THE
NATURAL
HISTORY
SOCIETY OF
NORTHUMBRIA

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THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA

1929-1979

by

GRACE HICKLING

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LIST OF OFFICERS: 1929-79

Honorary secretaries

C E Robson	1904-47†
G W Temperley	1930-51
Grace Hickling	1948-
R G Grey	1951-63
I M Telfer	1963-

Honorary treasurers

A H Dickinson	1888-1902 (*honorary secretary*) 1902-1946†
R P Winter	1946-62
J A Crisp	1962-70
D P Walton	1970-

Curators

T R Goddard	1923-48†
C E Fisher	1949-57†
A M Tynan	1958-

ACKNOWLEDGEMENTS

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1929-1979

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FOREWORD

In 1929, as part of the centenary celebrations, the then curator, T Russell Goddard, prepared his *History of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne: 1829-1929*. As its title implied, this dealt with the foundation and early years of the Society, the growth of the collections and the development of the museums, in particular the Hancock Museum; it also included brief accounts of the many eminent local naturalists to whose enthusiasm the Society owes so much.

For a considerable time I have realised the desirability of complementing Goddard's *History* with an account of the past fifty years, but it was the somewhat rash promise to give a talk on this subject, as part of the 150th anniversary celebrations, that provided the necessary incentive. Its main sources have been minute books, especially those of the Council, General Purposes Committee and Museum Management Committee, annual reports, and the Society's files which contain more detailed information. I have had access to press cuttings books, started in 1924, and maintained up to the present time. Finally, I have drawn on my own store of memories, which extend over a period of more than thirty years as honorary secretary and include my recollections of talks with Russell Goddard and Gladys Scott when they described the early years of the period: it is these memories that have provided the occasional anecdote with which I have tried to enliven an otherwise factual narrative.

Inevitably, because of the Society's involvement with the museum during the early years, I have dealt in detail with its affairs at that time. However, I have made little attempt to list the various important accessions and gifts received, nor have I described the numerous changes made in the exhibition galleries. The Hancock Museum will be 100 years old in 1984 and it is hoped that another history will appear at that time which will include all these matters, especially the quite revolutionary changes and improvements that have taken place in recent years under the guidance and inspiration of A M Tynan.

Finally, I should like to record my thanks to those more senior members of the Society who filled in gaps in my knowledge, to A M Tynan for his valuable and unstinting help, and last, but by no means least, to my friends Mrs Amy Hindmarsh and Mrs Margaret Patterson who have not only assisted in the preparation of the manuscript, but, more important, have given continued encouragement and advice on what should, or should not, be included.

INTRODUCTION

The past fifty years have seen very great changes in the Society, chief among them being that it has ceased to be an institution whose outlook was geared largely to the maintenance of a museum and its collections and become, instead, not only an orthodox natural history society, but one of the foremost of its kind in the country. Examination of early balance sheets shows that money spent on the Society activities as we now know them took very much of a second place to expenditure on the museum fabric and staff salaries, small though these latter were. Today, however, the Society tries fully to live up to its objects, namely 'the encouragement . . . of the study of natural history . . .; the protection of the local flora and fauna; the maintenance and extension of the Society's library; the publication of *Transactions* and other scientific papers . . .'

There has also been a significant change in the financial position, for after repeated crises, which extended over forty-five years, the Society is at last solvent. Linked with this is the virtual abbrogation of its responsibilities for the museum, the only exception being that three representatives of the Society are members of the Museum Management Committee.

In the early 1920's the Society was to some extent a 'gentleman's club' and an establishment where an officer's needy dependents might be given employment. This happened in the case of A E Bennett who, because of ill health, was forced to relinquish his job as cabinet maker with Robsons, the house furnishers. At that time, C E Robson was one of the honorary secretaries and, through his influence, Bennett was appointed caretaker, a post he held for thirty-one years.

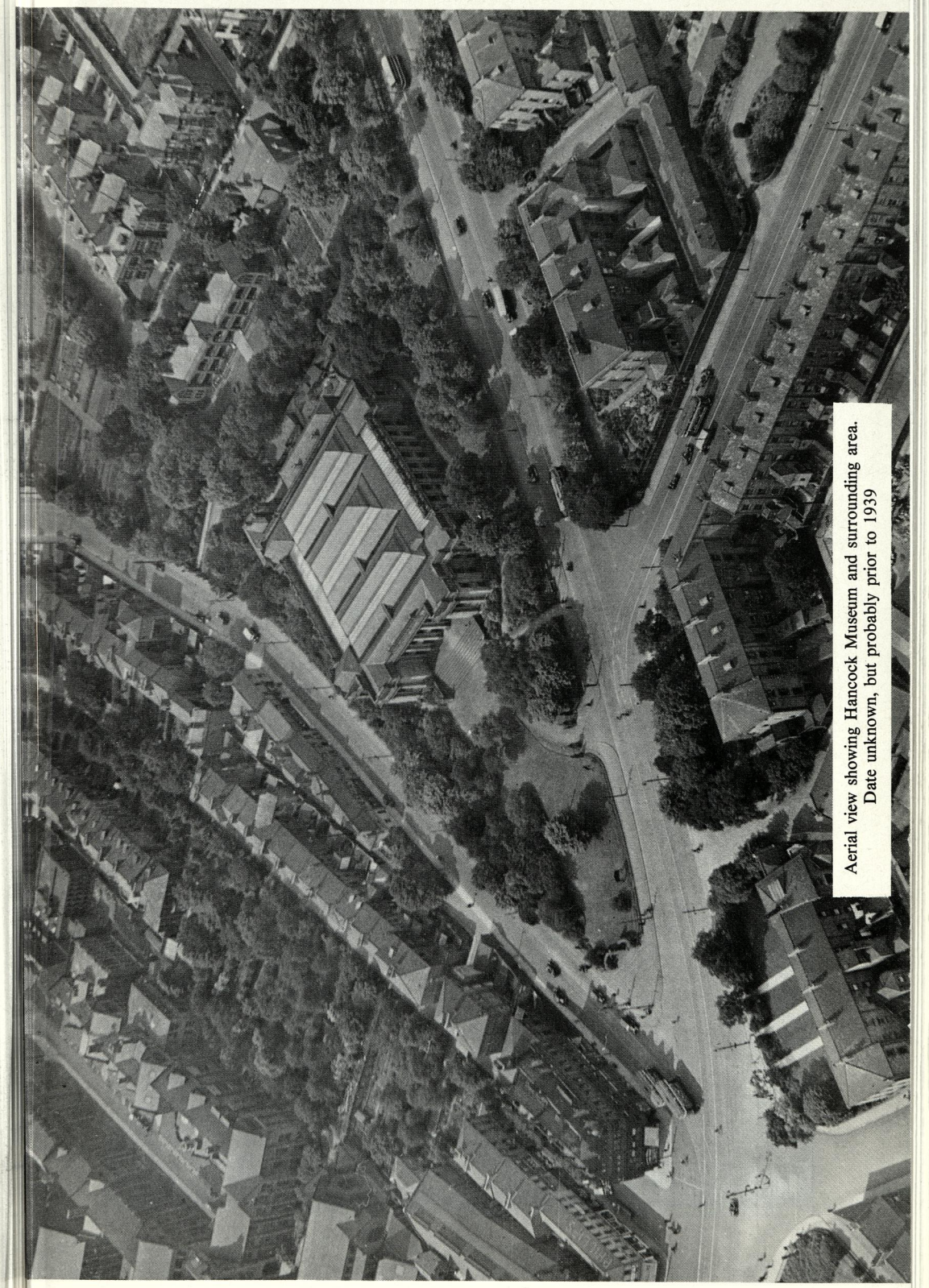
Vice presidents were considerably more numerous than at present – there were twenty-three in 1922 compared with ten in 1978-79 – and they were frequently appointed for their social position rather than for their services to natural history and the Society. From at least 1866 until 1930 the Lord Mayor (formerly the Mayor) of Newcastle upon Tyne appeared, each year, in the list of vice presidents and in 1954, when the subscription was raised, the author received a letter from the Earl of Durham's agent, explaining that because of financial hardship, his Lordship was not prepared to pay the increased amount, but would continue to send the original £1 0s 0d. Needless to say he could no longer be regarded either as a member or vice president.

The part played by the curator and the Society's officers in natural history matters has also changed. For nineteen years Goddard was the leading figure, for not only did he attend international conferences, but he was also a member of such bodies as the Farne Islands Local Committee of the National Trust, the council of the Chillingham Wild Cattle Association and the International Committee for Bird Protection Wildfowl Inquiry subcommittee. As a result, he was on familiar terms with many of the country's best known naturalists including Sir Landsborough Thompson, Miss Phyllis Barclay Smith, Dr John Berry and Sir Peter Scott. During the past thirty years the honorary officers, and through them the Society, have taken over this role, while the curator has developed his own place, both in the museum world, and in the wider sphere of natural history and conservation.

There seems little doubt that this situation affected G W Temperley's feelings towards Goddard. Temperley was a very competent all round naturalist, with a special interest in botany and ornithology, but his contacts were essentially local – he corresponded with experts, but had comparatively few opportunities to meet them personally. Furthermore, at a time when the museum had

very few staff, he undoubtedly resented, and with justification, the fact that while he himself gave many hours of his time to museum affairs, Goddard not only had various outside interests, but often did not appear at the museum until an hour or more after his own arrival.

The main events of the last fifty years are dealt with in the first three sections of this history while the final section 'Fifty years of change' has been divided into subsections in which are described the changes and developments that have taken place during the period. And finally, as a postscript, a brief account of the 150th anniversary celebration party has been included.



Aerial view showing Hancock Museum and surrounding area.
Date unknown, but probably prior to 1939

Evacuation of specimens, September 1939. In the foreground are S E Cook and A E Bennett (see page 10)

Caretaker's lodge, April 1965 (see page 25)

Hancock Museum floodlit, 28 November 1934 (see page 8)

AFTER THE CENTENARY

1929-39

The centenary was celebrated by two functions, both held on Thursday 17 October 1929. The main purpose of the afternoon gathering was to receive the congratulations of kindred bodies, and delegates from some fifty organisations delivered addresses. These included eight universities and university colleges, among them Oxford, St Andrews, Glasgow, London and Armstrong College, Newcastle upon Tyne; there were also six museums and twenty-five societies involved in various aspects of natural history. Representatives were welcomed by the president, Viscount Grey of Fallodon, while Lord Joicey and Lord Armstrong also spoke.

In the evening there was a reception in the museum, guests being received by the president. Light refreshments were provided and the programme included two talks, the first, Professor A Meek's 'Sketches of the earlier naturalists of the Society' and the second, Lord Grey's informal account of his waterfowl collection at Fallodon. The evening concluded, according to the printed invitations, with 'carriages at 10.30 pm.'

The total cost of these festivities was £123 12s 7d: this included £71 12s 6d paid to Tilley and Company for catering and £5 12s 3d for staff wages. Printing charges amounted to £29 6s 6d and it is interesting to discover that the printers were Bealls Limited, forerunners of the Society's present printers, J & P Bealls Limited.

Reference has already been made to Goddard's *History*. A thousand copies were printed at a cost of £286 13s 9d and these were sold (in hardback) at 7s 6d a copy (there was a concessionary price of 6s 0d for members). The Council's annual report for 1929-30 commented that 'this book should be in the possession of every member' and, in fact, the few remaining copies are still in demand today.

Unfortunately, the excitement of the centenary was soon submerged in the harsh realities of existence and, in particular, in the ever present need to obtain more income. Money raised as the result of a maintenance fund appeal in 1927 had been used for essential repairs as well as for general expenses, but by 1932 this was largely exhausted and in February of that year Viscount Grey launched a further appeal which stressed not only the desirability of an increased membership, but also the need for voluntary donations. The response, however, seems to have been poor for in July the Council was told that only £137 had been received. In the discussion that followed this announcement, it was agreed that, although there would be no reduction in the number of staff employed, all salaries (except those of charwomen) would be reduced from 1 July by 15%. An amendment proposing a reduction of only 10% was defeated.

Annual salaries at this time were T R Goddard £475, Miss G M Scott (assistant curator) £225, S E Cook (taxidermist) £170 and Miss Walker (typist) £110, while the caretaker, Bennett, received £2 12s 6d per week. It is interesting to speculate what would have been the employees' reaction had such a cut been enforced today! The cuts were in operation for over five years and even in 1937, when staff salaries were raised, the increases restored only half the original reductions.

In addition, it was suggested that both Northumberland and Durham education authorities should be asked to give yearly grants in recognition of the educational facilities provided by the museum (Newcastle Education

Committee had been making such a grant since 1929). Another proposal was that the Hawaiian feather helmet and cape might be sold and Dr A Wetmore of the United States National Museum was consulted as to its probable value. His reply indicated that it was worth about $5000, but, luckily, no further action was taken and so one of the Society's greatest treasures was saved.

Two other attempts to raise money must be mentioned although both were later abandoned. Early in 1932, it was decided, as part of the drive for increased membership, to publish a small leaflet *The Hancock Museum Bulletin* in which the work and activities of the Society were described: it was hoped that this bulletin would appear either quarterly or half-yearly. The first issue came out in April 1932, 1000 copies being printed at a cost of £11 10s 0d; it was sent free to members and the remaining copies were used for propaganda purposes. Unfortunately, it had a short life, only one more (No. 2, November 1932) being published.

The second attempt was, from the point of view of a learned society, decidedly unusual for in November 1933 Percy Ward proposed that a ball should be held in the Old Assembly Rooms; he himself offered to defray the cost of hiring these rooms. The idea was accepted and a small subcommittee appointed, but despite various tentative plans, including a promise from the Marchioness of Londonderry that she would receive the guests, the date proposed (20 February 1934) was considered unsuitable and it was decided to postpone the event until the following October. There is no further mention of this proposed ball, so it must be assumed that it was never held.

In July 1933, the treasurer gave warning of the critical financial position, saying that, despite economies, during the previous twelve months expenses had exceeded receipts by £245. He added that this deficit had been met by withdrawals from reserves and, as a result, only £125 now remained in these reserves.

An even more telling example of the desperate financial position is given by Goddard in the 1933-34 annual report when he points out that he had had only £9 8s 6d – less than 4s 0d per week – to spend on actual museum work such as preserving existing specimens, dealing with new accessions and so on.

