareous grassland (mean = 38.3 ± 5.8), though this difference was not significant ($t = 1.63$, $df = 11$, NS).

5. Subsequent subseral stages are light scrub (a mosaic of patches of calcareous grassland amongst low scrub) and dense scrub where the calcareous grassland is virtually confined to the paths. At Sherburn Hill both species richness (mean = 5.65 ± 0.40) and density (mean = 31.0 ± 2.6) were less in dense scrub than calcareous grassland, but in neither case was this significant (richness: $t = -0.61$, $df = 6$, NS; density: $t = -1.63$, $df = 11$, NS). The proportion of mobile species, however, was greater in dense scrub.

Table 3

The frequency of butterfly species in different habitat types on three Magnesian Limestone grassland sites in County Durham during 1990-92

Note: Frequency expressed as percentage of transect sections on which the species was recorded.
Data from all years combined, with number of samples in parentheses.

SPECIES	CALCAREOUS GRASSLAND (42)	TRANSPLANTED CALCAREOUS GRASSLAND (15)	SHELTERED CALCAREOUS GRASSLAND (14)	CLEARED SCRUB (4)	GRASSLAND/ SCRUB (2)	LIGHT SCRUB (2)	DENSE SCRUB (6)	NEUTRAL GRASSLAND (10)
Small skipper	14	53	43					
Large skipper	24	47	57		50	50	67	
Dingy skipper	29	47	64					
Clouded yellow		7						
Large white	26	27	57		50		83	10
Small white	45	33	71	75	50	100	100	30
Green-veined white	26	20	57		100	50	100	10
Orange tip	2		29				33	10
Small copper	5							
Northern brown argus	64	87	86		50	50	33	
Common blue	83	100	100	50		50	100	40
Red admiral	2		29					
Painted lady	5		7	25	50			
Small tortoiseshell	57	73	79	25		50	67	50
Peacock	14		57			50		
Wall	21	13	93		50	50	67	30
Meadow brown	95	100	100	75	100	100	100	100
Ringlet	38	20	86					
Small heath	100	100	100	75	100	100	100	60

6. Two sections of dense scrub at Cassop Vale were cleared in 1989/90. Species richness, butterfly density and species diversity were all low in 1990 (Ellis 1995). Section 2 in 1990 had the lowest values for the entire recording period and no sedentary species were noted at all during that season. Recolonization of the bare ground on these sections by the calcareous grassland flora was followed by a recovery in the butterfly fauna with substantial increases in richness and density in 1991.

The effect of habitat type on butterfly species

Associations between species and different habitat types were analysed by calculating frequencies of occurrence and abundance ranges using data from all sites and all years. Frequency was calculated as the percentage of transect sections on which the species was recorded (Table 3) and the minimum and maximum densities are given in five frequency classes (Table 4):

1. Most sedentary species were recorded from a range of habitat types, but only *M. jurtina* and *C. pamphilus* were constant (i.e. 60% or more of transect sections). *M. jurtina* was abundant in all habitats but especially in calcareous grassland; the highest densities were recorded from the ranker and more tussocky transplanted grasslands at Thrislington Plantation. *C. pamphilus* was also most abundant on calcareous grassland but in contrast to *M. jurtina* it was only recorded at low densities from other habitat types.

2. Both *P. icarus* and *A. artaxerxes* were constant and relatively abundant in calcareous grasslands; other preferred habitats were those sheltered by light to dense scrub.

3. *E. tages* occurred at low densities but was more or less restricted to calcareous grassland.

4. *A. hyperantus* was constant on the non-transplanted calcareous grassland at Thrislington Plantation and most abundant in sheltered situations. *L. megera* was constant and most abundant in sheltered calcareous grassland; bare ground is a requirement for this species and was characteristic of this habitat where limestone had been quarried or tracks constructed.

5. *O. venata* was rarely constant or abundant but occurred in calcareous grassland and especially where scrub was present. In contrast *T. sylvestris* was more abundant in open calcareous grassland.

6. Of the mobile species, all Pierids were constant in dense scrub as was *A. urticae*, the commonest of the Vanessids. The latter was also constant in transplanted and sheltered grassland. *P. rapae* was most abundant in light to dense scrub, where one of its hostplants *Reseda lutea* L. (wild mignonette) was common. *A. urticae* was particularly abundant at Cassop Vale in the neutral grassland where a major source of nectar, *Cirsium arvense* (L.) Scop. (creeping thistle) was the most prominent herb.

Relationships between butterflies and habitat variables

Investigations of the butterfly and habitat variables in 1990 by Principal Component Analysis (Figure 2) and by Pearson Product Moment correlations (Table 5) revealed several significant relationships. There were significant positive correlations between all three butterfly variables (total species richness, abundance and diversity) and plant cover, between abundance and sward height, between species richness and low level scrub and between diversity and southerly aspects. There were significant negative correlations between the butterfly variables and bare ground and also between density and scrub over 1m tall. Analyses of the relationships between butterfly variables and larval hostplants/successional indicators were more difficult to interpret because several plant species were recorded only infrequently in the quadrats. However, there were significant negative correlations between butterfly abundance and both wood false brome and gorse. Finally, there were significant relationships between several habitat variables, including wild thyme with steeper slopes, bird's-foot trefoil with southerly aspects and common rockrose with low level scrub.

Table 4

The range of abundances for butterfly species in different habitat types on three Magnesian Limestone grassland sites in County Durham during 1990-92

Note: Data from all sites and years combined with number of samples (ie transect sections) in parentheses.
Minimum and maximum densities (N $100m^{-1}$) are given in the following frequency classes:

1: 0.1-5.0; 2: 5.1-10.0; 3: 10.1-25.0; 4: 25.0-50.0; 5: >50.0

SPECIES	CALCAREOUS GRASSLAND (42)	TRANSPLANTED CALCAREOUS GRASSLAND (15)	SHELTERED CALCAREOUS GRASSLAND (14)	CLEARED SCRUB (4)	GRASSLAND/ SCRUB (8)	LIGHT SCRUB (2)	DENSE SCRUB (6)	NEUTRAL GRASSLAND (10)
Small skipper	1-2	1-2	1					
Large skipper	1	1	1		1	1	1	
Dingy skipper	1	1	1		1			
Clouded yellow	1	1						
Large white	1	1	1-2		1		1	1
Small white	1-3	1	1	1	1-3	1	1-3	1
Green-veined white	1	1	1		1-2	1	1-2	1
Orange tip	1		1		1		1	1
Small copper	1							
Northern brown argus	1-3	1-2	1-4		1-2	1	1	
Common blue	1-3	1-2	1-3	2	1-2	1	1-3	1
Red admiral	1		1					
Painted lady	1		1	1	1			
Small tortoiseshell	1	1-2	1	1	1	1	1-3	2
Peacock	1-2		1-3		1	1		
Wall	1-3	1	1-3		1	1	1	1
Meadow brown	1-4	2-5	2-5	1-4	1-3	2	2-3	1-4
Ringlet	1-3	1	1-4					
Small heath	1-5	2-4	1-5	1	1	1	1-2	1-2

Figure 2 Ordination plot showing relationships between total butterfly species richness, diversity, abundance (solid symbols) and a range of habitat variables (open symbols) on three Magnesian Limestone grassland sites in County Durham in 1990.

Table 5

Correlation matrix between total butterfly species richness, diversity and abundance and a range of habitat variables on three Magmesian Limestone grassland sites in County Durham in 1990. Data are significant Pearson Product Moment Correlations (Critical values: r= 0.301, P<0.05; r=0.389, P,0.001).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Butterfly variables																				
1 Species richness																				
2 Density	0.41																			
3 Diversity	0.50																			
Local topography																				
4 Slope																				
5 Aspect			0.57																	
Sward structure																				
6 Sward height		0.48			0.36															
7 Scrub shoot density >30 cm	0.48			0.39																
8 Scrub shoot density >1 m		-0.35			0.34		0.48													
9 Scrub shoot density >5 m																				
10 Plant cover	0.39	0.31	0.33			0.33														
11 Bare ground	-0.39	-0.31	-0.33			-0.33				-1.00										
Larval hostplants																				
12 Yorkshire fog																				
13 Cocksfoot					-0.33	-0.39														
14 Bird's foot trefoil					0.33							0.81								
15 Common rockrose							0.38													
16 Fescues																				
Successional indicators																				
17 Wild thyme				0.42												0.37				
18 Wood false brome		-0.44					0.41	0.80												
19 Gorse		-0.47					0.35	0.56										0.75		
20 Hawthorn							0.31									0.48	0.32			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

DISCUSSION

Two methodological limitations require some discussion, though neither compromised the conclusions reached:

Transect counts

Since butterflies are recorded only on the transect route, some species known to be present in low numbers were not recorded for the site (e.g. *L. phlaeas* at Thrislington Plantation). Transect counts for several other species (e.g. skippers) were very low during all years of the survey making it impossible to draw conclusions from the annual fluctuations recorded. Transect length may be a contributory factor to some low annual index values. Pollard and Yates (1993) suggest that about 3km is the optimum transect length. The transect routes at Cassop Vale and Sherburn Hill were below optimum length but were limited by the overall size of the site and particularly by the area of calcareous grassland.

Habitat variables

Recording vegetation characteristics is particularly time consuming and only one quadrat was recorded per transect section; clearly there is a danger that such recording may be unrepresentative of the whole transect section, particularly for larval hostplants. Furthermore the measurement of abundance of hostplants is an incomplete measure of suitability because many species require a specific growth form for ovipositing (Thomas 1991b). In other words, simple but accurate measures of hostplant cover are of insufficient sensitivity. This may also apply to the measurement of sward height which was very useful in recording changes in vegetation structure due to management. However the calculation of mean sward height is not sensitive to local variation such as mosaics of short and long turf on individual transect sections; these mosaics may provide clues as to why some areas of a site are used by several species which have different sward height requirements (e.g. Butterflies Under Threat Team 1986). The standard drop disc used in this study was of 30cm diameter and has been recommended for grassland biotopes; however some workers use a disc of only 10cm diameter (for example Warren 1991) to assess small scale change in vegetation structure in relation to ovipositing sites.

The detailed recording of site characteristics should not be readily undertaken on other sites using the transect count method, unless specific factors affecting spatial distribution and abundance have already been identified (e.g. shade and woodland butterflies). Long-term monitoring is best restricted to aspects of vegetation structure such as sward height and scrub density, both of which can be recorded along the transect route and the effects on them of changes in management (e.g. grazing and scrub clearance) assessed.

The butterfly community

The results of this study suggest the spatial distribution and abundance patterns of butterflies on the three Magnesian Limestone grassland sites were relatively stable throughout the study period. Pollard and Yates (1993) cite several examples of stability in local distribution where species occupy the same areas of a site over a number of years. In these cases short-term fluctuations (due for example to weather) still occurred, but were of a similar magnitude on all sections of a site.