It was in this situation that Professor H G A Hickling who, throughout his years in Newcastle, took a very great interest in the Society, outlined to Council a scheme, based on one in operation at the Manchester Museum, which would, he hoped, provide adequate funds.

Under this plan, the management would remain in the hands of the Council; this would, however, be expanded to include representatives of the City of Newcastle upon Tyne and of Armstrong College, both bodies being invited to give financial aid. It was emphasised that the museum would not be handed over merely as an exhibition gallery, but that scientific work would be safeguarded.

Members of Council agreed that the scheme was worthy of serious consideration and proposed to discuss it at their meeting in October 1933. However, probably because of Viscount Grey's death on 7 September, no action was taken and it was not until January 1935 that the possibility of obtaining public grants was again considered. A special meeting of Council took place on 30 January and, although several members supported Professor Hickling, there was by no means unanimous approval. Nevertheless, it was agreed that any plans likely to improve the Society's financial position must be investigated and, accordingly, a subcommittee was appointed to carry out this investigation and prepare a scheme to put before the Council at a future meeting. Three months later, apparently because it was

hoped that the proposed memorial to Viscount Grey might provide adequate capital, it was decided to postpone any action.

As already mentioned, Viscount Grey of Fallodon, who had been a member of the Society for twenty-eight years and president since 1924, died in September 1933 and six months later, in March 1934, the Council took the first steps to raise a memorial fund.

In the weeks that followed, however, it was learnt that some form of national memorial had been proposed and there was considerable discussion before Lord Grey's nephew, Captain C G Graves, agreed that, subject to the proviso that it must be confined to Northumberland and Durham, the Society's appeal could go ahead. The North Country Memorial was inaugurated by Lord Armstrong in October 1935 and a printed appeal letter, signed by Lord Armstrong, was sent out in January 1936.

The letter stressed the Natural History Society's serious financial position and explained that, shortly before his death, Lord Grey had decided to issue a personal appeal for an endowment fund which he himself thought should not be less than £20000. It had, therefore, been decided that the main purpose of the appeal would be to provide this endowment; at the same time a suitable memorial tablet would be placed within the Hancock Museum. (In the event, no tablet was erected in the museum; instead, an inscription was carved on the outer wall, to the west of the entrance steps, and this was unveiled by Earl Grey of Howick on 9 February 1937.)

By early November 1935, £5126 had been received (including two anonymous donations, one of £1000 and the other of £2000) and the final total amounted to £7717; this was invested in a trust fund.

In January 1936, Mr Stanley Baldwin, the then Prime Minister, launched a national memorial scheme intended to commemorate Viscount Grey both as a statesman and naturalist. It was proposed to erect a statue or bust in a central part of London and, of special interest to northcountrymen, to purchase Ros Castle, overlooking the park at Chillingham, and hand it over to the National Trust. The third proposal, namely the formation of a permanent institute of bird studies at Oxford, resulted in the Edward Grey Institute of Bird Studies, a department of inestimable value to ornithologists.

From the Society angle, the endowment fund went some way towards easing the financial situation, but there were still difficulties. The annual report for 1938-39 mentions the heavy cost of museum maintenance and adds that 'the rate of interest on trust funds is so low that even with this addition to the income, it is still insufficient to meet normal expenditure'. Nevertheless the outbreak of war meant that the matter remained in abeyance and it was not until 1945 that the question of negotiations with outside bodies was again raised.

Having dealt with Viscount Grey's death, it is appropriate to mention some of the other distinguished members who died during this decade. Perhaps the best known was George Bolam whose death occurred suddenly, and unexpectedly, on 25 October 1934. To the ornithologist, Bolam's name will always be associated with his *Birds of Northumberland and the eastern borders,* published in 1912, and the later 'A catalogue of the birds of Nortumberland' which, as described on page 36, appeared in the *Transactions* in 1932. His interest was, however, not confined to birds for he was the author of *Wild Wales,* a general account of nature in that country, while in his papers in the *Transactions* he dealt with subjects as varied as bats and snails. He was without doubt a perfect example of those enthusiastic amateur observers whose work has, in the past, done so much to advance the study of the

natural history of the area. Lord Joicey, who died in 1936, had joined in 1888 and served as president from 1910 to 1924 while Sir George Noble's period of sixty years of membership (from 1877 to 1937) was one of the longest ever recorded.

Finally, mention must be made of G E Henderson, a trustee of the Society, and undoubtedly one of the northeast's greatest benefactors. He gave very large sums to what was then Armstrong College and the present Henderson Hall commemorates these gifts; moreover, it is virtually certain that he was the source of the very welcome anonymous donations received by the Society on various occasions, while in his will he bequeathed £1000. With their neatly trimmed white beards and immaculate clothing, he and his brother, W F Henderson, were unforgettable figures and their joint period of membership totalled one hundred years – a record that is unlikely to be broken.

It is quite impossible to describe all the work involved in maintaining the collections, but mention must be made of Temperley's reorganisation of the herbaria. In 1933, he volunteered to overhaul the various miscellaneous herbaria, amalgamating them to form a local reference collection. Initially, the Winch herbarium was to be excluded from this rearrangement, but it was later agreed that its inclusion in the general collection of British plants would increase its usefulness.

At the same time, it was decided that the Pallas collection of foreign plants which, it was alleged, had probably not been consulted for more than fifty years, should be offered to the British Museum (Natural History). The gift was accepted with gratitude, for the Director, Dr Tate Regan, explained that it comprised many species missing from the museum's own herbarium of Pallas' plants and as such was of great value.

Some nineteen years elapsed before Temperley's work for natural history was officially recognised in academic circles (he received an honorary degree in 1952), but in June 1932 the University of Durham conferred the degree of MSc, *honoris causa*, on his colleague, C E Robson. Three years later, in 1935, the curator, T R Goddard, received a similar honorary degree.

Today, the nightly floodlighting of the museum is very much taken for granted, but in the 1930s it was a new venture, undertaken only to mark a national event. The first of these was the wedding on 29 November 1934, of Prince George (later the Duke of Kent) and Princess Marina, and the Newcastle and Gateshead Gas Company carried out the operation without charge to the Society: the Company installed similar lighting for King George V's Silver Jubilee on 6 May 1935 and for the coronation of George VI in 1937.

It was also decided to open the museum free to the public between 1100 and 1600 on the actual wedding day and the result was incredible – some 4817 people passed through the turnstile, at the rate of nearly 1000 an hour, a figure equivalent to one third of the average yearly attendance! Indeed, so great was the ensuing crush that Goddard had to telephone for police assistance in controlling the crowd and a sergeant and two constables were actively employed in keeping visitors on the move.

The last major social event of the period was the reception, held on 8 July 1937, for delegates attending the 48th annual conference of the Museums Association. Some 250 guests were received by the patron, Lord Armstrong, and Lady Armstrong, and it is interesting to discover that A H Dickinson, the honorary treasurer and a member of the local reception committee, had also held office in 1895, when the association had last met in Newcastle.

With 1938, came the threat of war. Early in the year, Goddard was asked to

consult the Museums Association about possible air raid precautions and, as a result, it was decided not only to overhaul and augment the fire fighting equipment, but also to list the most valuable specimens and make plans for their possible evacuation. Later, a trench was dug in the grounds for the accommodation of the staff, but this suffered from flooding and had to be pumped out at regular intervals. After Munich, the specimens were reinstated in their cases, but it was an uneasy peace and efforts continued to ensure the safety of the collections in the event of war.

THE WAR YEARS AND AFTER

1939-48

The declaration of war on 3 September 1939 made vast changes not only in the lives of individuals, but also in organisations such as the Society. During August 1939, as the threat of war loomed larger, precautionary measures were reactivated and on 29 August an emergency Council meeting was held at which it was agreed that, in the event of war, the closing of the museum should be left to the discretion of the honorary officers. On 3 September, the officers decided on immediate closure and this remained in force until early May 1940 when the building was re-opened to the public from 1300 to 1700 on weekdays. The prohibition had not extended to members of the Society who had been allowed access from 1100.

The emergency Council meeting also decided to appoint a subcommittee to handle the details of providing for the safety of the collections. Fortunately, in late December 1938, Goddard had written to the directors of the British Museum and the British Museum (Natural History) for advice; he asked particularly if it would be possible to store irreplaceable articles such as the immature great auk and the Bewick drawings with the national museums' own treasures. In reply, he was told that, while the natural history museum would, in certain circumstances accept the great auk and one or two other objects, the consensus of opinion was that it was wiser to disperse important specimens.

Accordingly, during the latter half of August 1939, various items were removed from display, or storage, and very carefully packed in strong cases and 'no nail' boxes, all lined with damp-proof paper and containing suitable preservatives. Among them were many of the unique Maori specimens, the Bewick drawings, Albany Hancock's drawings of nudibranchs, the Atthey and Hutton collections of Coal Measure fossils (including type and figured specimens), all other type specimens in the museum, and birds such as the great auk, passenger pigeons and other examples of extinct or very rare species. The Society's minute books, dating from 1829, and a complete bound set of the *Transactions* as well as other valuable documents, were also packed ready for removal.

The actual removal took place, by lorry, between 1 and 15 September; fifty-seven cases went to Cragside, home of the Society's patron, Lord Armstrong, where they were stored in the Gilnochie Tower, while a single case, containing the great auk's egg, was lodged in the cellar of Dr Wilfred Hall's house at Hepple Woodside, near Sharperton. Some two years later many of the rare books were removed from the library and housed with certain members who lived in the country.

In 1945, when the war had ended, all the boxes were returned and, although it was some time before unpacking and reinstatement in cases was completed, the contents were found to be in first class condition. Nevertheless, the unpacking was not without its anxieties, for in the late 1950s, when the author enquired about the whereabouts of the dried Maori heads, no trace of them could be found. These heads are, of course, extremely valuable although hardly attractive and, when she pursued her enquiries, it was suggested that the probable explanation of their disappearance was that Goddard's successor as curator, C E Fisher, who apparently disapproved of the display of human remains in this form, had given them decent burial! Luckily, this idea proved incorrect and the box containing the heads was later found hidden

away. The next step was to protect the remaining specimens and, where possible, the building. Windows were boarded up, wire netting fixed to the underside of the glass roof and boards placed over the desk cases to protect them from falling debris. Subsequently, much inflammable material was cleared from the roof space above the rafters, where it had been stored, thus reducing the risk of fire damage. In addition, yellow lines were painted on the oak floors to guide the air raid wardens as they groped their way around the building in the dark.

It was realised that the closure of the museum and the consequent loss of admission fees would mean a considerable drop in revenue and the future of the staff became an important issue. On 29 August, it was reported that the curator 'had offered service to the army', Miss Scott proposed to undertake 'motor driving' while Cook planned to become a 'voluntary A R P warden'. Eight days later, on 6 September, the Council resolved that the assistant curator, Miss Scott, and the caretaker, Bennett, should 'continue in employment on the same terms as at present', but that 'other members of staff be asked to find other employment': if necessary the latter's earnings would be supplemented for a period of three months so bringing these up to the amount of their present salaries. Cook's absence was comparatively brief for he was re-engaged after six months and resumed his normal maintenance work on the collections; Miss Scott was appointed acting curator and both she and Cook subsequently received annual war bonuses and occasional increments. This meant that by July 1944 her total salary amounted to £327 10s 0d a year while Cook was paid £300.

Goddard's position was difficult, for at the age of nearly fifty he had little chance of being accepted by the army and it was largely due to Lord Eustace Percy, then Rector of King's College, that he secured a position in the Regional Commissioner's office in the Ministry of Home Security where the author met him.

The story of this meeting is in the nature of a digression, but it explains to some extent how the Society acquired both an honorary treasurer and an honorary secretary as well as two members of the office staff.

In 1938, because of her qualifications (she had read mathematics and geography at Cambridge), the author was asked to undertake voluntary training with a view to working in a regional war room if hostilities broke out. She was duly called up on 1 September 1939 and became one of three intelligence officers whose duty, in conjunction with three operations officers and a team of plotters, telephonists etc, was to man this war room which was situated in Watson House, in the centre of Newcastle. Shifts were twelve hours on and twenty-four hours off duty and the salary was £400 a year (in the author's case this was reduced to £300 when it was discovered that the 'G' in her name represented 'Grace' and not 'George'). Like the museum, King's College had been closed at the beginning of September and at least one member of staff was employed as an operations officer. The college had another connection with the war room for Lord Eustace, realising the strain of continual shift work, organised a volunteer team which, each weekend, undertook one tour of duty.

As life settled down, it was decided that the college courses should recommence as usual in October and this meant the withdrawal of college staff from the war room. It was the knowledge of the resultant vacancy for an operations officer that led Lord Eustace to suggest Goddard, who up to then had been unable to find a job, as a possible candidate.

Goddard was duly appointed, at a salary of £400 per annum, and from then

until May 1941, when he became one of the assistant regional officers, the Society supplemented this by a yearly payment of £40.

Because of the 'phony war' there were long periods when the war room staff had little to do – they were simply sitting waiting for bombs to fall – and during this time Goddard used to talk to the team about his work at the museum and his visits to the Farne Islands. The author's interest was aroused and this, and her subsequent friendship with Miss Scott, was largely responsible for her acceptance of the post of honorary secretary. At the time, Lt Col R P Winter was Assistant Military Liaison Officer and as such had close contact with the war room staff, a fact that undoubtedly influenced him when, in 1946, he agreed to become honorary treasurer. Two members of the team, Miss W Sowerby and Mrs D Salkeld, later joined the Society's clerical staff.

As mentioned on page 9, a trench had been dug in the museum grounds. This was still in existence in September 1939, but it proved difficult to keep it free from water and it was finally abandoned. A shelter, to be used by the staff, was then erected at the northeast corner of the building, but a much more secure refuge became available when the City authorities made an entrance to the Victoria Tunnel from the grounds. The tunnel, which had been constructed as a wagonway to enable coal from the old Spital Tongues colliery to be conveyed to the Tyne, had been disused for many years and it now provided what was probably the safest air raid shelter in the northeast.

In the museum, additional measures were taken to combat the possible effect of air raids: these included the provision of long-handled shovels and rakes (still preserved in the museum loft), the purchase of four large cylindrical water containers and, in May 1941, the engagement of a night watchman. Members of the staff also undertook air raid precaution and fire-watching duties, while it was arranged that a second fire-watcher should attend during alerts.

Practically all Society activities were discontinued; the virtual impossibility of blacking out the glass roof meant that the building could not be used for evening functions and all other meetings and lectures were discontinued. Moreover, because of possible risk during raids, the Newcastle Education Committee refused to allow parties of schoolchildren to visit the museum and, in consequence, withdrew its annual grant to the Society.