The term 'community' is used in this paper to describe the butterfly species composition of Magnesian Limestone grassland sites. However, definitions of community refer to interactions between species such that species associations are constant rather than random. Comparable associations in plant communities, based on measures of abundance range and constancy, are much easier to define (e.g. Rodwell 1992), whereas there have been few attempts to devise similar classifications for insect communities (Porter, Steel and Thomas 1992). However, this study does suggest that a useful distinction can be made between sedentary and mobile species. The latter were generally of low abundance and constancy. Knowledge of the ecology of these mobile species (e.g. Thomas1986,1991a) suggests that their local distribution is random, partly because magnesian limestone grasslands rarely provide all their resource requirements.

In contrast, the sedentary species obtain all or most of their resource requirements from this habitat and therefore may be regarded as a recognisable butterfly community. Seven sedentary species were found to be constant across the three sites. Two other species, *T. sylvestris* and *A. hyperantus*, have undergone range expansions this decade, and are also now constant and abundant (pers. observation). However, *L. phlaeas* was neither constant nor abundant and therefore cannot be regarded as part of this community.

These nine sedentary species do not form a true guild because they do not utilise a common resource. However, knowledge of their ecological requirements suggests resource partitioning occurs, particularly in respect of larval hostplants and sward structure. Six species are grass-feeders; they are all able to feed on a range of grasses but niche separation occurs by differences in both species and sward height preferences (Butterflies Under Threat Team 1986). Thus *T. sylvestris* oviposits in the range 20-40cm, *O. venata* at 8-20cm, *A. hyperantus* at 15-30cm, *M. jurtina* at 5-10cm, *L. megera* at 2-10cm in sparse turf and *C. pamphilus* at 2-5cm. Habitat partitioning also occurs in the herb feeders *E. tages* and *P. icarus* which share a common larval hostplant, *L. corniculatus*. Oviposition occurs at 2-5cm in *E. tages* and at 4-10cm in *P. icarus*. It follows that maintenance of the butterfly community therefore requires a mosaic of sward heights ranging from short (0-5cm), through medium (6-10cm) to tall (>10cm).

Comparisons with other butterfly communities

Species composition on Magnesian Limestone grassland was similar to that of Derbyshire Dales NNR, the nearest BMS calcareous grassland site. Twenty-three species were recorded on the latter, eighteen of which were common to both areas. *A. hyperantus* was not found on the Peak District transect, but additional species were *A. aglaja*, comma *Polygonia c-album* L. and white-letter hairstreak *Satyrium w-album* Knoch (D Gilbert, pers. comm.). Note that *P. c-album* was recorded again from Magnesian Limestone grassland in 1996 (pers. observation). In contrast, calcareous grassland sites in southern England such as Castle Hill NNR (twenty-six species), Martin Down NNR (thirty-five), Old Winchester Hill NNR (thirty-six) and Kingley Vale NNR (forty) were considerably richer in butterflies than Magnesian Limestone grasslands (Pollard, Hall and Bibby 1986). However direct comparisons are difficult because some of these sites are mosaics of grassland and woodland. Even artificial habitats such as arable field margins in southern England supported more species (twenty-two) than magnesian limestone grasslands (Feber, Smith and Macdonald 1996). None of those recorded on the former would be regarded as rare or local and several were mobile species. However, patterns of emergence were similar, though peaks of abundance were earlier.

Comparisons of density are more difficult because transect length data are not readily accessible. However, density on the Derbyshire Dales transect was calculated as 136.5km^{-1} for 1992, considerably less than any of the three north-east England sites. Both *M. jurtina* and *C. pamphilus* were much less abundant on the former and more or less absent from the wooded sections of that route.

Factors influencing the butterfly community

Several reasons may be advanced which might explain differences between habitat types and why no single environmental factor was strongly correlated with the butterfly variables. Firstly, transect counts record adult butterflies engaged in a range of activities including mate location, the location of nectar sources or roosting and resting sites as well as suitable breeding habitat. These resources do not necessarily occur in the same part of a site and this may explain why species richness, the proportion of mobile species and abundance were greatest in sheltered calcareous grassland. For mobile species their spatial distributions on a site are less likely to reflect breeding habitat and sheltered situations may be used only for non-breeding activities.

Secondly, egg laying females of most species tend to be less conspicuous than the more active males (Thomas 1991a) and therefore transect counts may record non-breeding activities (e.g.

nectaring) of a species more frequently. This may be especially true for exposed grassland sites where butterfly counts are usually higher on the sheltered sections (Pollard and Yates 1993).

Thirdly, the local distribution of butterflies on a site is likely to be determined by a complex of factors. In some biotopes the measurement of one environmental variable may be sufficient to give an indication of the overall suitability of the habitat for butterflies. In woodland habitats significant relationships between the amount of shade and both species richness and abundance have been found (Warren 1985; Greatorex-Davies *et al.* 1993). Shade determines the amount of sunshine and ambient temperature which will directly affect adult butterfly activity but also acts through its effect on the vegetation (availability of nectar and larval hostplants). In a study of the butterflies of road verges, Mungira and Thomas (1992) found relatively few significant relationships with environmental factors for this predominantly grassland habitat. Furthermore the highest correlated factor in their study was the partly subjective assessment of presence or absence of suitable breeding habitat for each species; the only other significant variables were nectar sources and habitat size (i.e. verge width). In this study, aspect and scrub which affect microclimate and plant cover and sward height which affect the availability of nectar and larval hostplants, were identified as important factors. These habitat variables, collectively or individually, reflect those parts of a site which are lightly grazed or ungrazed and hence the type and duration of management is the critical factor in determining the richness and abundance of the butterfly community.

Habitat management

Historical management of magnesian limestone grasslands

Historically, Magnesian Limestone grasslands were managed under a mixed arable/pasture enterprise. The deeper soils, derived from glacial drift, were ploughed and the calcareous grassland provided additional grazing for sheep and cattle (both dairy and beef) on an extensive management system (Warwick Percy 1970). Rodwell (1992) postulates that variations in structure and composition of some swards may be due to differences in the type of grazing stock used, being more characteristic of grazing cattle than sheep. Recent farming enterprises on the magnesian limestone are now more productive. Higher yields from leys and permanent pasture, silage production and indoor wintering have made grazing of the calcareous grasslands unnecessary (Pritchard 1989). Only eleven sites (50% of the inland SSSIs – note that coastal SSSIs are largely unmanaged) were grazed in 1989, with the addition of Thrislington Plantation in 1992. The precise nature of the grazing regimes was unclear, but several general observations can be made.

Firstly, most grazed sites were managed on an extensive system of one grazing compartment, mainly because the sites were small. Thrislington Plantation was an exception which was both large enough and sufficiently well resourced as an NNR to warrant the establishment of a rotational grazing system. At Cassop Vale the calcareous grassland occurs in at least five grazing compartments but these are part of several farming enterprises and were not part of a rotational management system. Secondly, none of the sites were grazed continuously; the grazing period was usually spring through summer to autumn; some sites appeared to be grazed only in the summer. Magnesian Limestone grasslands are not very productive and there is little incentive to winter graze because stock would lose condition.

In 1989, six sites were grazed by cattle and five sites by horses. Sheep grazing was re-introduced to these grasslands in 1990 at Cassop Vale (western section) as part of a mixed grazing regime and in 1992 at Thrislington Plantation on a rotational system. Detailed knowledge of stocking rates was limited to a small number of sites, but a wide range of grazing intensities was reflected in the differences in sward height. Long swards were usually unmanaged and there were several examples of overgrazing (e.g. Hastings Hill). There was evidence of rabbit grazing on many sites and they were probably responsible for maintaining the grassland patches in the grassland/scrub mosaics at Sherburn Hill.

Three sites (14% of the inland SSSIs) were managed using a mowing regime. One of these, Harton Down Hill, is an urban site and two others, Castle Eden Dene and Hawthorn Dene, are effectively woodland glades; grazing will always be impractical on these sites. Castle Eden

Dene is mown annually in the winter, but the other two are mown annually in early autumn. Scrub management has been undertaken since 1989 on at least eight sites (36% of inland SSSIs), on two of which this was the only management undertaken. Bishop Middleham Quarry and Raisby Hill Grassland (in part) are both disused quarries with mainly secondary grassland where grazing is largely impractical.

Currently, four sites (18% of inland SSSIs) remain unmanaged, three of which are disused quarries and the fourth, Tunstall Hills and Ryhope Cutting, a limestone outcrop where the turf is very short on the thin soils. Most of the managed sites contain at least some areas which are unmanaged. Pritchard (1989) concluded that at that time nearly all aspects of site management were inadequate, primarily due to the small and fragmented nature of the sites.

Development of a Magnesian Limestone grassland strategy

Pritchard (1989) identified three management elements to be addressed. Firstly, scrub control which ideally would be gradual rather than large-scale clearance, for aesthetic reasons as well as reducing the opportunity for invasion by weed species. Secondly, fencing to control stock because many sites were unfenced or inadequately fenced. The lack of suitable water sources was also a problem on many sites. Thirdly, the removal of annual plant growth by grazing or mowing. Sheep grazing was proposed as the ideal stock type but this was considered practical on only a few sites because of theft, dog worrying and boundary maintenance. Cattle and pony grazing were considered more acceptable in those situations. Grazing time would ideally be restricted to late summer to early spring, but low intensity continuous grazing was considered an acceptable alternative. Mowing with a forage harvester was considered suitable for sites where grazing was not possible, providing cuttings were removed.

These outline management prescriptions proposed by Pritchard (1989) were centred on the negotiation or re-negotiation of Section 15 Management Agreements (under the Wildlife and Countryside Act 1981) on between seven and nine sites (including Sherburn Hill and parts of Cassop Vale not owned by English Nature).

Management regimes for the three study sites (see Ellis (1995) for further details) were:

Cassop Vale: unmanaged prior to study period. Extensive spring, summer and autumn grazing commenced 1990 but lapsed in 1992. Grazing intensity was low to medium with cattle at 2 ha^{-1} to remove the rank vegetation at the beginning and end of each season, and sheep grazing at 2-16 ha^{-1} through the summer.

Sherburn Hill: unmanaged prior to study period. Scrub control 1991 onwards by which four interconnecting areas of grassland/scrub mosaic were cleared.

Thrislington Plantation: unmanaged prior to study period. Five grazing compartments were established in 1992. Rotational sheep grazing commenced in two during summer 1992. Grazing intensity was medium with 10-25 sheep ha^{-1} for 2-6 weeks varying according to compartment size and season.

Management objectives and prescriptions for the butterfly fauna

This study suggests that both species richness and abundance are greater in taller, sheltered calcareous grassland swards and that the presence of some scrub is preferred. However, for some species the required conditions are met only by a shorter sward.

The following general management objectives are therefore proposed for the conservation of the butterfly fauna of Magnesian Limestone grassland sites:

1. Maintain and increase populations of sedentary species, particularly local and declining butterflies (e.g.. *A. artaxerxes*, *E. tages*).

2. Maintain and enhance the area of calcareous grassland habitat within each site.

3. Maintain a diversity of sward heights ranging from short turf (<5cm), through medium (6-10cm) to tall turf (>10cm).

4. Maintain some scrub on each site, insofar as this is compatible with 2 above. Scrub providing sheltered conditions for adult butterflies is particularly important.

5. Maintain a diversity of other habitat features (e.g. hedges, paths and rides) and other habitat types.

Objective 1 can be met only by implementing objectives 2 and 3, that is by maintaining large areas of a structurally diverse habitat type which holds the largest populations of the sedentary species. This would be achieved most effectively by grazing. The details of the regime will vary from site to site, but winter grazing is the preferred option with autumn to early winter most acceptable.

The type of stock is not considered especially important, though cattle or horses/ponies may be preferable to sheep providing excessive poaching of the ground is avoided. Stocking rates on an extensive grazing system should be kept low to create a mosaic of sward heights, but could be greater if a large proportion of the site is more productive neutral grassland. Areas important for butterflies on sites managed by rotational grazing should not be grazed during the spring and summer. Winter grazing is also the preferred option for rotational management. Winter grazing may not be practical on many farming enterprises. The stocking rate on such sites grazed in the spring and summer should be low enough that about 50% of the site remains ungrazed. On sites where grazing is impractical, rotational or annual mowing will be a suitable alternative to no management.

Reclamation of calcareous grassland from scrub should concentrate on the grassland/scrub mosaics where the return to species-rich grassland is most likely to be effective. Clearance of large areas of dense scrub may not be particularly effective in reclaiming Magnesian Limestone grassland and these areas should be managed by scalloping (semi-circles of scrub about 30m in diameter cut from a ride or path edge) unless scrub encroachment is at an advanced stage on the site. Scrub should be cut in the autumn or winter either with hand tools or power driven hand tools and burnt on the less sensitive parts of the site the base of the slopes are particularly useful on these sites because the sward is of little conservation interest and access is easier. Experience with scrub regrowth at Sherburn Hill suggests that cut stumps should be routinely treated with herbicide. The most effective time for herbicide treatment is in late summer to early autumn when the sap is falling so scrub cut in the winter may be left proud and the stumps re-cut and treated the following autumn.

Wildlife Enhancement Scheme

Section 15 Management Agreements have now been superseded on magnesian limestone grassland SSSIs by the Wildlife Enhancement Scheme. Durham Wildlife Trust sites are now eligible for the similar Reserves Enhancement Scheme. There is provision in both schemes for practical management such as fencing, scrub clearance and water supply, providing the grazing regime requirements specified by English Nature are met. Both reclamation and maintenance grazing regimes are specified; for the former, grazing intensities must be 1-2 cattle per ha or 4-10 sheep per ha between mid-June and late November and for the latter 0.5-1 cattle per ha or 2-5 sheep per ha within the same time restriction. Provision is also made for mowing in September on sites unsuitable for grazing.

In practice these regimes, though not the preferred management option for butterflies, do meet many of the objectives listed above. Avoidance of spring grazing is clearly a benefit to many of the rare plant species, allowing flowering and seed production to occur. The regimes were designed in part to take account of the requirements of both the flora and the butterfly fauna, particularly of *A. artaxerxes* (Ellis 1997a). Preliminary results from monitoring *A. artaxerxes* populations and sward heights on these sites have been generally encouraging (Ellis 1996, 1997b).

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A REVIEW OF THE RAINFALL OF JUNE 1997 IN NORTHUMBRIA

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INTRODUCTION

In recent years the trend of rainfall in Northumbria (taken here to include the land east of the Pennines and Cheviot watersheds between the Tweed and the Tees) has been slowly but decisively downwards (Wheeler 1997). The long-term records from Durham, Sunderland and the Whittle Dene Reservoir to the west of Newcastle upon Tyne, all of which begin around the middle of the nineteenth century, show the past ten years have been the driest of any ten-year sequence in their respective series. This is a feature shared by much of eastern Britain. North-western areas, on the other hand, have tended to be wetter, leading to a steepening of the north-west to south-east rainfall gradient that characterises the climate of our islands (Marsh *et al.* 1994). It might seem all the more remarkable therefore to be reporting on conditions of unprecedented wetness. Yet climate, and especially its shorter-term counterpart, weather, are inherently variable phenomena that will embrace events that depart significantly from the long-term trends, if only for a few weeks or days. This paper reviews the rainfall of June 1997 when many sites in the Northumbrian region experienced their wettest such month on record. For this reason alone the climatic background of the month warrants attention.

The peculiarities of the rainfall notwithstanding, the synoptic conditions which produced the wet weather were unusual only in their mid-summer incidence. As will be shown, the principal depressions followed routes to the south of the region in a pattern more commonly associated with winter, when the tendency is for them to pass eastwards across central and southern England in response to the regular southwards shift of climate belts that takes place in that season. In summer, when the climate belts return northwards, depressions tend to adopt more northerly routes, crossing eastwards between Scotland and Iceland. In addition to exemplifying the occasional peculiarities to which the climate of the British Isles is subject, this study also provides an analysis of those synoptic conditions in which the Northumbrian region might expect its heaviest rainfalls.

CONDITIONS IN JUNE 1997

The raw statistics are easily conveyed: over England and Wales, June 1997 was the wettest of the century with a nation-wide average rainfall of 135mm; over twice the normal amount. It exceeded the previous wettest twentieth century June, of 1982, by just 6.1mm but did not quite match those of 1879 (139.2mm), 1860 (157.1mm) or 1841 (141.5mm). The greatest percentage anomalies, although not necessarily the highest absolute monthly totals, were recorded in eastern and north-eastern England (Figure 1). Nevertheless, the wet conditions, whilst being widespread, were not to be found everywhere and parts of northern and western Scotland, Northern Ireland and small areas within the Lake District enjoyed drier than normal conditions. The overall pattern therefore represented a notable reversal of the usual rainfall gradient noted above in which northern and western areas are traditionally the wettest.

RAINFALL IN NORTHUMBRIA

The nature of the month's rainfall was studied using daily data from twenty-two sites (the location of these sites is noted by the 'point' rainfalls in Figures 2a and 4-6). Care was taken in assembling this sample to avoid bias with respect to altitude and location and data were collected from low- as well as high-level sites spread across the region. Of the sites in the sample, only Tynemouth recorded less than 100mm. Nowhere recorded over 200mm but some individual totals were notable, especially in the Wear Valley where Durham University's Observatory recorded 190.1mm and Tunstall Reservoir 191.5mm. Even at low altitudes, where rainfall might normally be expected to be light, many coastal sites recorded totals in

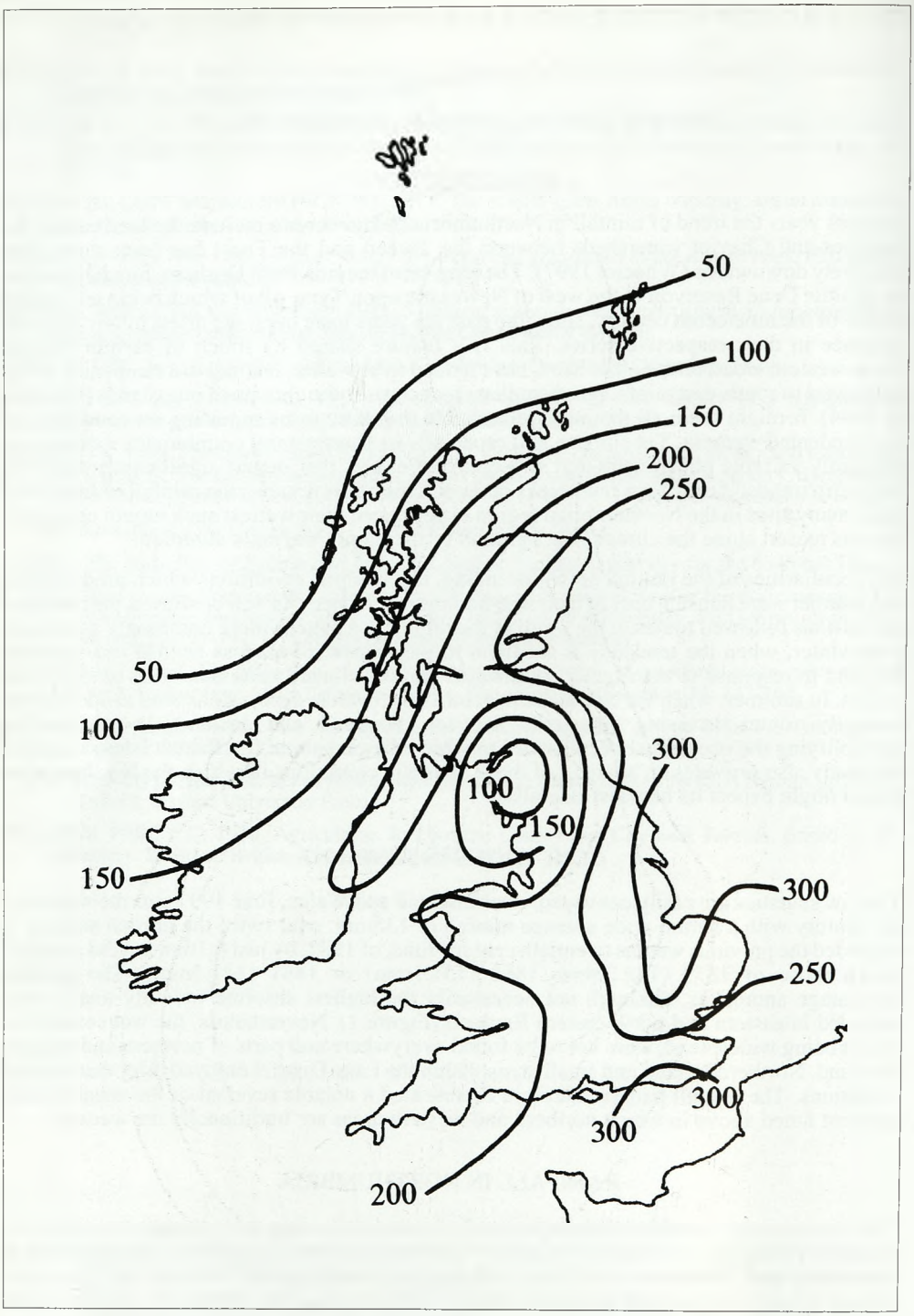

Figure 1 Generalised rainfall in the British Isles for June 1997 as percentage of the long-term mean. *Reproduced by kind permission of the Climatological Observer's Link.*