Inevitably the reduction in staff had an adverse effect; despite this the annual reports show that a considerable amount of maintenance work was carried out on the specimens, accessions were catalogued and processed and some new exhibits prepared.

However, neither Miss Scott nor Cook had any academic scientific qualifications. Miss Scott, whose father was a member of Council (and, later, a vice president) had had no training and joined the staff in 1914 as a 'lady assistant and secretary' at a time when it was almost impossible to get professional help. At first, she had been a general 'dogsbody', but she soon developed an interest and expertise in ethnology and entomology and later became responsible for these parts of the collections and also for the library. Stephen Cook had been appointed as a technical assistant in 1928; he had previously been employed by Newcastle Breweries and his very considerable skill as a taxidermist was largely self taught.

Fortunately, members of King's College, in particular Professor Hickling and Professor A D Hobson, were available to give expert advice, but inevitably, a great deal of responsibility devolved on Temperley, the only active honorary secretary (C E Robson, was eighty-two when war broke out). Temperley was

an excellent field naturalist and as such was able to deal with many problems, particularly those relating to ornithology and botany. Nevertheless, it is to be regretted that he allowed part of the local herbarium to be sent to the British Museum (Natural History) for, while it was there, the museum was damaged by enemy bombs and the herbarium destroyed in the resulting fire. Happily, replacement specimens were later provided.

Membership figures dropped by over forty per cent (from 645 in 1938-39 to 372 in 1944-45) for although many members loyally continued to pay their subscriptions, others either resigned or lapsed. Furthermore, very few new members were elected; in 1939-40, for example, there were only two and in 1942-43, four. Luckily the position gradually improved and in 1944-45 twenty-two new members and seven associates joined the Society. In addition, there were inevitable losses by death. Chief among these was the joint president, the ninth Duke of Northumberland, who fell in action near Tournai on 21 May 1940, and this was followed in 1942 by the patron, Lord Armstrong; he had been a member for nearly fifty-three years and had been successively president and patron.

With the ending of the war, the question of Goddard's future became urgent. He himself was somewhat uncertain about the Society's attitude and, although the Council minutes of 28 July 1944 reported that 'it was unanimously resolved' to offer him reinstatement, there seems little doubt that there were reservations about this decision. These are apparent in a letter sent to him three days later and signed by the chairman of Council, which contained the statement that 'The Council are not unmindful of your services in the past, but... it is regretted that in view of financial and other circumstances your reinstatement could only be considered temporary and would have to come up for reconsideration six months after your return'.

Goddard duly accepted this offer, but it soon became obvious that the Society was, indeed in serious financial difficulties, for on 22 February 1945 Temperley warned the Council that unless a new source of income could be found there was likely to be a deficit of some £700 per annum; he sounded a further gloomy note by pointing out that considerable additional expenditure was already envisaged as parts of the roof were in urgent need of repair.

However, the meeting closed in a more hopeful mood when a subcommittee was appointed to negotiate with the Rector of King's College on the possibility of financial support and co-operation from the University. Thanks largely to the efforts of Professors Hickling and Hobson, these negotiations proved successful and seven months later Council was told that the Council of the College had approved an agreement between the two bodies. The main provisions of the agreement, which would come into force on 1 January 1946, were that (1) the Hancock Museum should be both a university and a public museum (2) the College should make the Society a grant of £1000 a year towards the costs of the museum (3) the professors of botany, geology and zoology, together with one other person nominated by the Council of the College, should be elected to the Society's Council (4) a Museum Management Committee, consisting of the professors of botany, geology and zoology, together with three members appointed by the Society, should be responsible for the organisation and development of the museum collections and (5) the teaching staff and students of the College should have free acess to the museum.

Before the terms of the agreement could be implemented the rules of the Society had to be amended and these alterations, and the agreement itself, were approved at the annual meeting on 5 December 1945. Subsequently,

B P Hill, the chairman of Council, H Tully and G W Temperley were appointed as the Society's representatives on the Museum Management Committee.

This committee was constituted on 1 January 1946 and has continued to meet regularly ever since. Its immediate concern was to undertake essential repairs to the museum fabric and to make the alterations and improvements necessary to facilitate the use of the building by students. Among these latter were to be the provision of a ceiling in the storeroom and the fitting of additional electric lights, the conversion of the lower west corridor into a room for research students and the removal of some of the reserve collections to this room. Finally improvements (dealt with in greater detail on page 33) were planned for the library.

The storeroom improvements were duly carried out although two years later an infestation of *Anobium punctatum* was discovered in the timbers and steps had to be taken to eradicate this. Unfortunately, the plan for the lower west corridor had to remain in abeyance for the College asked if, as a temporary measure, the room could, instead, be handed over to two of its departments, and this occupation continued until the end of the 1951 summer term.

In March 1947, the death of A E Bennett, who had been caretaker for thirty-one years, brought to a head the problem of the caretaker's lodge. From the outside, this appeared to be an attractive stone-built detached house, but the internal arrangements were far from satisfactory. Accordingly, it was decided that before the new caretaker, Henry Hastings, took up residence, various improvements should be carried out: these involved the installation of electric light, the provision of a bathroom and alterations to the decidedly primitive drainage system, so that this complied with local authority regulations. Unfortunately, because of the Council's generous gesture in allowing Mrs Bennett to remain, rent free, in the lodge, this improvement work could not be started and in June 1948 it was finally necessary to give her three months notice to quit. Renovations were carried out during the autumn and Mr and Mrs Hastings moved in in December 1948.

In the immediate post war years the Society lost two of its three honorary officers and also its curator. A H Dickinson died on 6 March 1946; he had joined the Society in 1884, and had served as honorary secretary from 1888 until 1902 when he became honorary treasurer, a post he held until his death. In November of the following year C E Robson died at the age of ninety: he had been one of the honorary secretaries since 1904. And finally, came T R Goddard's death on 17 October 1948. He had been curator for twenty-five years, having taken up his duties on 1 January 1923, and, during his early years, did much to recondition and redisplay the collections after the unavoidable neglect of the first world war. He was engaged in various schemes for developing the museum under the guidance of the Museum Management Committee when failing health necessitated an operation from which he did not recover. Despite shortages, the Society's affairs had gradually begun to return to normal, but these deaths, and the replacements they involved, led to considerable changes and may be taken as the end of an era.

THE MODERN SOCIETY

1949-79

The year 1949 brought major changes in the shape of a new honorary secretary and a new curator. Following Goddard's death, Miss Scott was made acting curator and steps were taken to obtain a new curator. As a result, Cyril E Fisher BSc was appointed and took up his duties on 2 May 1949. Fisher had been born in 1912 and during the war he served in the RNVR. He was primarily an entomologist, but took a keen interest in all branches of natural history and his eight years in Newcastle were a period of great progress in the museum. Unfortunately, his health gradually deteriorated; perhaps because of his war service in submarines he suffered from bronchitis and this developed into a graver form of chest disease which was accompanied by serious side effects. By July 1957, it was apparent that he would not be able to return to full-time work for at least a year and efforts were made to find a temporary curator. However, before an appointment could be made, his condition worsened and he died in November 1957. It is gratifying to find that, thanks to the generosity of the Knott Trustees and the Council of King's College, for the next five years an allowance of £750 per annum was made to Mrs Fisher in order to provide for the upbringing of her children.

Miss Scott resigned in 1954, after forty years service to the Society, and S E Cook replaced her as deputy curator. Accordingly, it fell to Cook, with the author's assistance, to deal with museum matters during Fisher's illness and in the interregnum until a new curator could be appointed.

This period ended on 1 July 1958 when Anthony M Tynan BSc took up his post. Tynan had been Assistant Keeper of Geology in the National Museum of Wales, but, like Fisher, he was a natural historian of wide interests rather than a specialist in a particular discipline. Happily, after twenty-one years, he is still guiding the museum from strength to strength, a fact which will, it is hoped, be dealt with in detail when the 'Hancock' celebrates the centenary of its opening in 1984.

The author was elected honorary secretary at the annual meeting in December 1948 and in April 1951 Temperley resigned: he had been honorary secretary since 1930. In the following year he became a vice president and in 1955 an honorary member. Despite his resignation he continued, until 1956, to compile the annual ornithological reports and he also acted as local organiser for the wildfowl counts. He died, aged 92, on 29 November 1967 after a long illness.

He was succeeded by R G Grey who had joined the Society as a boy in 1932. At the time, he was one of the assistant solicitors in the Clerk's office of the Northumberland County Council and his legal knowledge proved of inestimable value to the Society. In 1963, he became Deputy Clerk of the Cumberland County Council, but although his move to Carlisle meant that he could no longer be an honorary officer, he remained in touch with local affairs and his sudden death in 1965, at the early age of 47, was a sad blow to his many friends.

Mr Grey's successor in 1963 was Dr I M Telfer who, like his predecessor, had joined the Society as an associate member in 1932. Dr Telfer is a busy general practitioner so is unable to take an active part in the running of the Society, but he is always available for advice and support.

In 1962, R P Winter, who had held office since 1946, resigned because of

professional commitments, but, fortunately, another chartered accountant, J A Crisp, kindly agreed to become honorary treasurer, a post he held for eight years. Mr Crisp's resignation in 1970 posed a problem, for it is becoming increasingly difficult for voluntary organisations to obtain suitable honorary officers and the Council was, therefore, delighted when D P Walton, who had just retired from an important position in industry, agreed to undertake the treasurer's work.

The first, and indeed until the 150th anniversary party, the only major social event of the thirty years was the reception and conversazione given by the Society on 6 September 1949 for members attending the annual conference of the British Association. Some 450 people were present: 150 from the Society and 300, including fifty from each of five sections – anthropology, botany, geology, zoology and corresponding societies – from the Association.

It was a brilliant affair. The Duke and Duchess of Northumberland received the guests, most of whom were in evening dress and many of the important natural historians of the time were present, including Professor (later Sir) James Gray of Cambridge, Professor A C Hardy of Oxford, Professor H R Hewer, Dr F F Darling, Dr Hugh Cott, R S R Fitter and Professor R Sparck, Professor of Zoology at Copenhagen University. Catering was carried out by what might be described as a wartime 'relic' – the Civic Restaurant in College Road – and the menu, which cost 2s 6d per head, consisted of 'sandwich, sausage roll, cheese straws, cream cake and ice-cream (Walls)'. The drinks were either coffee or mineral water. On the whole, this seems to have been quite satisfactory, but one learned professor commented that 'it was below the dignity of members of the British Association to expect them to drink mineral waters out of bottles, even when straws were provided!'

An appeal to members of the Society to contribute towards the cost of the evening produced £172 1s 0d which more than covered the actual cost of £167 13s 0½d.

The conference had indirect consequences for the Society, for one of the excursions was a trip to the Farne Islands on 3 September. The author was asked not only to lead the party, but also to give a preliminary talk to members of the zoology section. This was her first public lecture and seldom can a speaker have had such a baptism of fire: fortunately, it was a great success.

Some 120 people visited the islands, in a flotilla of nine boats, and several distinguished scientists, who later helped the Society and its work, had their first introduction to Northumberland's most famous nature reserve. Chief among these was Sir James Gray and it was he, who when the seal versus salmon controversy was at its height, ensured that the Society's field work on the Farne seals should continue by seeing that it had adequate financial support. He was also responsible to some extent for the setting up, in August 1959, of the Consultative Committee on Grey Seals and Fisheries, although he was unsuccessful in his attempt to have the Society represented on this committee.

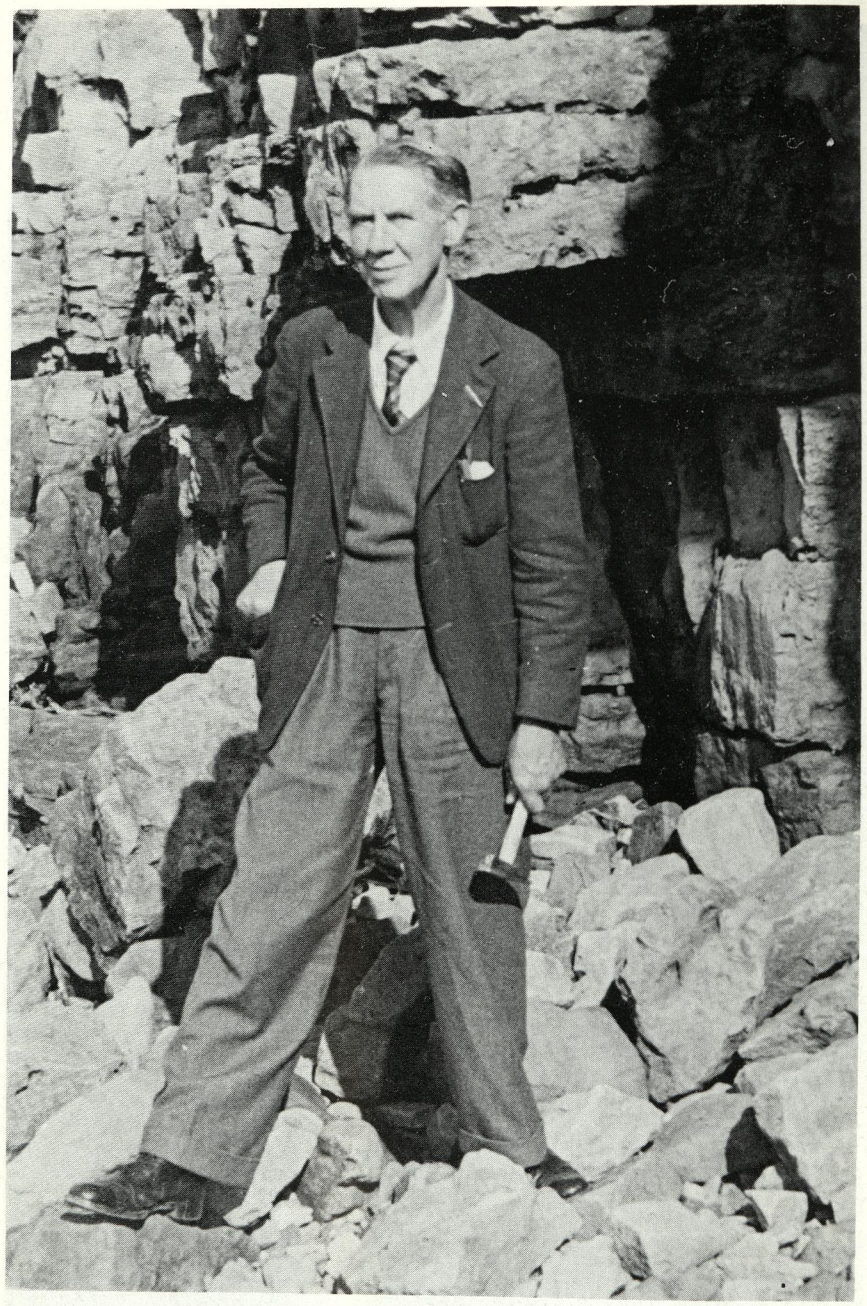
Some of the happenings of the next few years, as for example the establishment of the Farne Islands Study Centre, will be dealt with in detail later, but, on the whole, affairs proceeded uneventfully.