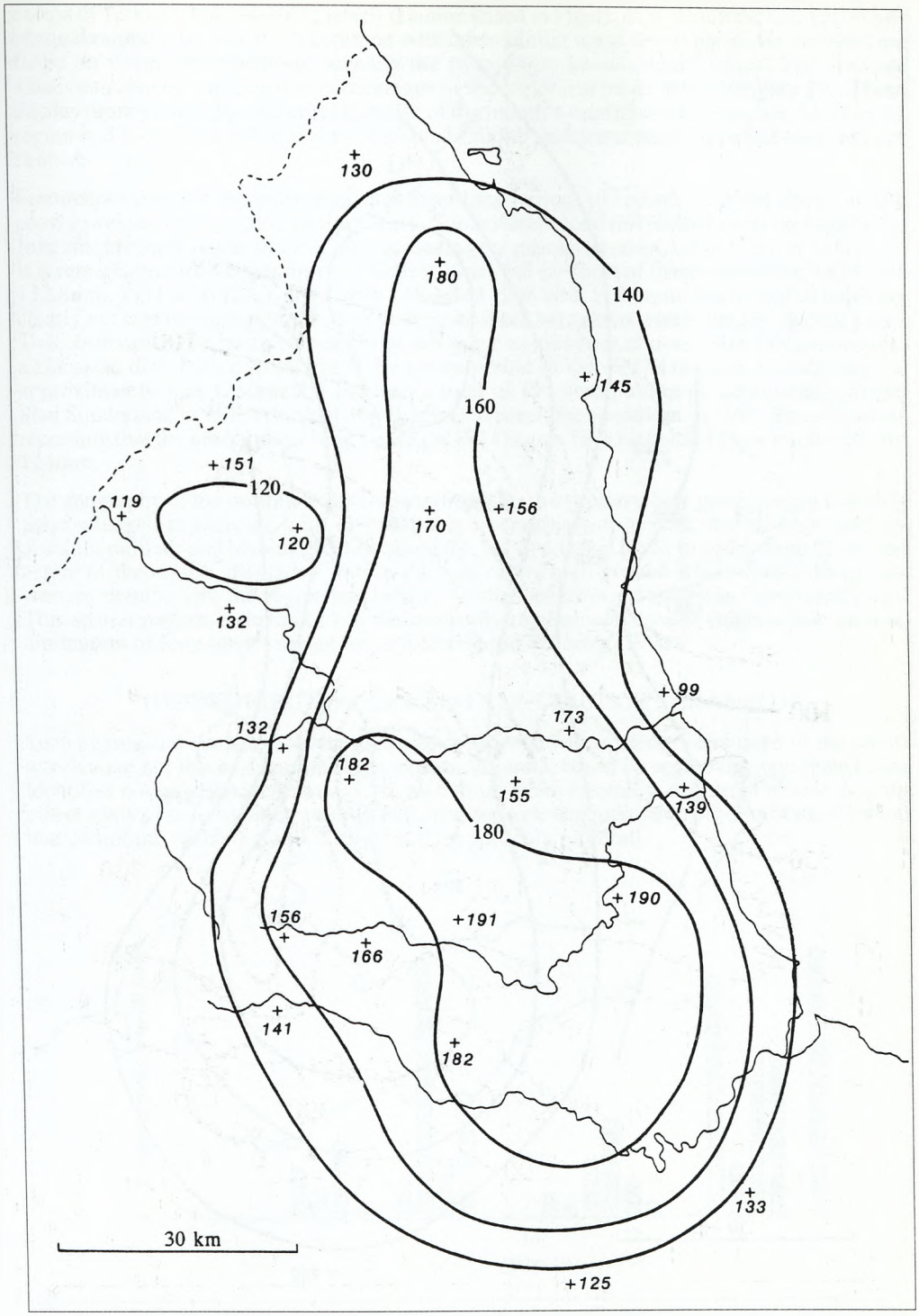

Figure 2a Rainfall isohyets for June 1997 in north-east England expressed as absolute totals (in mm).

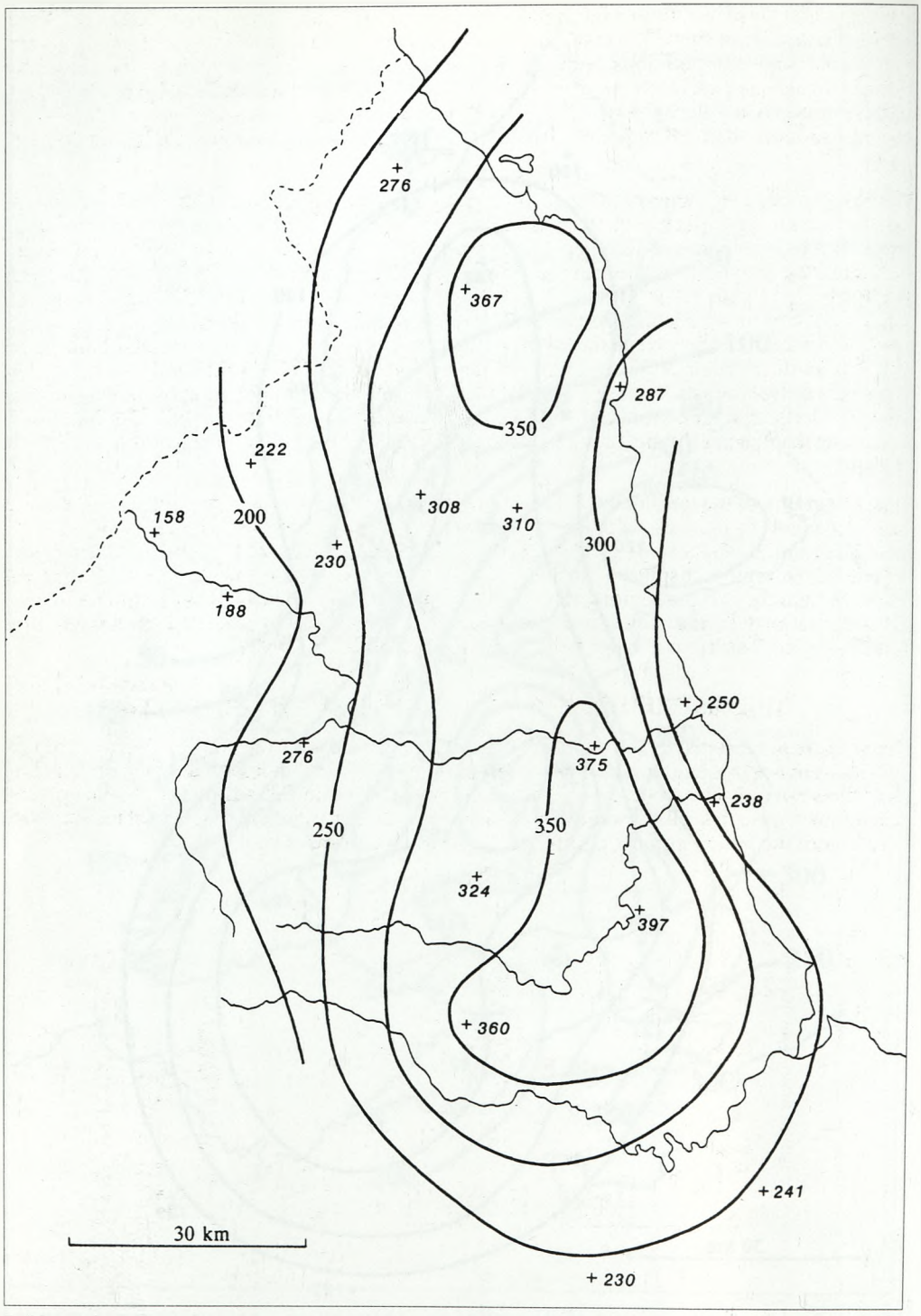

Figure 2 b Rainfall isohyets for June 1997 in north-east England expressed as percentages of the long-term mean. *Note*: reliable percentage departures from the mean could not be calculated for those stations with only short periods of record.

excess of 120mm. The month's rainfall is summarised in Figure 2a in which the isohyets (lines of equal rainfall) are shown. In common with other similar maps in this paper, the isohyets are based on visual interpolations between the twenty-two known point values. The absolute values can also be expressed as percentages of the long-term mean values (Figure 2b). These display more vividly the extreme character of the month's rainfall over the region. Most of the region had more than 200 per cent of normal rainfall and some areas recorded over 350 per cent.

Fortunately some of the individual sites have long periods of record, as noted above, which provide a clearer perspective on the events. Sunderland's total of 138.8mm was the highest for June since records began in 1859, just exceeding the previous record, set in 1980, of 136.7mm. It is remarkable to note that the next wettest Junes fall far short of these two totals; 1879 with 112.8mm, 1911 with 122.7, 1912 with 118.1 and 1948 with 114.6mm. Such rainfall totals are clearly not commonplace in this month, despite there being two within the last twenty years. This observation can be given numerical substance as the series of over 130 totals conforms to a Gaussian distribution from which the return period of the 1997 event can be calculated at approximately 1 in 1250 years! Durham's total of 191.4mm, although substantially higher than Sunderland's, failed (but only by 0.3mm) to break the record set in 1980. But it is worth recording that the next highest June figure (in 1914) again falls far behind these totals with just 124mm.

The geography of the rainfall totals is also revealing. In a region where precipitation is widely acknowledged to increase with altitude, it is interesting to note that the areas of heaviest absolute rainfall, and also of greatest anomaly, lay in a broad north to south band across the centre of the region, displaced well to the east of the high ground which forms the natural western boundary to the region and where, on this occasion, rainfall was significantly less. This spatial pattern is distinct from the markedly regular west to east (high to low ground) diminution of long-term average totals discussed in Wheeler (1990).

THE DISTRIBUTION OF RAINFALL THROUGH THE MONTH

Such aggregated statistics, however, disguise the true nature of the conditions in the month which were not those of unremitting wetness. Figure 3, based on regionally aggregated data, identifies not only the wettest days but also those when rainfall was light or absent. It is the closer study of such spells of weather that provides a clearer indication of some of the elements that contribute to the region's climate and, in particular, rainfall.

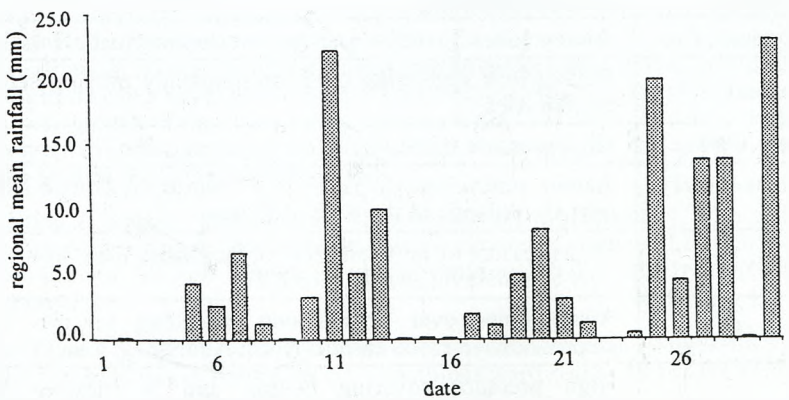

Figure 3 Daily rainfall (in mm) for June 1997 in north-east England based on twenty-two sites across the region.