In April 1952, it was decided to form a Science Committee: this would be similar to the Museum Management Committee, but would be concerned with the Society's scientific work, rather than with the development of the museum. It consisted of four or five representatives of each of the existing sections (botany, geology and ornithology) together with the chairman of

George Bolam, 8 June 1929, aged 69

Viscount Grey of Fallodon

T R Goddard showing the captive eagle to Lords Richard and Geoffrey Percy **ca** 1929-30



Professor H G A Hickling at Beadnell, July 1952

Council and the honorary secretaries and honorary treasurer *ex officio*.

Initially, this committee dealt with the need not only to organise small groups interested in field work, but also to provide these groups with a qualified leader and suitable preparatory lectures; with this in mind, the author was appointed field secretary to coordinate field work. Most of its subsequent deliberations involved publication of the *Transactions* and, in 1961, when it was discovered that four years had elapsed since the last meeting, it was decided to dissolve it. It was pointed out that most of its functions were now covered by other parts of the Society and that the vetting of papers for publication could be carried out more effectively by a small committee, either the General Purposes Committee, or a special Publications Committee.

Lack of money was an ever present problem and the income and expenditure account for the year 1951-52 showed an adverse balance of £743 5s 6d. An application to the Knott Trustees resulted in a promise of £200 per annum for the next five years, but, although very welcome, this did little to ease the general position and in November 1953 the treasurer pointed out that in both the previous, and the current year, there would be a deficit of £1000.

It was, therefore, decided to raise the yearly subscriptions of full members from £1 1s 0d to £2 2s 0d, and of associate members from 5s 0d to 10s 0d. The increase took effect on 1 July 1954 and, at the same time, it was resolved that all subscriptions would become due on a fixed date, namely 1 July (this was afterwards changed to 1 August).

In April 1955, a special committee, consisting of Professors Hobson and Westoll and the honorary officers, met to assess the effects of the increase and it was reported that about 20% of the ordinary members, and nearly 50% of the associate members, had not paid the new rate. In addition, the committee considered representations, notably from the geological section, about the effect this increase would have on the young and more active members of the Society. As a result, it was decided to recommend that rates for associate members be revised; a new class of junior associate members (up to the age of eighteen) would pay the old subscription of 5s 0d while associate members, aged between eighteen and twenty-five, would pay the new rate of 10s 0d. The two professors also said that they had mentioned the Society's problems to the Rector of King's College, who was sympathetic, and that there was a possibility that the grant from the College (then standing at £1250 per annum) would be increased after 1957.

These rates remained in force for seventeen years, but in 1971 the whole membership question was reviewed. It was decided to abolish the class of junior associate and to have only associates: this included everyone up to the age of eighteen and, as a special concession, it was extended also to people over that age who were in receipt of full time education and, later, to students of the Open University. The subscription was £1.00 per annum: a permit for Gosforth Park Nature Reserve cost an additional £1.00. Ordinary members paid £4.00: this allowed the member, his wife (or, where appropriate, her husband) and children up to the age of sixteen to attend meetings, visit the museum and so on. In addition, the member received a copy of any part of the *Transactions* issued during his or her membership; individuals who did not wish to have publications paid a reduced rate of £3.00. There was a new privilege, which applied to all members and their families, namely free admission to the nature reserve.

In February 1955, two months before this special committee met, the Society had been faced with very heavy additional expenditure which, it was obvious, could not possibly be met out of income.

There had been increasing concern about the state of the museum roof, in particular the part over the three main galleries, and at the Council meeting on 24 February the chairman gave a brief résumé of reports prepared by the honorary architect, P C Newcombe, and his son, not only on the roof, but also on the general fabric of the building. The architects recommended that the existing glazing of the three large lanternlights be replaced immediately by patent glazing, with wired plate glass in lead-sheathed steel bars, and with proper footwalks to allow future maintenance and cleaning. In addition, a certain amount of repointing and restoration of the stonework, together with the provision of new ridge and hip tiles and general overhauling, should be carried out as soon as possible.

The chairman said that the Museum Management Committee regarded these repairs as essential and he, therefore, advocated that the total cost (£6000) should be met by using the remaining £3250 of the Percy Hedley Trust with the balance of £2750 coming from the general endowment funds. The Council approved this proposal and in the subsequent discussion on the financial position, it was emphasised that the real problem was the upkeep of the building and the collections, together with the salaries of the staff, and that the time was not far distant when it would be impossible to maintain the museum.

During the following months various charitable trusts were approached in the hope that they would make contributions to the cost of repairs and in 1956 both the Pilgrim Trust, and the Knott Trustees, responded generously to this appeal, making grants of £2500 and £5000 respectively. Unfortunately, it had by then become apparent that further repairs would have to be undertaken and that they would cost an additional £6000.

For some years, one or two local education authorities had made regular payments to the Society and, in return, schoolchildren from these areas were admitted to the museum without charge. In March 1957, letters were sent to these authorities, asking them to increase their grant and, at the same time, an approach was made to other authorities who had not previously contributed. As a result, both Newcastle and Northumberland increased their contributions – from £100 to £200, and from £20 to £100, respectively – while, for the first time, Tynemouth gave £20 and Durham County £300.

On 20 May 1958, a special meeting of Council was held at which, once again, the financial position was discussed. The treasurer pointed out that approximately £5000 of the Society's Trust funds had already been used to meet the recurring annual deficit and that it was anticipated that there would be an adverse balance of about £1500 in both 1958 and 1959. He emphasised that it was vital to stop this continual erosion of the assets.

Various ideas were put forward, including that of selling some of the ethnographical specimens. Professor Westoll said that the Rector, and other officers of King's College, were gravely concerned at the Society's plight, but saw little prospect of increasing their grant before 1963. They did, however, suggest the possibility of a joint appeal for funds not only to charitable trusts, but also to local industry.

This suggestion produced little concrete result, but, fortunately, Professor Westoll continued to study the problem. Early in 1959 he submitted a scheme which would, he considered, not only be to the mutual benefit of the Society and the College, but also enable the College to qualify for financial help from the University Grants Committee for the maintenance and development of the museum. He pointed out that it would cost £6000 to run the museum at the 1959 level while expenditure on purely Society matters would amount to

£935. He believed that, if his plan could be implemented, the museum would form a very important and valuable part of the College *ensemble*, but that even to run it on its present basis of bare maintenance, without any of the essential developments, the College would have to find a further £3000 a year.

He stressed that, as the Society did not pay rates on the museum building, any agreement with the College must be drawn up in such a way that this exemption, which was due to the Society's position as a registered charity, was not affected.

Happily, the Councils of both bodies approved this idea and, after various negotiations, the appropriate documents, dated 10 June 1960, were prepared and signed. The first was a lease, made between the trustees of the Society and the Council of King's College, under which the museum buildings and grounds, together with all fixtures and fittings, were demised to the Council for a term of ninety-nine years from 1 August 1959 at a yearly rent of £5 0s 0d. The second took the form of an underlease, whereby the museum, buildings etc were demised by the Council to the trustees for a period of twenty-one years from 1 August 1959, the annual rent being £100.

Following the completion of these agreements, a General Purposes Committee was set up to deal purely with Society affairs. Initially, the members consisted of the chairman of Council, the honorary officers and the honorary legal adviser, but in 1967 the 'joint' legal adviser, J S Stephenson, was appointed. Finally, in January 1979, when it was felt desirable to have someone on the committee who was in regular touch with the ordinary membership, D F McGuire became a member.

The Museum Management Committee continued to be responsible for the running of the museum, the funds at its disposal consisting of the College grant together with a contribution from the Society. This last included the money given by local education authorities in recognition of services rendered by the museum (page 18), it was paid direct to the Society and not to the committee.

Initially, the Society's contribution amounted to £2000 and, although in 1964 this fell to £1800, by 1972 the Museum Management Committee was receiving £2500. It was then realised that, unless income could be increased by way of new members, and expenditure controlled strictly, there would be an operating loss in the current year.

It was at this point that negotiations were, once again, started with the University and the results of these are apparent today in the present positions of the museum and the Society. An agreement was signed on 19 November 1974 by which the existing underlease was surrendered and in return a licence, which would run for the unexpired period of the lease (i.e. eighty-five years from 1 August 1973) was granted to the Society's trustees. Under this licence the Society would have the exclusive occupation and use of the Council room, library and present office. Furthermore, members of the Society would be able to hold meetings in the museum and to visit it free of charge.

The Society's contribution to the museum running expenses would cease, but all admission charges, together with grants payable in respect of these charges, would be retained by the University. In return, the Society would receive an annual sum of money: this would be adjusted regularly according to a recognised index of inflation.

Quite the most disturbing event of the latter part of the period was the

construction of the central motorway east. For several years, there had been threats of a redeveloped Barras Bridge, with associated new roads, and these were substantiated when, on 16 December 1965, a letter was received from the City Legal Adviser regarding a proposed compulsory purchase order involving a considerable area of the Society's land.

Enquiries showed that the proposals would have a disastrous effect both on amenities and attendance figures. The stretch of the A1, which ran along the east side of the grounds, would be replaced by a motorway some twenty feet below the existing road level, while Jesmond Road would be continued, as a twenty-four foot link road, over this new motorway and through the museum grounds to meet Claremont Road at its junction with King's Road. A twelve foot wide slip road would take off from the Park Terrace junction and run above the centre of the motorway to join the extended Jesmond Road.

The compulsory purchase order would apply to virtually the whole of the grounds to the south of the steps, and also to a strip bordering the A1. The surface of the extended Jesmond Road was planned to be some four to five feet lower than the bottom step, but it was felt that the accompanying safety barriers would form a visually undesirable horizontal line across the front of the building. It was thought that the small remaining triangle of ground between the road and the Armstrong memorial would probably be used for pedestrian ways and, possibly, a bus layby.

It was obvious that the whole external appearance of the museum would be radically altered for it would no longer rise in dignified fashion above its lawn and garden. Moreover, although much of the car park would disappear, as would the two existing entrances on the east, the City Engineer's plans gave no indication of where, and how, vehicles and pedestrians could enter the museum precincts. Because of their effect on attendances, and on the resultant income, these last points were of vital concern both to the Society and the University and they figured largely in subsequent negotiations.

Once the effects of the proposed order had been assessed, there were consultations with officers of the University and it was agreed that the latter's solicitors should act for both bodies in this matter. There was, however, some reservation about the need for such an extensive order, the Society holding that the garden should be left untouched while the University's development officer stressed that the access road was very necessary as it would provide the only means of approach to the University and the Royal Victoria Infirmary. Nevertheless, he stated, and this was later confirmed officially, that the University would, if necessary, provide a car park for the museum at the rear of the building.

Formal notice of objection was lodged and arrangements made for Professor J S Allen, formerly professor of landscape architecture, to investigate the situation. In his report, he stressed that, while it would be unreasonable to oppose the order as it affected the eastern entrances, the objection to the link road should be sustained. At the same time, he considered that an attempt should be made to persuade the City authorities to modify their proposals and so lessen their impact on the museum.

Professor Allen gave evidence at the public local enquiry which was held between 14 February and 15 March 1967, but, unfortunately, his representations were unsuccessful and the compulsory purchase order was confirmed on 18 March 1969.

The next step was to ensure that not only did the construction of the motorway cause the minimum amount of damage to the museum building and surrounding land, but also, if such damage occurred, compensation could be

obtained for injury either to the collections, or to the structure.

A clause was inserted in the preliminary conditions of contract and specification which stated that 'Construction in the vicinity of the Hancock Museum shall be carried out so as to avoid completely any vibration likely to cause damage to the valuable collection' and the contractors made every effort to fulfil this proviso. There was, however, considerable concern about some of the trees which seemed likely to be affected and it was agreed that, while every effort should be made to save them, they should, if necessary, be replaced at the contractor's expense.

A thorough survey of the collections and museum fabric was undertaken and 'tell tales', designed to show if structural damage occurred, were fitted. This survey was agreed with the City authorities as a 'Schedule of condition'. In addition, the two lead eagles, made by John Hancock, were removed from the main gates and stored in the museum.

Although the motorway itself was some forty-five feet away from the Council room windows, the working space needed by the contractors extended to within fifteen feet of the windows and, accordingly, it was decided, in order to minimise the noise and dirt, to install double glazing in this room. (A few years later, the windows in both the library and Society office were also double glazed.) Work in the vicinity of the museum started in late November 1972, but before it began the contractors, with unusual thoughtfulness, erected a screen outside the windows. This bore a painting of trees and, as such, not only provided the honorary officers with privacy, but was to some extent a substitute for the real articles.

With the completion of roadworks, the question of reinstatement became urgent, one of the main problems being a new car park. Several tentative designs were considered, but for various reasons (including the high probable cost) they had to be abandoned. The City authorities grassed over and generally tidied up part of the affected area and with the recent completion, by the University, of the new car park, the grounds are now restored to normal.

No action had been taken on one part of the original proposals, namely the construction of a link road between Jesmond Road and Claremont Road, and there was great delight when, in November 1977, it was learned that the local authority had agreed, in principle, to the withdrawal of the notice to treat in respect of all the lands which had not been used for the existing motorway. This meant that it was not intended to proceed with the link road scheme and the Society was able to retain this part of its land.

It is worth adding that in January 1980, the Council agreed to accept the City's proposed offer of £63 in compensation for the compulsory purchase of eighty-six square yards of the Society's land; £34 of this represents the trustees' freehold interest while £29 goes to the University as leaseholders.

Inevitably, a great deal of space has been devoted to the Society's difficulties and it is refreshing to turn to some of the more pleasant happenings of the past years.

The Northumberland loughs are situated in one of the county's most important wildlife areas and there was considerable disquiet when, in July 1957, it was learnt that a boating club had been started on Greenlee Lough. The Council's recommendations that the use of mechanically propelled boats should be prohibited, and sailing limited to the months April to September inclusive, were put to the County Planning Officer by R G Grey and were duly embodied in the planning permission issued by the authority.

The Westwater Lakes Society, which was responsible for the Greenlee scheme, appealed against this decision and some months later a meeting was held at its headquarters, Bonnyrigg Hall, to discuss the situation.

Among those present were Dr R J Elliott, Regional Officer of the Nature Conservancy, the County Planning Officer and the County Surveyor, and the Chairman of the Northumberland National Parks Committee. The author represented the naturalists' interests. The position was carefully examined and it became apparent that the Westwater Lakes officers genuinely wished to co-operate – they certainly had no desire to harm the wildlife. This was confirmed at a later date, for a natural history section was started and in due course one of its members joined the Natural History Society.

Throughout the whole twenty-one years of the Council for Nature's existence, the Society has been closely associated with its activities. The author was present as an observer at the inaugural meeting on 17 February 1958 and two months later it was decided that the Society should apply for constituent membership. She was appointed the Society's representative and was subsequently nominated for cooption to the provisional executive committee: she duly attended the first meeting of this committee and of the conservation committee. In due course, with the division of the country into regions, she became the representative for the northeast and as such had a place on the executive committee (later renamed the 'council').

Then in 1969, following the death of Professor H R Hewer, she was made chairman of the reconstituted natural history societies committee, an office that carried with it a vice chairmanship of the Council and a place on both its council and executive committee. In this capacity she was present on 4 October 1979 when, with considerable sadness, it was unanimously agreed to dissolve the Council on 31 December 1979.

From its inception, the Council had played a major part in conservation and natural history matters – its support for the Farne Islands seal management plan, which resulted in the 1972 and 1975 culls, was particularly valuable – but over the years circumstances have changed. Among these has been the steady growth of its two main supporters, the Royal Society for the Protection of Birds and the Society for the Promotion of Nature Conservation, and the realization that these organisations had, in a sense, taken over many of the Council's functions.

Moreover, the Council had always suffered from lack of money, and, at least in recent years, could not have continued to operate without the generous help of the World Wildlife Fund.

There was, unfortunately, no comparable support from the natural history societies, the bodies which had most to gain from its continued existence. Unlike the naturalists' trusts, the societies have no umbrella organisation which can look after their interests and promote the exchange of ideas, and the Council for Nature fulfilled this role admirably. Those (and they included members of the Society) who attended the conferences at Lancaster and Warwick will never forget these pleasant weekends with the opportunity to make new friends and to discuss how a natural history society should, or should not, be run!

The final blow came when, because so few people wished to attend, the proposed conference at Sheffield had to be cancelled. Members of the natural history societies committee tried to think of ways in which the many members of local societies could be brought together as an effective force, but here again they encountered apathy and, very reluctantly, it was decided that, since these societies were not prepared to take any positive action to help

themselves, there was no alternative but to agree to the dissolution of the Council for Nature.

Early in 1961 it was suggested that, with the growth of the naturalists' trust movement, a local trust should be formed. The Council felt that, while it viewed the proposal sympathetically, it was not within the scope of the honorary officers to inaugurate such a proposal and, accordingly, that no action should be taken. In the event, the trust (then the Northumberland and Durham Naturalists' Trust) was formed as the result of an informal meeting held in Gosforth Park Nature Reserve at which, among others, the honorary secretaries and the curator were present, although in a private capacity.

The Society plays no official part in the running of the Northumberland Wildlife Trust, but many of its members are also members of the trust and there is close cooperation between the two organisations. This is made easier by the fact that not only is the Hancock Museum the trust's registered address, but its headquarters are in a prefabricated building at the north end of the museum.

In December 1962, a meeting at Kielder between the curator and officers of the Forestry Commission led to the idea that a small local museum might be established in the area and a few months later, when Old Lewisburn cottage, near the Lewisburn caravan site, became available, it became possible to implement this plan. The building was leased by the Forestry Commission to the Society's trustees, but the museum was regarded as a 'branch' of the Hancock and all organisation and management was undertaken by the Museum Management Committee. The Carnegie United Kingdom Trust made a grant of £600 towards the basic cost of conversion while exhibits included specimens presented by the Forestry Commission and others drawn from the reserve collections.

It had been hoped to open this new museum in May 1963, but the roof was found to be in an unsatisfactory condition and repair work was extremely slow. Nevertheless, it was sufficiently far advanced to receive a small party of delegates from the Museums Association Conference in July 1963. However, it was not until 3 May 1965 that what was now known as the Border Forest Park Museum was officially opened by the Duke of Northumberland.

The museum was closed, each year, from the end of September to the beginning of April, but during the summer it attracted considerable numbers of visitors, including school parties, and in recognition of this Northumberland County Council education committee gave a small annual grant of £50 towards its upkeep. Accordingly, there was very considerable concern when, in April 1969, it was learnt that the proposed building of the Kielder reservoir would mean the flooding of the Lewisburn site. The threatened closure took place in 1977, all the exhibits being removed. The Northumbrian Water Authority was, however, obliged to pay compensation and in the same year, in order to facilitate the collection of this money, the lease of the building was transferred from the trustees to the University.

The Society's collection of Maori objects, given by Miss Julia Boyd in 1892, includes some of its greatest treasures and it is not surprising to find that, in 1934, a request from the Auckland Museum and Institute, in New Zealand, to purchase this collection was rejected.

More than thirty years later, in 1968, the authorities of the Canterbury Museum, in Christchurch, asked if they might borrow an amulet (known as a rei puta) believed to have been given to Captain Cook during his first voyage. The Council agreed that, although valuable objects were not normally allowed to go outside the museum, it was prepared, provided suitable

transport could be arranged, to make an exception in this case. In fact, the amulet travelled to New Zealand in February 1969 by diplomatic bag.

Next year, the Canterbury Museum authorities again approached the Society, this time expressing the desire to retain the rei puta in exchange for some more spectacular object. The proposal was discussed at length and it was agreed that the amulet should remain in Christchurch on extended loan until April 1972 when the matter would again be considered by Council.

Despite the Council's subsequent decision that the rei puta must be returned, it did not stay long in this country for early in 1974 it was handed over to Dr Duff, director of the Christchurch Museum. Initially, the loan was to be for a period of five years and, in return, a complete skeleton of a moa was sent for the Hancock Museum collections. The position was reviewed in January 1980 and the Council agreed that, while the Christchurch Museum could retain the amulet for a further period, it must be returned to the Society in time for the centenary celebrations of the Hancock Museum in 1984.

The Society has always been proud of its Bewick material, in particular its collection of his drawings. During the war, these were evacuated to Cragside and on their return it was realised that both the drawings, and the mounts, were foxed, sometimes quite badly. Accordingly, in late 1949 they were sent to the Department of Prints and Drawings, in the British Museum, where they were cleaned and remounted at a cost of £140. When they were returned, a few were put on exhibition, but the remainder were stored in the library, in specially constructed boxes; recently, however, because of the danger of fading, all have been removed from display and it is planned to replace them with coloured reproductions from Iain Bain's new book (see below).

Inevitably, there are numerous requests to borrow these drawings and although, in the past, these were often granted, today much greater caution is exercised. Needless to say, genuine exhibitions are a different matter and in 1953 various articles were lent to the Laing Art Gallery where they featured in an exhibition to mark the bicentenary of Bewick's birth. Three commemorative lectures were given, one of them being by G W Temperley who spoke on 'Thomas Bewick as a naturalist'.

Twenty-five years later, in 1978, the Laing organised another exhibition, this time to celebrate the 150th anniversary of Bewick's death, and among objects lent by the Society were several sheets of drawings, the Bewick family bible, portraits and miniatures, a few of the stuffed birds which he used as models for his illustrations as well as some of the early natural history books which he had regarded as his text books. A smaller version of this exhibition was subsequently shown at the Yale Center for British Art in New Haven, Connecticut, where it won high praise.

The Society has received a great deal of invaluable help and advice from Mr I Bain, the country's leading expert on Bewick, and it is fitting that his forthcoming book *The watercolours of Thomas Bewick* will include many of the Society's drawings.

And finally mention must be made of two honours which came to the author and through her to the Society. In 1959 she received the Royal Society for the Protection of Birds' silver medal 'for services to bird protection', while in the 1974 Birthday Honours she was awarded the MBE as 'secretary of the Northumberland Natural History Society'.

FIFTY YEARS OF CHANGE

Buildings. As described on page 14 considerable alterations were carried out to the caretaker's lodge in 1948 and the house remained in use for the next eighteen years. In 1964, however, it became apparent that the University's plan to construct a new Science-Arts block, which included a bridge over Claremont Road, would have a serious effect on the lodge and, after considerable negotiations, the Society agreed to its demolition and to the sale of a small portion of land: the sum of £100 was received in payment. An essential condition of this agreement was that the University must provide accommodation for the caretaker in one of its nearby buildings and the present caretaker, in fact, lives in a flat at the top of the tower block.

Three years later, in 1967, the University again asked for some of the Society's land, this time near the northeast corner of the museum building. The area in question, which measured 296 square yards, was required for the construction of a pedestrian bridge over the new motorway and in 1969 the trustees agreed to its release.

The major repairs to the roof, and to the fabric of the building, effected in the mid-1950s have already been mentioned (page 18) and apart from painting, and general maintenance, the only important external work undertaken during the period was the cleaning of the stonework in 1973. This followed the receipt of a special stonecleaning grant, authorised by the Department of the Environment, under which the local authority paid 100% of the cost.

In 1959, to mark the seventy-fifth anniversary of the opening of the museum, the Northern Gas Board presented and installed a pair of Victorian gas-lamps on the walls above the entrance steps. The original lamps had become dilapidated and had long since been removed and the replacements added greatly to the museum's appearance. The lamps were, it was thought, very securely fixed and there was considerable dismay when, early in 1978, it was found that they had been stolen! Fortunately, the curator was able to obtain duplicates and it is planned to weld these to the stumps of the original lamps.

Opinions about a suitable treatment for the words 'HANCOCK MUSEUM' on the front of the building have differed widely. In 1934, Percy Ward offered to pay for these to be gilded, but the Council decided that this would not be in harmony with the stonework. The matter was again raised by A H Dickinson in 1961 and 1963 when he stressed the need to have these letters painted; they had, in fact, been repainted in 1951 and no further action has been taken.

The position regarding the interior is very different and throughout the period there have been numerous changes.

The three main galleries – zoology, bird and geology – have remained unaltered in general content although the displays have been transformed out of all recognition. The Council room, too, is much the same, but the Tully breakfront bookcase, and the two Italian marquetry cabinets, given by the Coal Board when Cresswell Hall was demolished, have been added. The carpet, laid when the museum was opened in 1884 and featuring the Royal arms, was replaced in 1963 when new light fittings and curtains were provided. The original curtain poles are, however, still in place.

In 1929, the east and west corridors, both upper and lower, formed part of the main display area and those on the east are still open to the public, but, as will be described later, during the past fifty years, the western galleries have been used for a variety of purposes.

The so-called 'ladies' room' was situated at the southwest corner, in a position corresponding with the Council room on the southeast, while the museum

offices, which included the curator's and taxidermist's rooms and the workshop, were at the north end where a corridor runs east and west behind the geology room. Above these, on the first floor, was the storeroom.

It is difficult to discover exactly where meetings were held in the early days, but it seems probable that the bird room was used, at least for public lectures, while some of the smaller gatherings may have taken place in the library. However, in December 1935, the Council authorised expenditure of £10 to 'rearrange it [the ladies' room] for sectional and other meetings and to transfer the entomological and other cabinets to the library'. The ladies' room was still used as a lecture room when the author became honorary secretary in 1949, but there were no cabinets in the library and, presumably, they had been removed to the storeroom when the new bookstacks were installed.

In July 1946, as a result of the agreement with King's College, the geography department was given permission to occupy the lower west corridor for the remainder of the year; the necessary alterations, which included a new access from Claremont Road, were paid for by the College. In fact, the geographers' occupancy lasted until July 1949 and, on their departure, the geology department moved in, remaining here until July 1951. Dr D A Robson clearly recalls this period and that this was the only room available to the department that could accommodate some of the large post-war classes.

It was becoming increasingly obvious that the ladies' room was quite unable to contain all those who wished to attend lectures and in 1952 a partition was placed across the lower west corridor, so providing a new lecture theatre. This, although much more capacious than its predecessor – it could hold between 120 and 140 – had the disadvantage that it was long and narrow and, therefore, was not really suitable for this purpose. Accordingly, in 1959 it was decided to convert the greater part of the storeroom into a lecture theatre and, with the help of the Percy Hedley Trustees, who paid the whole cost (£2800), this conversion was carried out in 1960. As a mark of appreciation, the room was named the 'Percy Hedley Lecture Theatre'. An added refinement, for which members have largely to thank D C Souter, was the upholstery, in 1964, of the distinctly hard wooden benches.

Following the division of the lower west corridor, the remaining space became a students' room. A forty-foot long bench was fitted and storage cupboards, in which the reserve collections were housed, installed. The room was used regularly by students, but by 1963 it had become inadequate for the College classes so it was decided to exchange it for part of the upper west corridor, which had at one time been used as a storeroom. Once again, the College paid for the necessary adaptations and the result proved mutually satisfactory – the College had a much more suitable teaching laboratory while the museum gained an additional office and a staff room as well as the former students' room.

Today, both the upper and lower west corridors are used by the museum. The lower west corridor is the principal storeroom – 'railways' mean that the storage cabinets and cupboards can be housed to the best possible advantage and yet still be accessible. An air conditioned store, intended mainly for ethnographical specimens, has been constructed within the upper corridor while designers and zoologists, currently working on the bird room and kindred projects, use the former teaching laboratory.

Another development which took place in 1952 was the reorganisation of the ladies' room as an insect store; in 1960, however, the entomological cases were moved into the adjacent area of the lower west corridor and, with the aid of a grant from the Carnegie United Kingdom Trustees, the erstwhile ladies'

room was equipped as a laboratory workshop: it is now the main design studio.