Research has examined the relationship between precipitation and synoptic conditions, i.e. the disposition of anticyclonic (high) and cyclonic (low) pressure systems. Early work of Lamb (1950) defined seven basic 'airflow' types which depend upon the dominant weather system (anticyclonic or cyclonic) or, if the British Isles does not fall under the direct influence of either of the former systems, the prevailing direction of air mass movement (northerly, north-westerly, westerly, southerly and easterly). Table 1 provides a brief definition of the Lamb airflow types which can, for most purposes and with the exception of the cyclonic and the anticyclonic types, be regarded as broadly equivalent to wind direction. More recent studies by Sweeney and O'Hare (1992) and O'Hare and Sweeney (1993) have drawn attention to the contrasting geography of rainfall across Britain under each of the Lamb airflow types. Weston and Roy (1994) have conducted equally illuminating studies for Scotland and Mayes (1991) has examined the regional aspects in greater detail. Such works have added important detail to our understanding, but it was appreciated several years earlier that the north-east of England and eastern Scotland were more likely to experience heavy rainfall from easterly winds on the northern flanks of depressions passing to the south on their usual eastward passage from the Atlantic towards mainland Europe (Hay, 1949; Sawyer, 1956; Jackson, 1969). The events of June 1997 amplify and confirm the findings of these studies and draw attention to the detailed regional geography of rainfall under different weather situations.

As a first step in this analysis each day in the month was classified using Lamb's (1950) original scheme. Table 2 shows that there are clear distinctions between the rain-bearing capacities of the different air-flow types. Not uncommonly for the mid-summer period, anticyclonic (A) types were frequent and produced little rainfall. Westerly (W) type weather contributed only a small proportion of the total rainfall. Such westerly winds produce heavy orographic (altitudinally enhanced) rainfall to the west of the Pennines as a result of air being forced to rise over the hills. To the east of the watershed however this same situation provides shelter for Northumbria and in such circumstances rainfall is often minimal as a result of the 'rain shadow' cast across the region. Clearly this shelter is dependent on wind direction and disappears when winds are from between north and south-east. The region's vulnerability in these circumstances is exemplified in Table 2 where the northerly (N), easterly (E) and southerly (S) airflow types are shown to provide the majority of the region's rainfall in terms of both the absolute totals and totals over standard periods of one day.

Table 1

Definitions of the Lamb airflow types. Adapted and simplified from Lamb (1950).

Air flow type	**Brief definition**
Anticyclonic (A)	Anticyclones centred over, near, or extending to the British Isles.
Cyclonic (C)	Depressions stagnating over, or frequently passing across, the British Isles
Westerly (W)	High pressure to the S and low pressure to the N
North-westerly (NW)	Azores anticyclone displaced NE towards the British Isles or N over the Atlantic to the west of Britain
Northerly (N)	High pressure to the W and NW of the British Isles. Low pressure over Scandinavia and the North Sea
Easterly (E)	Anticyclones over Scandinavia extending towards Iceland. Depressions over the eastern North Atlantic
Southerly (S)	High pressure covering central and N Europe. Atlantic depressions blocked west of the British Isles or travelling N or NE.

Table 2

Classification of days in June 1997 according to Lamb airflow types. The regionally aggregated rainfall totals under each type are also shown together with the equivalent daily mean values.

Airflow type	W	N	NW	E	S	C	A
Number of days	1	2	0	5	4	6	12
Rainfall total (mm)	5.0	22.9	0	59.3	30.5	23.0	12.0
Ave. daily rainfall	5.0	11.5	0	11.9	7.6	3.8	1.0

With these summary data in mind, attention can turn to those individual days that best exemplify the extremes encountered in the month (Figure 3).

1st-4th and 15th-18th: (Lamb type A - anticyclonic). These two periods mark spells of relatively dry weather. All eight days were classified as airflow type A, anticyclonic. Such conditions bring dry weather to all regions that fall within the range of the anticyclonic (high pressure) system. Anticyclones were most marked at the start of the month when the focus of high pressure lay to the north of Scotland, spreading settled and dry weather to most of Britain. The other period of dry weather, between 15th and 18th, was the result of high pressure centred to the west of Ireland but extending its influence towards Britain. This also brought mostly dry conditions but convective, thundery outbreaks over the warm land surfaces were occasionally of sufficient vigour to overcome the stabilising influence of the anticyclone.

On the other hand, the wettest days stand out clearly in Figure 3 as 11th, 25th and 30th, which between them accounted for forty-three per cent of the region's monthly total. On each of these days the weather was dominated by active low-pressure, cyclonic systems the centres of which lay to the south of the region and were thus favourable for winds from between north and south-east. All three however were of different Lamb airflow types and provide good examples of their individual importances for the region's rainfall and its distribution.

11th June: (Lamb type E – easterly). On this day a depression had advanced slowly from the south-west (Figure 4). An occluded front extended southeast-to-northwest across England and was moving northeastwards with the depression. This is a typical situation for heavy precipitation ahead of the front across most of eastern England. The cyclonic easterly winds that this disposition of weather systems creates are responsible for some of the region's wettest weather. The strikingly similar examples from September 1976 and November 1984 have been described respectively in Sharp (1993) and Wheeler (1985). In winter the same situation produces snowfalls (Wheeler 1991; Sharp 1993). On this occasion the heaviest falls were situated over a broad, east-facing area of rising ground on the slopes of the Cheviot and Border Hills and the middle reaches of the Wear and Tees valleys (Figure 4). Rainfall was less marked over the lower ground of the Tyne valley between these two areas. But despite this locally strong orographic influence, the rainfall declined westwards as the ground rose further towards the highest reaches of the Pennines.

The prevailing depression continued its slow northward movement on 12th and 13th but diminished rapidly in vigour although the easterly airstream continued to provide plentiful rainfall over the next few days (Figure 3), which by mid-month had already accumulated to the month's normal total.

25th June: (Lamb type S – southerly) On this occasion the dominant depression approached more rapidly from the west before taking a south-eastward course across the Midlands. The winds were light southerly to south-easterly ahead of the advancing system and its associated fronts. This is also a situation which produces poor weather in the north-east of England and rain duly fell over a twenty-four hour period beginning at 0830GMT on 25th. Figure 5 shows a large area of the middle Tees and Wear valleys lying within the 30mm isohyet but, once again, the rainfall decreased towards the highest ground further west. In addition, the Cheviot Hills,

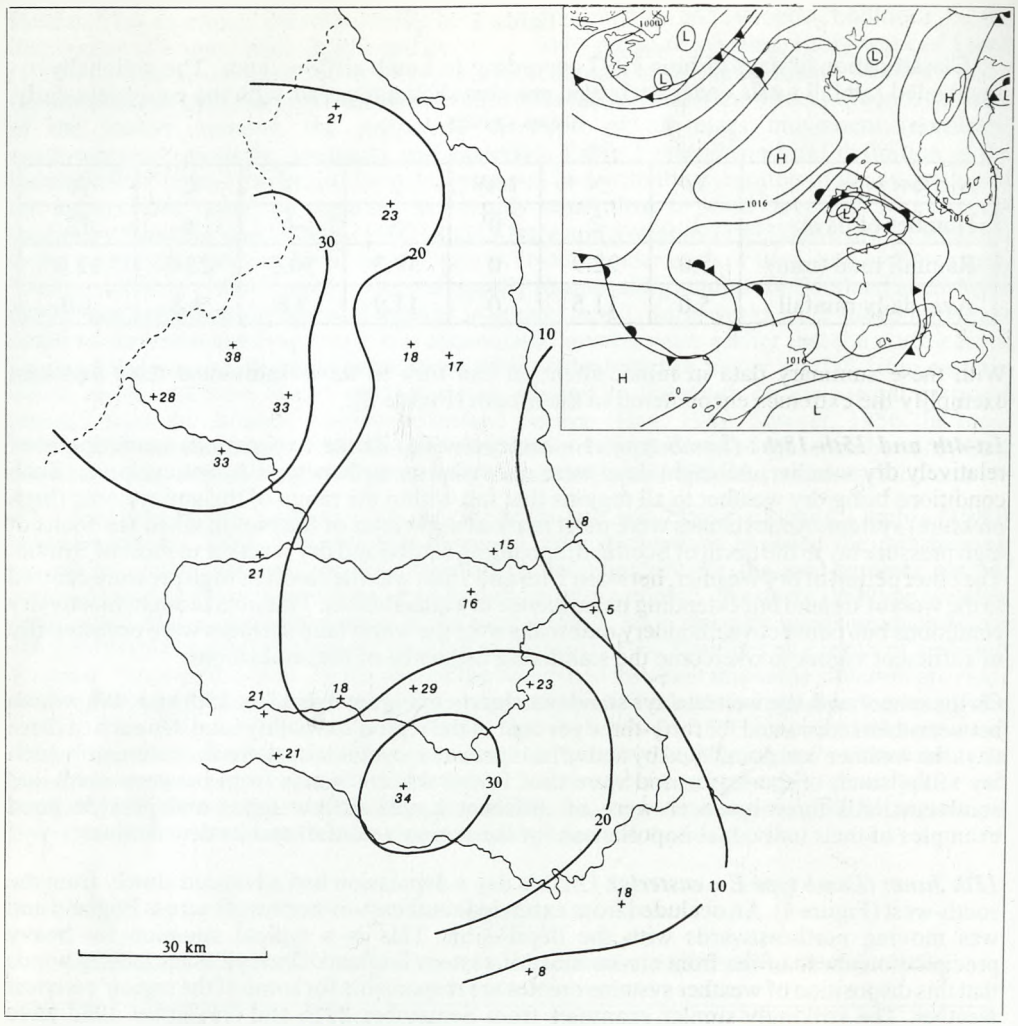

Figure 4 Regional rainfall (in mm) on 11 June 1997. Inset: synoptic map for 1200GMT. *Note*: figures 4-6 present generalised isohyets based on the twenty-two point observations marked on each map. *Inset by courtesy of the Royal Meteorological Society.*

now enjoying a degree of relative shelter in the southerly airstream, experienced very little rainfall (in contrast to the situation in easterly conditions).

Following its rapid advance eastward, the depression became near-stationary over the southern North Sea on 26th, unable to make further progress against high pressure over Scandinavia and Europe. In this position it sustained a north-easterly airstream across the region with persistent heavy rain. The 27th and 28th were the region's fourth and fifth wettest days of the month (Figure 3). Rainfall diminished only on 29th as the system weakened.