For the first twenty years, the ground floor curator's room was to some extent a general office and it was used by both the curator and deputy curator and, occasionally, by less orthodox inhabitants. One such was a hamster, at that time a species only recently introduced into this country, and there was great concern when it escaped from its cage and disappeared under the massive bookcases: fortunately, it finally reappeared. The room boasted a real 'museum' piece in the shape of a gas stove which may well have dated back to the opening of the museum in 1884. It was a cylindrical iron object and, in addition to boiling a kettle, Miss Scott occasionally used the flat top for some simple cooking. It was removed in 1958 and was replaced by an electric fire.

Not surprisingly, a few months after Fisher's appointment in 1949, it was decided that he must have his own room. The place selected was in the southwest corner, on the first floor, and a screen was erected to cut it off from the upper west corridor. The original curator's room was used by the museum assistants although Fisher himself did not entirely abandon it and A M Tynan remembers how, in his early days, he shared the room with the then assistants, Miss J Lance and Miss R Ward. The construction of the 'Percy Hedley Lecture Theatre' made it possible to provide new, and better, accommodation for the curator for, because of its shape, the theatre did not completely fill the old storeroom and the remaining, decidedly irregular area, was partitioned off to make offices for the curator and his secretary.

Throughout the years, quantities of useless or inappropriate papers had accumulated in the library and by 1959 the shelves were full to overflowing; it was, therefore, decided that some of the runs of American periodicals should be removed to what is now the Society office. They were housed on fixed shelves, and also on central stacks, but this proved to be an undesirable form of storage for the room was in effect a passageway between the upper west corridor and the front of the building. As a result, the books became very dusty, while the relatively open access meant that their safety was at risk.

Instead of the present large open space, the office then consisted of a small area partitioned off from the main room. Adjacent to it was a similar partitioned-off area, first used as the museum office and staff tearoom, and from 1962 until 1973 this was the headquarters of the Natural History Officer of the Area Council for Museums in the North. By this time, in the course of library reorganisation, all periodicals had been removed from the 'annexe' to the main library and with the departure of Miss Christopher, the then Natural History Officer, the University agreed that the whole area (with the exception of a narrow strip which was cut off to form a passage) should become a new office for the Society.

The only other major alteration with which it is proposed to deal was the modernisation of the entrance hall between 1960 and 1965. Originally a wooden counter which, in summer, carried a display of wild flowers, ran the whole length of the room; there were turnstiles at both entrance and exit and a small office for the attendant who collected the admission money. The counter was removed and a central office, complete with an Automaticket machine, constructed, while other improvements included the provision of notice boards and the installation of fish tanks and show cases: some of these latter displayed a selection of the wide variety of goods now offered for sale to visitors. The later addition of easy chairs and low tables provided a pleasant rest area and, incidentally, the only public place in the museum where smoking is allowed.

Museum grounds. The question of the possible involvement of the City of Newcastle upon Tyne in the maintenance of the museum grounds dates back to April 1929. In 1927, a subcommittee was appointed to inspect the grounds, but it seems to have produced no specific proposals and in December 1928 R M Richardson submitted a resolution that a subcommittee should be appointed 'to restore the grounds of the museum to the condition intended by the original layout, which has been so much affected by the growth of years'. It was pointed out that such a body already existed, but it was agreed that Mr Richardson should be appointed an additional member.

He appears to have been a forceful character, who was obviously not satisfied with the subcommittee's progress, and on 10 April 1929 the Council learnt that he had evoked the help of the City Engineer and that, as a result, the Parks Superintendent had cut down, or pruned, several trees. Not unexpectedly, this news aroused a storm of protest; the subcommittee was dissolved and it was decided that all future decisions about the grounds must be left to the honorary officers and Council.

Incidentally, it is interesting to discover that earlier that year permission had been sought for the erection of a petrol station, and accompanying roadways, behind Lord Armstrong's statue at the southern tip of the grounds. Fortunately, this development which, had it been approved would have radically altered the appearance of the building, was turned down.

The matter of the City's involvement continued for the next two years: in 1930, the Parks Superintendent again inspected the grounds, but no action was taken, while in April 1931 a letter was received from the City Engineer containing a proposal to alter and acquire the grounds. Although no one was in favour of this idea, it was agreed to receive a deputation from the City and on 13 May 1931 two councillors, and the City Engineer, attended the Council meeting and explained their proposals. These were that (1) the railings of the grounds to the south of the main building should be removed and replaced with a low horizontal rail, (2) a certain number of trees should be felled, turf laid and asphalt paths made and (3) the open space thus created should be thrown open to the public, its upkeep being a charge on the City. Predictably and, with hindsight, regrettably, these plans were turned down and, as will be seen, it was not until some twenty-eight years had elapsed, and the Society had expended considerable sums of money, that the proposals were finally implemented.

The idea was revived in November 1938 when, following the annual meeting at which Professor Hickling spoke of possible collaboration with the City in running the Hancock Museum, a writer to the *Evening Chronicle* (7 November 1938) proposed the removal of the railings and the installation of a flight of terraced steps leading from the Armstrong memorial to the main entrance; the letter was accompanied by a 'doctored' photograph showing how the appearance of the museum would be affected.

Following this, a letter was sent to the City's Parks Committee asking if the proposals made in 1931 still held good. This was duly considered by the committee, but it was agreed that any decision must be deferred until plans for the proposed redevelopment of the Barras Bridge area had been completed.

During the war it proved impossible to maintain the garden and grounds in good condition. Mortar trenches, sandbags and barbed-wire entanglements were installed, while in July 1940, in what was undoubtedly one of the most foolish wartime 'bright ideas', all the railings, with the exception of small sections on either side of the gates, were removed for munitions. At the time,

it was hoped that the Corporation would make suitable reinstatement when war ended, but the actual amount received from the sale (as scrap metal) was only £17 6s 10d. The immediate consequence of the removal was that the grounds were thrown open to trespassers and night prowlers.

In 1946, it was decided to start restoration work by improving the lawns and felling, or trimming, trees and bushes. An attempt was also made to find out what the City planned for Barras Bridge, but no definite information could be obtained. However, subsequent letters from the City's officers suggested the desirability of cleaning up what was described as the 'somewhat neglected' ground at the rear of the museum and also of providing seats for the public within the grounds.

These suggestions culminated in a meeting at the Town Hall on 28 May 1951 at which the general improvement of the grounds was considered and, after considerable discussion, it was agreed to put a scheme to the respective Councils for consideration. The main points of this plan were that the Corporation would undertake the maintenance of that part of the grounds lying south of a line drawn along the bottom steps of the museum and, in return, this would be regarded as an open space and garden for the use of the public; seats would be placed on the grassy area between the Armstrong monument and the museum building. This maintenance was later extended on the west to the caretaker's lodge, and on the east to the boundary of St Mary Magdalene Hospital.

The plan was duly approved and put into effect, although it was not until 1959 that a formal agreement, embodying these and other points, was signed. In the meantime, the City Engineer had, at the Society's request, removed the flagpole from its place on the front lawn (where it was considered to be unsafe); a new pole was later erected on the parapet above the main entrance.

Both the forecourt and the driveways were in a poor state of repair and, again with the help of the City Engineer, these were resurfaced by the Limmer and Trinidad Asphalt Company in 1953 at a cost of £250. The result was excellent and it is sad to see how, in recent years, and largely because of the City's roadworks, the fine asphalt surface has been scored by heavy vehicles and dotted with numerous holes all repaired with tarmacadam, rather than with the original material.

Since then the University has looked after the remainder of the grounds and it played an important part in dealing with the problems arising from the City's compulsory purchase order in 1969. As a result of the construction of the central motorway east the whole appearance and layout of the grounds has changed. The lowering of the road meant the disappearance of the two long-established entrances on that side and the substitution of a single entrance from Claremont Road: this slopes up steeply and is difficult to negotiate in snow or ice. Another disadvantage is that this new entrance is directly opposite the main vehicular entrance to the University and it is all too easy for students, and other unauthorised parkers, to slip into the museum car park where they occupy the space intended mainly for paying visitors. Fortunately, the installation in 1977 of a barrier, which is kept in place between 1730 and 1000 next day, has gone a long way towards solving this problem.

The most recent development has been the construction, early in 1979, of an additional car park along the east side of the museum. This will prove most useful, and its appearance has been enhanced by the landscaping of the surrounding, and previously rather derelict, ground.

Organisation. As a 'daughter' of the Literary and Philosophical Society, much of the Society's organisation was based on that of the parent body. Even now the 'Lit and Phil' committee meets eleven times a year, a practice followed by the Natural History Society Council (which, indeed, held monthly meetings) until the outbreak of war in 1939. During the following years the Council only met irregularly, but today there are regular quarterly meetings in January, April, July and October. Another tradition (which is still followed by both societies) is to have two, rather than the more usual single honorary secretary. Then, too, there was a House and Finance Committee (a committee of that name still operates at the Lit and Phil): this apparently became defunct – it was certainly not in existence in 1948 – but the present General Purposes Committee now carries out its functions.

Conditions during the early 1940s, and the subsequent agreements with the University caused changes. For example, it had been customary to appoint, each year, a field president, but this, like the office of patron, no longer exists. Similarly, there are no longer honorary curators – in 1927, for example, there were fourteen although by 1939 this number had fallen to four.

The composition of the Council itself has changed. In addition to the president and honorary officers, there can still be up to twenty vice presidents, but the twelve elected members were reduced to eight in 1950, the remaining four being nominated by the then King's College. There was a further change in 1961 when it was agreed that each section should appoint a representative to serve on the Council: it was subsequently decided that, for this purpose Gosforth Park Nature Reserve should be regarded as a section.

Mention has already been made of the Museum Management Committee and its composition: since 1964 its finances have been quite separate from those of the Society while its chairman is always one of the University representatives.

There have also been changes in office staffing and procedures. In the early days one full time typist served both the Society and the museum, but in June 1960 the post was divided, Mrs D M Palgrave undertaking the Society, and Mrs O Marshall the museum work. Today, the Society has six part time staff: with one exception they are all either members, or wives of members, two of them being life members.

Office procedure has been greatly improved. When the author became honorary secretary there was no filing system, but now a cabinet, with suitably numbered files, provides quick reference to earlier correspondence. Numbered membership cards were introduced in August 1967; they replaced the former receipts and act as passes to the museum and Gosforth Park Nature Reserve. Associated with them are record cards on which details of annual payment and membership number, and dates of despatch of publications are noted. Printed programmes are provided for both indoor and outdoor meetings and these are amplified by stencilled bulletins which are issued four times a year. The first bulletin appeared in 1952 and since 1971 the first page has been run off on specially designed headed paper. There have been other changes, too numerous to mention, and these have all contributed to greater efficiency in the office.

Finally, mention must be made of the change in the Society's name. Since its foundation in 1829 it had been known as 'The Natural History Society of Northumberland, Durham and Newcastle upon Tyne', but it had become increasingly apparent that this was much too cumbersome a title and in 1974, after careful consideration, the Council decided to recommend that it should be renamed 'The Natural History Society of Northumbria', a decision which

was subsequently approved by members at the next annual meeting.

Sections and activities. Sections are an integral part of the Society and today there are five – botanical, entomological, geological, mammal and ornithological. With the exception of the Pybus Memorial Lecture, sectional officers are responsible for all indoor and outdoor meetings. They choose their own speakers and make all necessary arrangements for accommodation and entertainment, although the honorary treasurer reimburses any expenses: similarly, they plan the field meetings, accepting bookings and dealing with the finance involved.

This is really a policy of delegating responsibility and, as such, works extremely well, for it not only relieves the honorary secretary, but also ensures a varied programme. At the same time, sections are not watertight compartments: any member may attend whatever meetings appeal to him, for these are not confined solely to people whose major interest is in the discipline they represent.

In 1928, all but one (the mammal) of the present sections were in existence, but by the following year the entomologists had combined with the botanists. They met again as separate sections in 1934 and 1935, but the 1935 annual report comments that 'there was a lack of interest in entomology and . . . it appears scarcely worthwhile to continue the meetings of that section' and this recommendation seems to have been implemented, for there is no mention of entomology in 1936 and subsequent years.

Some nineteen or twenty indoor meetings were organised annually: most important were the three or four 'Evening lectures' which took place on a Saturday and were open to the public. They covered a wide range of topics and speakers included such distinguished lecturers as Lady Petrie (wife of the Egyptologist, Sir Flinders Petrie) and Miss E L Turner of Scolt Head fame. Arrangements were in the hands of the honorary officers, although the Council was sometimes consulted, and there was a definite policy that no fee must be given, merely travelling expenses. Indeed, an invitation to Dr C J Patten was withdrawn when he asked for an honorarium in addition to expenses! Happily, he later changed his mind and agreed to speak on 'The language of birds' in return for out-of-pocket expenses.

Sectional meetings were held monthly: these usually took the form of a talk by a local expert followed by a period of discussion. And, finally, there were one or two 'Afternoon lectures for young people', given by local naturalists during the Christmas holidays on various aspects of natural history

One of the most popular of winter activities was the 'Social evening' (or conversazione as it was later called): this was usually held in early spring and included two or three short talks together with various exhibits of plants, photographs and so on. Refreshments were provided (the total cost was normally about £15 or £16) and these were regarded as so important a part of the evening that even in 1933, when finances were at a very low ebb, it was decided that they should be provided as usual and without charge to members.

With the exception of the geologists who arranged their own expeditions (like today, they generally included a long-weekend excursion) sections do not appear to have held formal field meetings. A field meetings committee, under the chairmanship of a field president, was appointed annually and this body presumably organised the outings: in addition, members were invited to take part in meetings sponsored by the Northern Naturalists' Union and the Wallis Club.

The geology section seems to have been considerably in advance of its colleagues for in December 1938 its officers submitted a set of draft rules to the Council; at the same time, they asked for sectional representation on the latter body.

There were twenty-three proposed rules, most of them based on the Society's own rules and procedures. They included a proposal for a new type of membership, sectional members who would be '*ipso facto* associate members of the Natural History Society' and would pay 7s 6d per annum to the Society. Ordinary members could also register as members of the section and the honorary treasurer was to pay the section a grant of 2s 6d a head in respect of each individual who had registered.

The Council accepted these rules, but probably because of the war, they do not seem to have remained in force, as an entity, for long. Certainly the section still meets on the second Friday of the month although not, as then, every month. But the present sectional secretary does not now 'receive all manuscripts submitted for publication in the *Transactions* of the Natural History Society' although officers of the section certainly 'render such assistance ... as may be necessary in the publication of such papers'. Furthermore, under the then Society rules, it was not possible to have sectional representation on the Council and it was not until 1961 that this suggestion was implemented.