***30th June (Lamb type N)*:** The near-absence of rainfall on 29th proved to be only a temporary respite, and on the 30th the depression re-established itself while high pressure developed to the west of Ireland. The intensified northerly airflow that resulted from these two centres of action brought another day of heavy rain to the region. The distribution of rainfall on this day (Figure 6) differed notably from that of 11th and 25th. There was no evidence of any significant

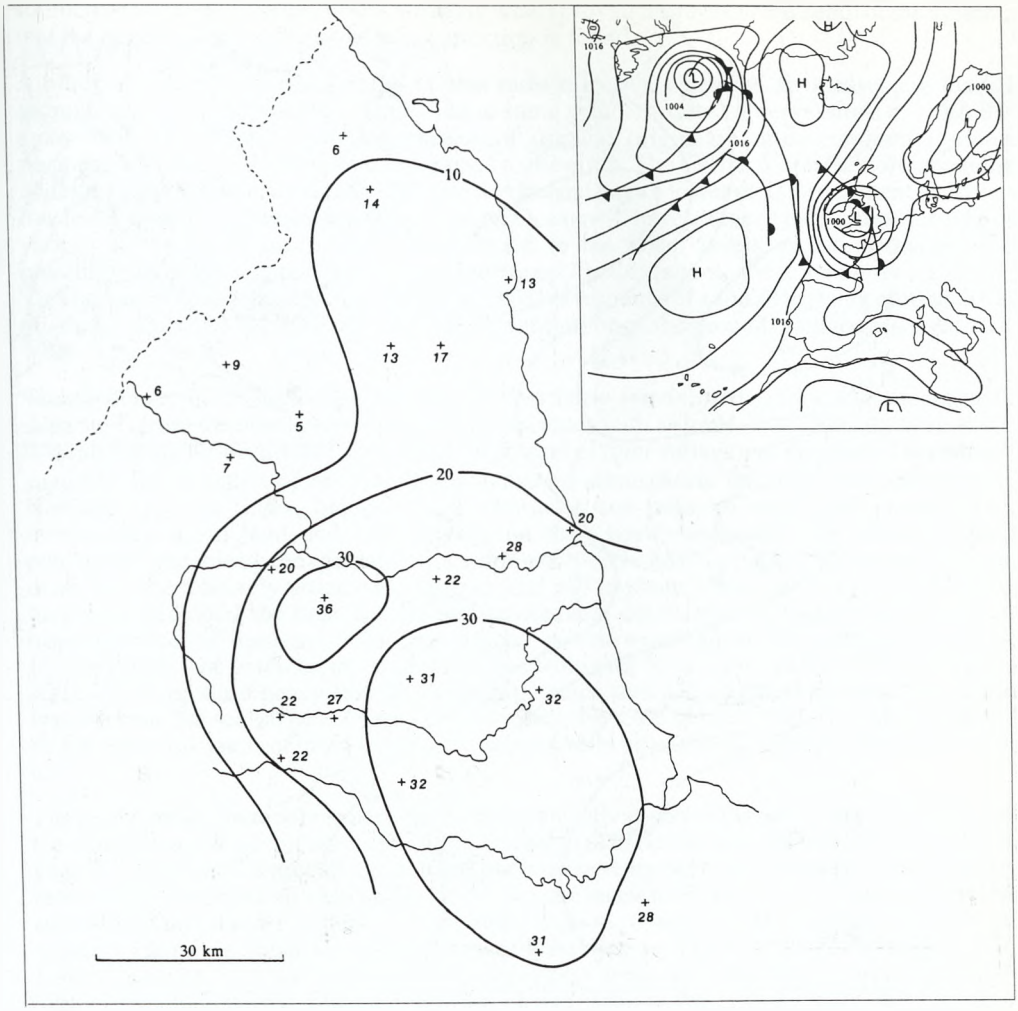

Figure 5. Regional rainfall (in mm) on 25 June 1997. Inset: synoptic map for 1200GMT. *Inset by courtesy of the Royal Meteorological Society.*

orographic control on the rainfall and high and much middle ground escaped with little rain. The area of heaviest rainfall extended along the coastline from just south of Berwick to Hartlepool, all of which lay within the 30mm isohyet. Some parts of the Northumberland coast and the Aln valley had over 40mm of rainfall. There was a slight secondary peak over the high ground of upper Redesdale and the wet weather also extended along the low ground of the Tyne valley in a reversal of the pattern noted for 11th. In contrast, the heights of Widdybank Fell, for example, had only 6mm on this day. This pattern, with the highest falls on low-lying and coastal areas, is similar to that found by Weston and Roy (1994) in their study of the geography of rainfall over Scotland under a northerly regime.

RAINFALL PROCESSES AND MECHANISMS

One of the abiding characteristics of the long-term British rainfall, and a feature recognised since the earliest days of scientific climatology, is the regular increase of rainfall with altitude. This characteristic is well-developed to the west of the Pennines ridge, which faces the

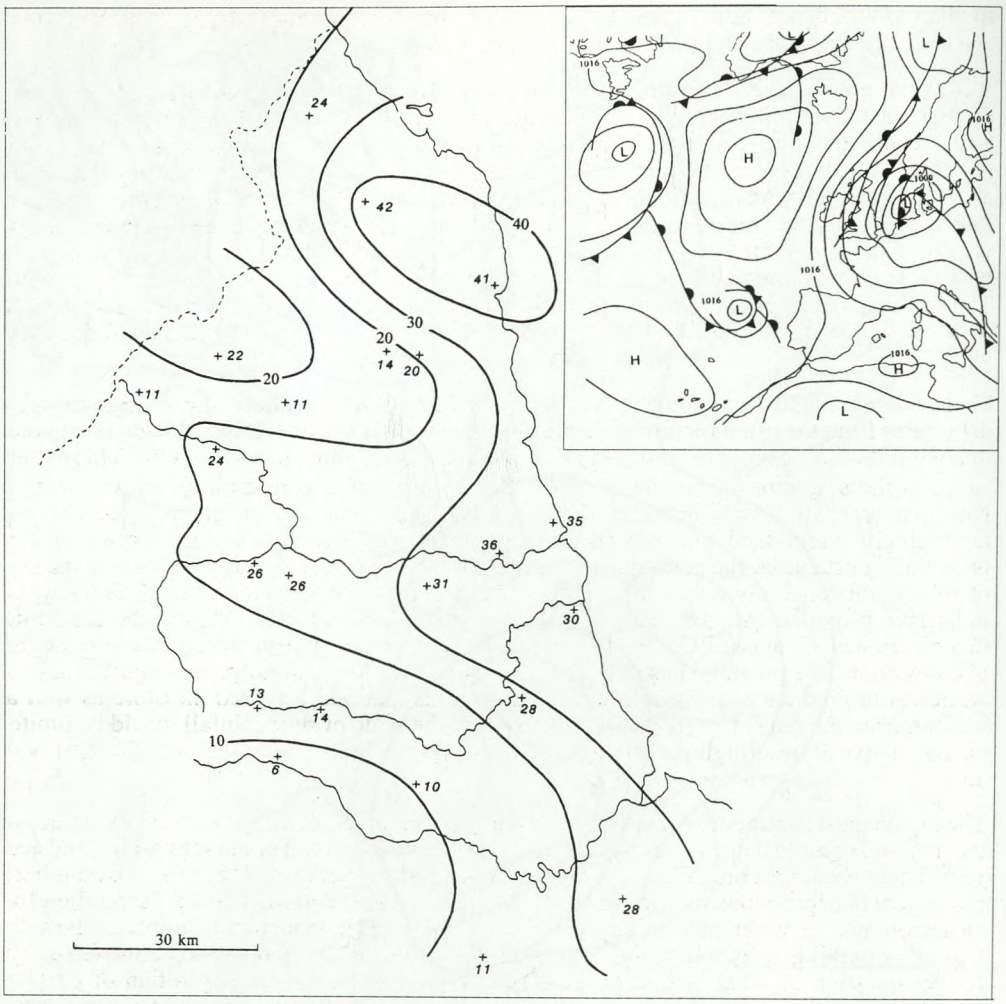

Figure 6 Regional rainfall (in mm) on 30 June 1997. Inset: synoptic map for 1200GMT. *Inset by courtesy of the Royal Meteorological Society.*

dominant westerly winds, but is less marked to the east. It is nonetheless identifiable in the Northumbrian region and Wheeler (1990) has described the close relationship between altitude and long-term average rainfall. Yet in all three above, short-term examples from June 1997 this link is obscure. This tendency for occasional departures from the long-term picture has not been described in earlier works, with the notable exception of Jackson (1969). But why should it occur? A number of factors can be distinguished in answer to this question. Douglas and Glasspoole (1947) and Sawyer (1956) identified one of the principal requirements for altitudinal enhancement of precipitation to be a positive wind profile throughout the depth of the prevailing air mass, i.e. the wind direction should be the same throughout the lowest 10km or so of atmosphere above the region in question. Such consistency of wind direction cannot be sustained to the north, west or east of depressions. This is a result of the changing character of air circulations with height; low-level air always circulates in an anticlockwise manner about depression centres. At the same time the upper level winds usually retain a more westerly character being part of the powerful upper westerly circulation that characterises the mid-latitudes at heights greater than 5km (Wheeler and Mayes 1997). Thus it is only on the

southern side of depressions, where westerly winds prevail throughout the depth of the system, that the necessary consistency of wind direction is found.

Altitudinal enhancement of rainfall is also most effective when the air masses are humid throughout a great part of their depth. These same southern sides of depressions are also the areas where the deep, moist air masses of tropical origin are most commonly found juxtaposed to the cooler and drier air masses to the north. The air masses on the northern sides of depressions are more commonly of polar origin and have a lower moisture content except at low level where evaporation from the Atlantic Ocean will have changed their character. These various factors combine to limit precipitation to the lower levels, reducing thereby the possibility of heavy rain continuing with further uplift of the air into the drier overlying layers. This fact helps to account for the initially productive response of rainfall to rising ground in the on-shore winds of 11th, 25th and 30th but its diminution as the ground continued to rise to the west.

The evidence of 30 June suggests that the northerly winds produce the most significant departures from the usual picture of rainfall increases with altitude. It has already been noted that rainfall was concentrated along the low ground of river valleys and the coast. This pattern suggests the operation of another factor – that of atmospheric instability and convection. Northern type air flows, being cool in character and polar in origin but passing over increasingly warm land and sea surfaces on their southward paths, are often rendered potentially unstable by the consequent warming of their lowest layers. In this case the passage of air over the relatively warm mid-summer land and in-shore water surfaces of Northumbria may have provided the heat energy and consequent convection to trigger the instability inherent in such air masses. Cooler, higher level, ground would not encourage the same degree of convection. The potential instability realised within the lower atmosphere would have been sufficient to produce heavy rainfall in the airstreams that had acquired moisture as well as warmth from the sea surface. Once again however the scale of such rainfall would be limited by the relative dryness of the overlying air which would be unable to sustain rainfall over wide areas.