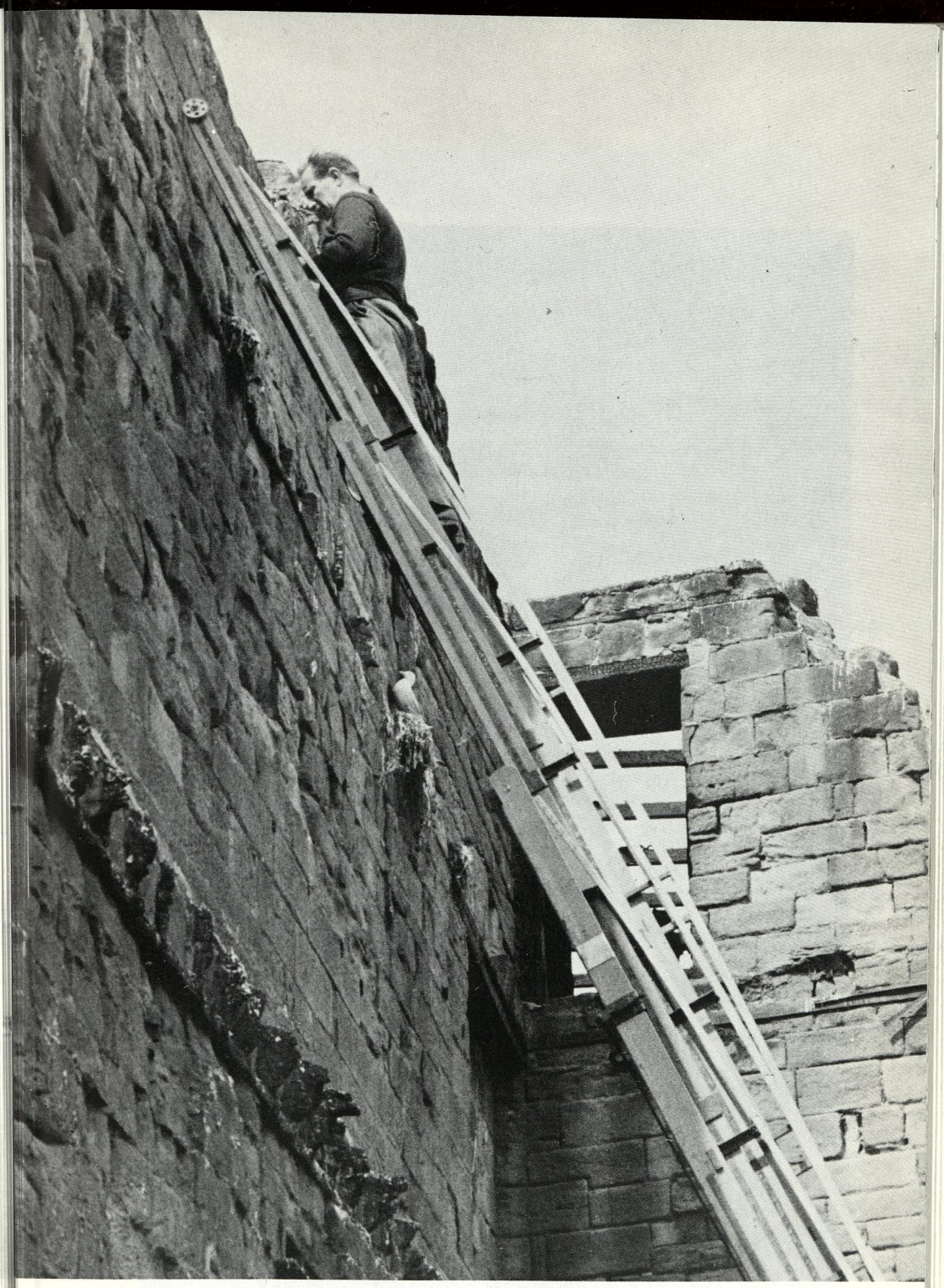
Throughout the war years, the ornithological section had continued to compile the annual bird reports for Northumberland and Durham and these were published in *The Naturalist*; other sectional activities were resumed in 1945-46 with two indoor and four outdoor meetings. Two indoor botanical meetings were also held, but it proved impracticable to arrange any field meetings and there is no reference to the botanical section in either 1948 or 1949. In February 1950, however, it was once again revived under the secretaryship of Mr Weldon Watts and, since then, it has flourished.

The geological section was restarted in 1947, John Lee being appointed honorary secretary, a position he held for thirty years. Two years later, in 1949, an attempt was made to form a microscopy section, but there was so little response that the idea was abandoned.

Thanks largely to the efforts of G A Cowen, preliminary negotiations for a mammal section were started in 1958-59 and the first lectures were given in 1960-61. It is extremely difficult to guarantee that live mammals will appear 'to order' and so comparatively few outdoor meetings have been held; however, talks on some aspect of the natural history of mammals are a regular feature of current winter programmes. Finally, after a lapse of some thirty-seven years, the entomologists re-formed their section in 1972-73: they now hold meetings in both winter and summer.

Reference has already been made to the Society's policy whereby visiting lecturers merely received travelling expenses, but after the war even this concession was jeopardised for, in 1949, the Council decided that, where speakers were concerned solely with sectional meetings, it was unfair to expect the general membership to bear the cost. It was pointed out, however, that some people had joined the Society solely with a view to taking part in sectional activities and would naturally expect part of their subscription to go towards the provision of suitable speakers.

After considerable discussion it was decided to give £10, to be spent by the geological and ornithological sections during the coming year; in return, each section should make one meeting 'open' to all members. A similar sum was allocated in 1951 although the revival of the botanical section meant that it



I M Telfer ringing kittiwakes at Peter Brown's burnt-out factory, 7 July 1952 (see page 43)

Weighing seals on the Farne Islands, 20 November 1954
Left to right: Elizabeth Foster, J Alder, Grace Hickling, I M Telfer, G Carter.
Hidden: A W Jones (see page 42)

Lake Lodge, April 1977 (see page 38)

Nest box ringing in Hamsterley state forest, 30 June 1951
Back: Longstaffe (forestry worker), F G Grey, G W Temperley
Front: R G Grey, J Alder, Carol Greenwell

had to be divided between three, rather than two, sections.

Today, although most lectures are arranged on a 'give and take', rather than a fee paying basis, it is an understood thing that a speaker's expenses are a charge on the Society's funds and first class travelling, a meal with one or two officers of the section sponsoring the talk and, where necessary, overnight accommodation, are all provided.

Since 1933, when the first ornithological report was prepared, members have continued to submit their ornithological records and today, although the Society is no longer responsible for compiling these annual reports, all record cards are passed on to the Tyneside Bird Club for inclusion in the annual *Birds in Northumberland*. Moreover, for over thirty years, members have taken part in the winter wildfowl counts.

Two other long established fieldwork projects, both carried out on the Farne Islands, are described elsewhere, but mention must be made of Operation Waterlog, first started in the winter of 1954. This, which was part of a national survey, involved the preparation of a register of all inland waters in Northumberland and Durham and produced much useful information. At about the same time (1953) members from the botanical section began an ecological survey of Kidlandlee, a newly-planted area of state forest. It was hoped to maintain this survey over a twenty year period, so monitoring the change in vegetation and birdlife, and work continued, with the help of the Forestry Commission, until the late 1950s. Since then, however, the Society has taken no part in these investigations.

The library. The present state of the library presents a very great contrast to its appearance fifty years ago. This was summed up by T R Goddard when he wrote in his 1938-39 annual report 'to my great regret I have to report that it [the library] is now in a deplorable condition. After frequent and urgent appeals from me, the Council, more than two years ago, authorised the expenditure of £100 to provide additional shelving and other accommodation, but up to the time of writing the money has not become available and I have been unable, therefore, to embark upon the urgently necessary work.'

In fact, nothing was done until 1946 when the newly constituted Museum Management Committee decided to tackle the problem. Members felt that what was virtually a locked-up collection of books must be developed into a real reference library and that it was essential to bind the large accumulation of back numbers of periodicals: they took the first step by authorising the binding of some one hundred volumes.

It should be explained that at this time virtually the only available storage space was a line of shelving running along the north wall of the room: this had been fitted when the museum was built and consisted of a series of open shelves with, underneath, sixteen lockable cupboards. This space housed the bound volumes, mainly books, but also including publications such as Ray Society monographs which had been issued in hardback. The very large collection of publications received on exchange over more than a hundred years was stored in packing cases and was, of course, inaccessible to would-be readers.

Accordingly, it was obvious that additional shelving must be provided and in 1947 six double-sided oak book stacks were ordered from Edmonds of Birmingham at a cost of £530 0s 0d. These were installed during 1948, being placed at right angles to the existing shelves and so arranged as to give a clear working area in the middle of the room. It had originally been planned to scrap these old shelves and to rely solely on the new stacks. However,

experiments showed that, with modifications, they could be retained and all the cupboard doors which, because of the position of the stacks could not be opened or closed, were therefore removed: the result was ten cupboards and six sets of open shelves, all of which are in use today. To complete the modernisation, the room was rewired and redecorated.

Next, with the help of E Patterson, deputy librarian of King's College, the books and periodicals were recatalogued on the Dewey system and a new card index prepared, while in 1948-49 a generous gift of £1200 from the Pilgrim Trust enabled the task of binding to start in earnest. On Professor Hickling's advice, runs of the most important publications, totalling nearly two thousand volumes, were bound while a similar number was housed in pamphlet boxes; some of the most valuable old books, whose binding had perished, were repaired.

In 1951, following the death of H Tully, the Society received what was perhaps the most important legacy of the period. Tully was an enthusiastic amateur ornithologist whose ambition was to amass a first rate ornithological library. He had always promised that, in due course, this would come to the Society and his will stipulated that the officers should be allowed to select any books on natural history and kindred subjects they thought appropriate. The result was the addition to the library of some sixteen hundred volumes, including a wonderful collection of beautifully illustrated bird books that has steadily increased in value; the will also gave a legacy of £5000 to the Society and £230 of this was used to purchase the fine mahogany Georgian breakfront bookcase, formerly in Tully's library and now in the Council room.

As already indicated, Miss Scott had always regarded the library as her special 'baby' and on her retirement in 1954, other members of the museum staff took over this responsibility, while the museum working parties, inaugurated in 1958, included it among their activities. By the early 1960s, however, it had passed to one of the Society's secretaries who, of course, had not been trained for this type of work. In 1968, changed circumstances enabled the author to devote more time to Society affairs and the past eleven years have seen the complete reorganisation of the library.

The first task was to weed out a very considerable amount of useless paper, part of which dated back for over fifty years. Next, it was important to decide on what should be retained in what was, after all, essentially a specialist library. Certain documents, which had little relevance to the Society, but which were of obvious interest either to people in other parts of the country or to different disciplines, were sent to the appropriate libraries where they were received with gratitude. Others were sold, the proceeds being used for binding and similar expenses.

Having eliminated surplus material, attention was then directed towards the periodicals and here, unfortunately, inspection revealed many serious breaks in the runs. Some of these were undoubtedly the result of borrowers failing to return books – indeed, an example of this came to light recently when, in 1978, two volumes of *Annales de la Société entomologique de France*, dated 1871 and 1872, were found by his son-in-law among the possessions of a distinguished academic who had been dead for many years! Other gaps were due to inefficient record keeping. No proper system of recording accessions existed and this meant that some of the lacuna dated back more than fifty or sixty years, a sorry state of affairs when it is realised that what could easily have been remedied at the time, is now virtually impossible to put right.

It was obviously essential to have an accession card which would include

such information as the name of the periodical, stocks already held, and the dates on which current parts were received, and after careful thought a suitable design was produced. Today, there is one of these cards for each periodical received on exchange, or purchased, and it is possible to check immediately if parts are missing or if items such as title pages or indices have not been received. Furthermore, the reverse side of the card is used to record the publications sent out by the Society – a very useful source of information when, as not infrequently happens, an institution writes to say that some part of the *Transactions* is missing and reference to this record shows that the appropriate acknowledgement card has, in fact, been received.

Obtaining the missing parts proved a difficult matter. In a few cases these were purchased either in the original form or as reprints; in others, deficiencies were made good by generous gifts from the institutions concerned, while in some instances photocopies of the originals were obtained. Even so, some parts were not available and the relevant runs remain incomplete.

A major binding programme started in 1969 and during the ensuing years some hundreds of volumes, the majority publications of learned societies, have been bound. All outstanding work of this kind has now been completed and, in future, it will only be necessary to deal with current volumes: in view of the cost involved (£7.50 per volume in 1979 compared with about £1.50 in 1969) this is a fortunate circumstance. A particularly useful part of this programme has been the binding of the Society's large collection of separates and pamphlets, which were formerly stored in file boxes. These papers have been arranged in suitable groups and can now be consulted much more easily.

All books bound in leather or half leather have been given preservative treatment which has not only greatly enhanced their appearance, but will do much to safeguard them in the years to come. In addition, many were in very poor condition and some have already been rebound or repaired while the remainder will, it is hoped, be dealt with during the next few years.

Finally, thanks to the generous assistance of the curator, A M Tynan, the library itself was completely redecorated during 1979. The newly painted walls provide a fitting background for three of the Bewick portraits while the refurbishing of the original Victorian furniture, and the carpeting of the greater part of the floor, have completed the renovations.

Publications. During the period some thirteen volumes of the *Transactions* have been published: this compares with the twenty-nine that appeared during the first one hundred years of the Society's life.