The region most commonly experiences westerly winds as part of the great circulations around the hundred or more depressions passing to its north over Scotland or the seas off Iceland each year. These westerlies prevail, on average, for over seventy per cent of the year. The southerly movement of depressions seen in June 1997 (see the insets to Figures 4-6) represents therefore an uncommon summer pattern and provides a good, if unwelcome, example of how the region's rainfall is sensitive to such unusual behaviour on the part of the atmosphere. The further question of what factors govern departures from the usual disposition of pressure systems must, however, remain unanswered and goes to the very heart of much present research in climatology. Glib attributions to 'the greenhouse effect' or to El Niño events in the central Pacific Ocean are, upon close examination, neither convincing nor readily substantiated by our current understanding. It is however interesting to note how possible global scale processes produce significant changes at the local and regional level, a sure indication that any future changes in the world's climate that might take place may well reveal themselves in unexpected ways at smaller scales.

SOME CONSEQUENCES OF THE MONTH'S RAINFALL – AN ENVIRONMENTAL POSTSCRIPT

It is inevitable that such unusual weather events should have wider repercussions. The Water Companies, increasingly aware of growing demands set against a seemingly diminishing resource, took some comfort from the heavy rainfalls. However the effect on bird life was detrimental in the extreme. The mortality amongst coastal species was high to a degree not seen in recent years. The effect on nestlings was acute. Puffin *Fratercula arctica* colonies were literally drowned out as water tables rose through the month and occasional heavy individual falls flowed into the burrows containing the year's fledglings. The Farne Islands' warden estimated fledgling and egg losses to be almost sixty-seven per cent among the 34,700 breeding pairs. Kittiwakes *Rissa tridactyla* did little better with sixty per cent losses among the

area's 6,100 pairs. Guillemots *Cepphus grylle* suffered losses of approximately 5,500 chicks and eggs (Bowman and Hodgson 1998). The heavy rainfall certainly helps to account for the puffin mortality while the 'waterfall' conditions described by observers to have been seen over the cliffs in some areas account also for the losses among cliff-breeding species. However, the persistently strong on-shore winds from south through to north, sometimes reaching gale force, not only provoked the rainfall but unquestionably hindered feeding by the adult birds, leaving many of them exhausted and vulnerable.

This grim picture was repeated along the north-east coast of England as far south as Bempton Cliffs in East Yorkshire where ninety per cent of the year's guillemots perished. Scottish sites were less seriously affected. Such losses were unprecedented but may not, in the long run, prove to be a serious problem as the breeding birds tend to return for the following seasons and only when the 1997 birds have entered the breeding population will the more persistent consequences be registered.

The consequences for inland species may have been only marginally less serious. For example, a regularly-monitored site near Rowlands Gill showed that only one of four nests of swallows *Hirundo rustica* had survived while at the Derwent Walk Country Park the number of successfully fledged great tits *Parus major* fell by nearly fifty per cent from its 1996 total (Durham Bird Club, personal communication). The low temperatures and unsettled character of much of the month would also have hindered feeding by these, and other, species.

ACKNOWLEDGEMENTS

The author acknowledges the kindness of the staff at the Newcastle Weather Centre and of Rachel Merrix of the Environment Agency for the provision of weather data. Keith Bowey (Durham Bird Club) and John Walton (National Trust Property Manager for the Farne Islands) provided the ornithological information. John Sharp (formerly of the Geography Department, University of Newcastle upon Tyne) was kind enough to comment on an early draft of this paper.

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Original contributions relating to the geology, flora, fauna and ecology of the north-east of England and connected historical studies will be considered for publication in the *Transactions*. These may take the form of extended articles or short notes. Papers (which should be sent to the Editor, The Natural History Society of Northumbria, The Hancock Museum, Newcastle upon Tyne NE2 4PT) are accepted on the understanding that they are not being offered in whole or in part to any other journal. All the authors should sign the covering letter. Submissions must conform to the style of the journal and will be subject to expert review which may require revision of the manuscript.

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RED DATA BOOK FOR NORTHUMBERLAND 1999 SUPPLEMENT AND ERRATA

Edited by LISA KERSLAKE

TRANSACTIONS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBRIA

Volume 58 Part 4

THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA
THE HANCOCK MUSEUM
NEWCASTLE UPON TYNE NE2 4PT
1999

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Front cover: the woodcut of sea holly *Eryngium maritimum* (on the left) is taken from William Turner's *A New Herball* of 1551. It is one of very few in his book not copied from Leonhardt Fuchs's *De Historia Stirpium* (1542), but the field eryngium shown for comparison was a (poor) copy of Fuchs's illustration. The unknown artist failed to show the sessile habit of the leaves. Turner wrote 'Eringium is a common herbe in many places of England by the sea syde. It is called of the common people se hulver or see holly'. It has recently been rediscovered at Alnmouth after being thought extinct in the county.

ISSN 0144-221X

Printed by Pattinson and Sons, Newcastle upon Tyne

Trans.Nat.Hist.Soc.Northumbria **59**:183-192 (1999)

RED DATA BOOK FOR NORTHUMBERLAND: 1999 SUPPLEMENT AND ERRATA

INTRODUCTION

D Gardner-Medwin

The *Red Data Book for Northumberland* was issued jointly by the Northumberland Wildlife Trust and the Natural History Society of Northumbria in 1998.

Almost inevitably a few errors, both typographical and factual, were subsequently discovered in so complex a document. We apologise for these. They are corrected in the errata section in Chapter 1.

One of the purposes of the Red Data Book was to challenge naturalists to find new information about the distribution and population status of the wildlife of Northumberland. We hoped that they would prove us wrong where we had said that species were rare or threatened when this was not so; would find species in areas where they had not been recorded before or where they had not been seen for many years; or, sadly, in some cases, would add evidence that species omitted from the Red Data Book were indeed under threat and ought to have been included. We are glad that readers have begun to rise to this challenge, particularly in relation to the information we provided on the fish of the county, and are very grateful to Mr David Hall for working with Ms Lisa Kerslake and Dr Judy Foster-Smith to revise the section on fish. These changes are presented in Chapter 2.

Similarly, several new records have made it necessary to revise the section on vascular plants. In addition, the publication of the third edition of the *British Red Data Book* for vascular plants (Wigginton 1999) has altered the official conservation status of certain plants. Dr Angus Lunn has collated the necessary changes to the Northumberland RDB, in Chapter 3. Finally, some additional, updated and corrected references are added.

No doubt other errors may be discovered in the future and it is quite certain that there will be no end to changes in the ecology of the region, to the risks and dangers, both natural and man-made, to which the local flora and fauna are subjected, or to the responses that they make to those dangers. So we expect to need to add further supplements and revisions of the Red Data Book as time goes on. We welcome suggestions for these and especially any well documented evidence that contradicts or supplements the information it contains.

In the Red Data Book we used the short, middle and long lists of the *UK Steering Group Report* in defining selection criteria and conservation status. Since then, English Nature (1998) has reclassified the species on the short and middle lists as 'priority species' and those on the long list as 'species of conservation concern'. The codes in the book and this supplement should be read with this in mind.

ADDITIONAL CONTRIBUTOR

Mr David Hall has studied the natural distribution of freshwater fish in Northumberland for many years, collecting data on ponds, lakes, streams and rivers from the Tyne to the Tweed. He is a regular contributor on the subject to the media and he wrote the chapter on freshwater fish for the book *North Country* which accompanied a television series. He was the first individual representing freshwater fish in general to be invited to sit on the Fisheries Committee of the then Northumbria Water Authority and went on to advise and serve on the same committee with the National Rivers Authority and the Environment Agency. As well as the study of fish he is interested in the art of fishing and writes a weekly angling column in *The Journal* newspaper and features in a twice weekly BBC Radio Angling Programme.

CHAPTER 1

ERRATA

Floating key Change ***RDB R*** to ***R***

Page 42 Change *Heather Weatherill* to *Hazel Weatherill*

Page 76 The grey seal entry should read:

The population in UK waters is of international importance, being 50-74% of the world population and 95% of the European population. The species is threatened by a variety of fishery interests. It is listed on Annex II of the EU Habitats Directive *as being of Community interest.*

There is a breeding population of approximately 4000 individuals on the Farne Islands, the most important breeding site in England. This population represents 3.5% of the UK population, 3.3% of the EU population and 1.7% of the world population.

Page 85 Corncrake:

replace *one breeding record* with *one suspected breeding record.*

Page 233 Sea spleenwort *Asplenium marinum*:

delete *Holy Island.*

Page 287 *Sticta limbata*:

change *Roddam Dene* to *Roddam Dean.*

Page 297 NATURE CONSERVANCY COUNCIL 1989:

for the correct title see the Reference list below.

Page 321 Change *Weiss ia* to *Weissia* and

delete *[Weissia controversa]* var. *densifolia* 260 267.

CHAPTER 2

FISH

R D Hall, L J Kerslake and J L Foster-Smith (marine species)

Information relating to fish in the county, particularly freshwater species, is limited because documented records are relatively hard to obtain. Davis (in prep.) has summarised the available data on marine fish. Electro-fishing surveys carried out by the Environment Agency (formerly the National Rivers Authority) since 1991 have supplied some data, mostly relating to salmonid species. Much of the following information originates from local anglers.

Species Action Plans have been proposed only for species which occur on the *UK Steering Group Report* short list (1995).

Fish species were selected for inclusion according to the following criteria:

H Listed on Annex II or IV of the EU *Habitats Directive* (EEC 1992)

L Listed on *UK Steering Group Report* long list; 'of conservation concern' (EN 1998)

M Listed on *UK Steering Group Report* middle list; 'priority species' (EN 1998)

S Listed on *UK Steering Group Report* short list; 'priority species' (EN 1998)

W Protected under Schedule 5 of *Wildlife and Countryside Act* 1981

Wp Partial protection under Schedule 5 of *Wildlife and Countryside Act* 1981

NR Rare in Northumberland.

Species		Criteria/status
Lampern	*Lampetra fluviatilis*	**H L**

Habitat: rivers, estuaries and inshore waters.

A much rarer species than the brook lamprey but still present in the county. Recorded in the Tweed, Coquet, Blyth and Tyne, as well as offshore off Blyth. Recent records include those from the River Tyne during the 1980s and early 1990s and from the River Blyth between 1992 and 1995.

Brook lamprey	*Lampetra planeri*	**H L**

Habitat: gravel beds of rivers and streams.

A local species, never common but suspected to be in slight decline. Since mink became widespread the species has declined dramatically; the author (RDH) recorded one large nest on the Pont in 1991. Recorded from the Tweed in the late 19th century and other Northumberland rivers have fluctuating populations.

Marine lamprey *Petromyzon marinus* **H L**

Habitat: while young, muddy estuaries and rivers; later the sea, in shallow water to depths of 400m.

Nationally and locally rare; recorded in the rivers Tweed, Aln, Coquet and Blyth (1982, 1984, 1992, 1994, 1995) and Tyne (1973, 1980 and 1988) but nowhere common in the county. Almost always found in a dead or dying post-spawning state.

Basking shark *Cetorhinus maximus* **M W**

Habitat: open sea.

Until 1983 frequent sightings were made by local fishermen (Davis in prep.). Its more recent status is not clear but records are infrequent. Occasional sightings occur during the summer months. Recent records for the county include specimens caught off Embleton (1985), off Whitley Bay (1988), two off Newbiggin (1989) and off Cullercoats (1997).

The species has recently been included in Schedule 5 of the *Wildlife and Countryside Act* 1981.

Sturgeon *Acipenser sturio* **H M W**

Habitat: tidal rivers, estuaries and open sea.

A rare vagrant in north-west Europe. The latest record for Northumberland was a specimen landed and released in the river Tweed near Horncliffe by salmon netsmen in 1974.

Allis shad *Alosa alosa* **H S Wp**

Habitat: inshore waters, estuaries and tidal reaches of rivers.

Nationally rare but may be less rare in Northumberland than previously suspected. Specimens were recorded from the Blyth in 1983 and 1986. Discussions at the Regional Fisheries Advisory Committee in 1990 indicated that this species is caught fairly frequently but that its likeness to the herring might have caused it to go unnoticed (D Hall).

SPECIES ACTION PLAN REQUIRED.

Twaite shad *Alosa fallax* **H S Wp**

Habitat: inshore waters.

Nationally rare. Locally caught specimens were rarely seen at North Shields Fish Quay in 1976-82 (Davis 1983, Davis in prep.).

The species is being considered for inclusion on Schedule 5 of the *Wildlife and Countyside Act* 1981.

SPECIES ACTION PLAN REQUIRED.

Salmon *Salmo salar* **L**

Habitat: clean waters. Spawns in gravel beds in streams and rivers in upland areas, feeding in fresh water for up to three years before moving to the sea.

Found in all the major rivers in Northumberland, the Tweed, the Coquet and the Tyne being the most important. Legislation has recently been introduced to protect spring run salmon.

Houting *Coregonus oxyrhynchus* **M**

Habitat: estuarine and inshore waters.

Very rare; one record for the Aln estuary in 1966 and an unconfirmed record near Coquet Island in 1974.

Grayling *Thymallus thymallus* **L**

Habitat: clean, cool, well oxygenated rivers in hilly areas.

In Northumberland it is common; found in the Blyth catchment and the River Derwent; also widespread in the Cheviot rivers, including the Glen and Beaumont, and also the Tweed and Till.

Smelt *Osmerus eperlanus* **L**

Habitat: inshore coastal waters, estuaries and tidal reaches.

At times present in Northumberland in irruptive numbers but regarded as extremely rare in the region. Records this century show occasional groups of smelt in the Long Nanny burn near Seahouses. Abundant in the Tyne in the 18th century but had declined by 1890, possibly due to pollution. It returned to the Tyne in large numbers in 1990 and has been seen on occasions since, but with fewer fish each year, despite the Tyne remaining clean. This and recent reports from the river Blyth (1980s) suggest that there may be a recovery.

Rudd *Scardinius erythrophthalmus* **NR**

Habitat: meres and still waters.

Rare in Northumberland and appears to be declining nationally. No records at all for the county until an ornamental population was introduced into Bolam Lake.

Bullhead *Cottus gobio* **H L**

Habitat: swiftly flowing rivers and streams with stony beds. Usually lives hidden under rocks and large stones and in dense weed beds.

An apparent newcomer to Northumberland; found in a short stretch of the Wansbeck in 1996 and occasionally in the South Tyne. Common in North Yorkshire and found in Durham and Cumbria.

CHAPTER 3

VASCULAR PLANTS

A G Lunn

The changes listed in this chapter are the result of new records, new taxonomic information or changes in the conservation status of some taxa of vascular plants.

The information about new records is largely from Professor G A Swan, although some of them were reported to him by various individuals. Professor Swan is also responsible for the new information on the status of *Tricophorum cespitosum* (deergrass).

The changes in conservation status are required because the 3rd edition of the vascular plant *British Red Data Book* (Wigginton, 1999) adopts different criteria from the 2nd edition (which was used in assessing the status of plants included in the *Red Data Book for Northumberland*). The *British RDB*, following revised IUCN criteria, no longer uses restriction to 15 or fewer hectads (10km squares) as the main selection criterion, and instead takes into account decline, threat and population dynamics as well as distributional data. These new criteria, together with fuller information on national distributions, determine the need for some changes in our codes. (Other 2nd edition British RDB taxa, not itemised here, retain their RDB status in the 3rd edition.)

Asplenium trichomanes subsp. *pachyrachis* is added as a new Northumberland taxon.

There are now seven extant Northumberland taxa in the British vascular plant RDB. *Epipactis youngiana* is placed in the IUCN category of threat (for Britain) 'endangered'; *Alchemilla gracilis* is 'vulnerable'; *Diphasiastrum issleri, A. acutiloba, Eleocharis austriaca* and *Polemonium caeruleum* are 'lower risk (near threatened)'; *Asplenium trichomanes* subsp. *pachyrachis* is 'data deficient' (*i.e.* there is inadequate information to assess its extinction risk).

For convenience we reproduce here the codes from the *Red Data Book for Northumberland* which are used in this Supplement:

D Rapid decline in population and/or range in UK

Ii Internationally important population in UK

G Globally threatened

L Listed on the *UK Steering Group Report* long list; 'of conservation concern' (EN 1998)

NR Rare in Northumberland (but may be common elsewhere), occurring in eight or fewer 5km squares in the county

Pop Nationally important population

R Nationally rare (occurring in 15 or fewer 10km squares)

RDB Listed in the relevant national Red Data Book

Sc Nationally scarce (occurring in 16-100 10km squares)

ADDITIONS

Species **Criteria/status**

Equisetum hymenale* × *variegatum Mackay's horsetail **NR**

= ***E.* × *trachyodon***

There are now known to be two sites in Northumberland (A M Tynan, pers. comm.).

Asplenium trichomanes subsp. ***pachyrachis*** Lobed maidenhair spleenwort **NR RDB**

A recent first record for Northumberland, from Hareshaw Dene in deep shade on a vertical sandstone cliff with other calcicoles. Its British stronghold is in the Wye Valley (on the walls of strongholds).

Polystichum setiferum Soft shield fern **NR**

There is an additional record, from upper Coquetdale.

Atriplex glabriuscula* × *longipes Taschereau's orache **NR**

= ***A.* × *taschereaui***

The first Northumberland record of this coastal species has been reported from Warkworth.

Rosa arvensis Field rose **NR**

This species has been recorded in a third square, adjacent to the other two.

Alchemilla gracilis (now ***A. micans***) A lady's-mantle **NR Pop RDB**

An additional locality in the Widdrington area. The plant at this locality appears to be of a different form from those at the previously known Northumberland localities.

A. glomerulans A lady's-mantle **NR Sc**

There is a second record, although not recently confirmed, from west Northumberland.

Medicago arabica Spotted medick **NR**

There is a new record of this ruderal species, previously considered extinct in Northumberland, from Alnmouth.

Eryngium maritimum Sea holly **NR**

This species has recently been confirmed at its Alnmouth site. It should be deleted from the list of possibly extinct species on page 258 of the RDB.

SPECIES ACTION PLAN REQUIRED.

Lamium hybridum Cut-leaved dead-nettle **NR**

An additional site has been found in lower North Tynedale.

Juncus subnodulosus Blunt-flowered rush **NR**

An additional site has been found at Bamburgh.

Festuca arenariam Rush-leaved fescue **NR Sc**

An additional site has been found at Newbiggin-by-the-Sea.

Poa compressa Flattened meadow-grass **NR**

An additional site has been found at Northumberland Wildlife Trust's Littlemill reserve. This species is therefore now to be found in nine 5km squares in the county and should be deleted from the Northumberland RDB.

Catabrosa aquatica Whorl-grass **NR**

A new inland site has been found, near Belsay.

Tricophorum cespitosum Deergrass

Professor Swan has been working on *Tricophorum cespitosum* (Hollingsworth and Swan 1999; Swan 1999). *Tricophorum cespitosum* subsp. *germanicum* is very common (and widely dominant on blanket bogs) in Northumberland. The following, however, are four notable Northumberland taxa which are to be added to the county Red Data Book.

Tricophorum cespitosum subsp. ***cespitosum***. In the British Isles now known only from Northumberland (four 10x10 km squares) and from the Scottish Highlands (two squares). It occurs in the marginal areas of *Sphagnum* mires with base enrichment, including Muckle Moss National Nature Reserve and Gowany Knowe Moss (a Northumberland Wildlife Trust reserve).

Tricophorum cespitosum nothosubsp. ***foersteri***. The characteristic *Trichophorum* of raised and blanket *Sphagnum* mires in west Northumberland (the Border Mires etc). It is a sterile hybrid between the two subspecies. All extant British records are from, or immediately adjacent to, Northumberland. The more widespread form is **non-proliferous**. The **proliferous** form (in which some of the flowers proliferate to give green plantlets), however, occurs on at least seventeen Northumberland mires and is unknown, except as herbarium specimens, from elsewhere in Britain.

There is also a **proliferous** form of ***Tricophorum cespitosum*** subsp. ***germanicum***, known from only one extant British site, near Hareshaw Head in Northumberland. There are herbarium specimens of this taxon from five squares in the Scottish Highlands.

The four taxa qualify for the Red Data Book as follows:

Tricophorum cespitosum subsp. ***cespitosum*** **NR PopSc**

Tricophorum cespitosum nothosubsp. ***foersteri*** **(non-proliferous)** **Pop Sc**

Tricophorum cespitosum nothosubsp. ***foersteri*** **(proliferous)** **Pop Sc**

Tricophorum cespitosum subsp. ***germanicum*** **(proliferous)** **NR Pop Sc**

Rhynchospora alba White beak-sedge **NR**

This species is probably no longer at its Holburn site.

CHANGES IN CONSERVATION STATUS

Species **Criteria/status**

Diphasiastrum complanatum morphotype ***decipiens*** Yellow cypress clubmoss **NR RDB**

Delete **pRDB**, replace by **RDB**. The 3rd edition of the British RDB includes *Diphasiastrum issleri* but without showing a Northumberland record. Jermy, who contributed the account, considers (pers. comm.) that this is the Northumberland plant. (The omission of the record from the national RDB map was due to the long gestation period of the 3rd edition.)

Atriplex longipes Long-stalked orache **NR Sc**

Delete **RDB**, replace by **Sc**.

Alopecurus borealis Alpine foxtail **NR Sc**

Delete **RDB**, replace by **Sc**.

Hammarbya paludosa Bog orchid **D L NR Sc**
G Ii

Delete **RDB**.

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