A major development has been the successful modernisation of the publication: this has been carried out with the expert help and advice of the Society's printers, initially W L Large & Sons and, currently, J & P Bealls Ltd. Up to 1970 there had been four separate series, namely, *Transactions of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne* (two volumes, 1830-38), *Transactions of the Tyneside Naturalists' Field Club* (six volumes, 1848-64), *Natural History Transactions of Northumberland and Durham* (fifteen volumes, 1865-1913) and *Transactions of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne* (new series) (seventeen volumes, 1904-72). Each series was numbered individually, using roman numerals, but in 1970 it was decided to introduce a more rational scheme which would treat all volumes as part of a continuous run; moreover, arabic would replace roman numerals. Accordingly, the next part issued ('Geology of Durham county') appeared as volume

41 number 1, while in 1974, to conform with the change in the name of the Society, the title was altered to *Transactions of the Natural History Society of Northumbria.*

There had been an earlier and striking change in the actual appearance of the publication. For over a century, the usual practice was to issue the *Transactions* in decidedly unattractive paper covers; furthermore, there were virtually no photographs – even as late as 1951 G W Temperley's 'A history of the birds of Durham' (volume IX) appeared without a single illustration. By volume XII, however, the policy had changed and, although paper covers were still used, part four contained five photographs as well as three maps. Since then, illustrations and maps have been included whenever appropriate. In 1959, the outward appearance became much more decorative when, for the first time, a photograph was used as part of a newly designed cover for volume XIII number 2. Considerable thought is now given to cover design and, although the smaller papers usually appear in plain paper, important works such as 'Geology of Durham county' and 'Northumberland's birds' have attractive covers which do much to add to their popular appeal. This new policy reached a peak with the lovely coloured photograph on the front of 'A guide to the geology of the Cheviot Hills'; unfortunately, this type of reproduction is too expensive for general use.

The Society's financial position has had a marked influence on the *Transactions*, and a brief account of the past fifty years shows some of the steps that were taken to ensure their continued existence.

In March 1929, the Council passed a resolution urging the desirability of co-operation with the Northern Naturalists' Union and for the next twelve months efforts were made to draw up a scheme for the joint publication of papers. From the Society's angle, it was felt essential that the *Transactions* should continue and it was suggested that the editing and management should be the responsibility of a committee made up of representatives from both bodies: it was also proposed that each organisation should contribute £12 per annum to a publications fund. A subsequent decision by the Council that the Society's part in this plan was contingent upon the appointment of the curator as editor aroused considerable opposition in the Union and, despite attempts to find a solution acceptable to both parties, it was finally agreed that publication in conjunction with another society was not practicable.

Thoughts then turned to the question of what (if anything) the Society could publish on its own. There was virtually no available money, a fact clearly illustrated by the Council minutes of 12 February 1930 where a reference to Goddard's centenary *History* states, first, that accounts for its publication should be paid 'when funds permit' and, second, that the guarantors had been advised of a probable call on them of 13s 2d in the £1. Nevertheless, it was realised that the publication of *Transactions* must be resumed and later that year two papers, including Dr J A Smythe's 'A chemical study of the whin sill' were accepted, the curator being appointed editor.

In March 1931, an invitation was sent to George Bolam asking him to compile 'A catalogue of the birds of Northumberland': this was to run to not more than 150 pages (although it was later extended to 200 pages) and to cost not more than £100. Fortunately, Bolam agreed to this proposal and the catalogue duly appeared in 1932 as volume VIII of the *Transactions* (new series). It was undoubtedly one of the most important ornithological works ever published by the Society and for some forty-eight years (until the appearance of the new 'Northumberland's birds') was the definitive work on Northumbrian ornithology. 800 copies were printed and fifty of these were

bound in plain boards, the total cost of £80 6s 6d being met from W E Beck's legacy of £100; copies were retailed at 3s 0d and 3s 6d respectively. Nineteen years elapsed before the publication of a similar work on Durham birds: this was G W Temperley's 'A history of the birds of Durham' which came out in 1951 as volume IX.

No papers appeared during the war, but, as the situation improved, the Council's thoughts began to turn to the future and in August 1943 it was agreed, subject to wartime restrictions, to resume publication, Professor Hobson stressing the importance of doing this in order to maintain the library through the exchange programme. The papers chosen were 'A preliminary list of the diptera of Northumberland and Durham' by W J Fordham and 'An annotated list of the Aphidae commonly occurring in Northumberland' by R A Harper, and these duly appeared early in 1945 as volume VII, number 3; H Tully and the King's College Research Grants Committee each donated £50 towards the cost of printing.

It is impossible to deal in detail with all papers, but two important series must be mentioned. Up to 1951 the annual county ornithological reports appeared in *The Naturalist*, but from 1952 to 1969 they, together with the Farne Islands bird reports for the years 1952-70, were included in the *Transactions*. Another long running series (and one which still continues) deals with the Society's field work on the grey seals of the Farne Islands. So far twenty reports have been published; the first (volume X number 5) came out in 1953 and the most recent (volume 43 number 3) in June 1979.

From the monetary point of view the most successful papers in recent years have undoubtedly been those on geology. The first of these was Dr D A Robson's 'A guide to the geology of Northumberland and the borders' (volume XVI, number 1): this is a popular booklet, very helpful to the amateur, which is still in demand today and after the two initial impressions (in December 1965 and May 1966) of a thousand each were exhausted, it was reprinted in Belgium. Another best seller was 'Geology of Durham county', compiled by Dr G A L Johnson. It consists of twelve sections, each written by the acknowledged expert on this particular subject, and it remains the recognised text-book for students of the area. Other papers for which there is still a strong demand are 'The geology of the coast section from Tynemouth to Seaton Sluice' by Dr J M Jones, 'The Carboniferous Namurian rocks of the coast section from Howick Bay to Foxton Hall, Northumberland' by Dr N Farmer and Dr J M Jones, and Dr D A Robson's 'A guide to the geology of the Cheviot hills'.

The current publication (volume 44) is 'Northumberland's birds' which is being compiled by Bryan Galloway and Eric R Meek with the assistance of a committee: it will appear in three parts and will include eighteen pictures of birds, specially drawn by James Alder.

Conservation. In these days, when a large part of the population belongs to organisations such as the Royal Society for the Protection of Birds and the county wildlife trusts, it is difficult to realise that fifty years ago conservation was a relatively unknown concept.

The Society, however, did not ignore this aspect of natural history and it was one of the first societies to become associated with a nature reserve. In 1924, one of its members, W E Beck, leased the shooting rights over part of Gosforth Park from the owners, the High Gosforth Park Company. This was the beginning of the Gosforth Park bird sanctuary (now the Gosforth Park Nature Reserve) and in 1929, when ill-health forced Mr Beck to give up these

rights, they were taken over by the then honorary secretaries, J A Richardson and C E Robson. In 1946, the trustees of the Society formally became the tenants although, unfortunately, and despite repeated attempts to secure a long-term agreement, the lease remains an annual one. Initially the rent was £25 0s 0d per annum, but in 1978 it was increased to £250.

Access to the reserve is through the garden of Lake Lodge; this is a small stone-built detached house which, like the reserve, belonged to the High Gosforth Park Company. The tenant was an employee of the Company and for many years, in return for a small annual gratuity, he acted as reserve warden.

The lodge became vacant in the autumn of 1967 and during the next fifteen months negotiations were undertaken with the Company in an attempt to lease it. Unfortunately, these proved unsuccessful and in April 1969 the Company decided to offer it for sale on the open market. The highest offer received was £2200 and the Company agreed to sell the property to the Society for that sum; on 4 May 1970 a special meeting of members approved this purchase.

Unfortunately, expenditure did not end here and continued vandalism – removal of pipes, breakage of glass and so on – added considerably to the cost. However, with the aid of a local authority improvement grant of £1500 and generous donations from the Conservation Appeal Fund, the World Wildlife Fund and Mr and Mrs Keyes, the repairs and renovations were completed. Mr and Mrs Keyes' gift of £500 had a particularly sad origin for it was made in memory of their daughter Diana, an associate member of the Society, who had been killed, along with other students, in the Comex coach disaster in Yugoslavia in 1967.

In June 1972, D Howard, who had earlier been appointed part time warden naturalist, took up residence, with his family, in the lodge. He remained until October 1975, when he was succeeded by F Colley who, in his turn, left on 30 July 1979. The present warden is R Tully.

The importance of the reserve was recognised officially in 1970 when it received a Countryside Award: this took the form of a bronze plaque and a replica is fixed to the outside of the lodge.

To mark the fifty years of the Society's association with the reserve it is planned to publish, in the near future, a full account of its history and wildlife – hence the comparative brevity of the account given here.

Other conservation matters about which the Society expressed concern in the early part of the period were the preservation of the Teesdale flora (in 1929) and, two years later, the safety of the nesting terns at Teesmouth. This concern was not limited to the British Isles, for in January 1933 a letter was sent to Signor Mussolini congratulating him on his efforts to protect birds in Capri!

In his *History,* Goddard described the meeting held in the museum on 18 January 1923 as the result of which the Farne Islands were purchased and handed over to the National Trust and throughout much of the period there has been very close co-operation between the officers of both bodies: the various projects undertaken on the islands are described elsewhere in this section.

The Society has been particularly concerned about the vexed question of seal culling. The recommendation, in 1963, of the Consultative Committee on Grey Seals and Fisheries that the breeding potential of the Farne seals should be reduced by twenty-five percent, gave rise to considerable controversy. It

was intended to implement this recommendation by killing calves (mainly weaned females) in the five successive years 1963-67 and, prior to the first cull, the Council prepared a statement setting out the Society's official view. Briefly, this was that it was considered particularly unfortunate that a culling policy should be applied to a National Trust sanctuary, but, if it was established that killing was necessary in the interest of fisheries, the Society would not oppose it. Nevertheless, members of Council believed that much more research was needed before a long term policy for the management of a seal colony could be formulated. They also stressed the need for measures to safeguard the Society's field work.

The actual killing aroused a widespread storm of protest and ten members of the Society signed a requisition, asking for a Special Meeting to be held to discuss the matter. The meeting took place on 30 January 1964 and the result was an unqualified condemnation of the culling policy. Two resolutions were passed, the first, and most important, stating that the Society 'recommend that the cull of the Farne Islands grey seals should now cease' while the second approved certain safeguarding proposals earlier put forward by the Council. There were two further culls (in 1964 and 1965) before the Trust took action and refused to allow further killing on its land.

In the early 1960s ornithologists in the Society became increasingly anxious about two aspects of the management of the Farnes, namely the question of obtaining legal protection by means of a Sanctuary Order and the continued tolerance of wildfowling. Their feelings were conveyed to the Farne Islands Committee of the National Trust and, in return, the chairman, Lord Grey, explained that the committee had already applied for an Order, but, because of the difficulty of enforcement, it would be an Egg Sanctuary, rather than a full Sanctuary Order. So far as wildfowling was concerned, Lord Grey understood that only about twenty local fishermen took part in this sport and he believed that, if it was stopped, the committee might lose their valuable co-operation in other matters. Furthermore, there appeared to be no effective means of enforcing such a prohibition.

The author has always felt very strongly on this subject and it is satisfactory to report that, after long, and so far as the committee is concerned unavoidable, delays, it is hoped to have a full Sanctuary Order by the summer of 1980. Wildfowling, too, has ceased, to some extent because of the appointment of a warden naturalist, but mainly because the more responsible local wildfowlers realised the anomaly of having controlled shooting in the nearby Lindisfarne National Nature Reserve and unrestricted wildfowling on the much older National Trust reserve on the Farne Islands.

In late 1935, the Air Ministry's proposal to establish air gunnery and bombing practice ranges in the neighbourhood of Holy Island posed a serious threat to the wildlife of the north Northumbrian coast. The areas involved were Goswick sands, Fenham Flats, Ross Links, Budle Bay and the adjacent sea and, as the result of a request from Belford Rural District Council, G W Temperley prepared a report (which was adopted by the Council) pointing out that, not only was the area of vital importance to wintering wildfowl such as brent geese and wigeon, but also that the ranges would be a major hazard to the National Trust's bird sanctuary on the Farne Islands.

The Society took an active part in organising the subsequent opposition and, following a meeting at the Air Ministry in London on 17 February 1936, attended by representatives of various archaeological, historical and scientific bodies, the project was abandoned. The area was, however, used throughout the war and there was a good deal of anxiety when, in March 1946, it was

learnt that, not only would the use of these ranges continue, but that it was planned to extend them.

In November 1955, when it became known that the Northumberland County Council might seek to impose a ban on the Sunday shooting of birds listed under section 2(1) of the 1954 Protection of Birds Act, the Council of the Society decided to make official representations against this shooting; it also undertook to seek a meeting with the Northumberland and Durham Wildfowlers Association in order to discuss a mutually acceptable policy. This meeting was held on 11 January 1957 and it was agreed that the most important thing was to enforce the Act, i.e. to prevent the shooting of protected birds. The County Council was duly informed of this decision and promised to give all possible help in implementing it.

A second, and so far as Lindisfarne National Nature Reserve was concerned, momentous meeting took place during the autumn of 1958 when, for the first time it was jointly suggested that part of the coast be set aside as a wildfowl refuge; the areas proposed included Goswick sands and Budle sandbar. It was also suggested that a retired policeman or gamekeeper should be employed as a warden.

Unfortunately, it proved impossible to find a suitable warden and, as indiscriminate shooting continued, the Council agreed to provide a poster which would, it was hoped, act as a deterrent. The poster, which was prepared free of charge, was designed by James Alder and engraved and printed by Philipson & Son Ltd and Tyne Printing Works Ltd. It carried a picture of a waxwing and bore the words 'A bird in the bush is worth a brace in the hand' and A M Tynan relates an amusing story about its final colouration. The reds, greys and blacks of the bird's plumage appeared on the printed version, but, in order to save money, no attempt was made to include the yellow on the wings and tail; instead, during one hectic evening in the geology room, Alder and two of his artist colleagues painted these in by hand. Three firms – Newcastle Breweries, Messrs Vaux and the Alnwick Breweries – promised to help by displaying it and some one thousand copies were despatched to local public houses.

The question of a wildfowl refuge was pursued independently by both the wildfowlers and the naturalists, for during 1960-61 Mr Frank Stabler, then chairman of the Northumberland and Durham Wildfowlers' Association, discussed the matter with officers of the Nature Conservancy. The Association was affiliated to WAGBI and the national body had earlier indicated the lines on which a reserve should be set up. At the same time, James Alder, and some other members of the Society's ornithological section, wrote privately to E M Nicholson, director general of the Conservancy.

Happily, unanimous agreement was reached and on 15 September 1964 the establishment of the reserve was declared at a public meeting, held at Belford, and presided over by Lord Howick, then chairman of the Nature Conservancy. The reserve includes all the places earlier threatened by the bombing range as well as a considerable part of Holy Island itself: Goswick sands and Budle Bay are sanctuary areas for wildfowl and waders while the number of wildfowlers to whom shooting permits are issued is limited.

Ultimate responsibility for the reserve rests with the Nature Conservancy Council, but advice about shooting policy and suchlike matters is given by the Wildfowl Panel. This is made up of representatives of WAGBI, the Northumberland and Durham Wildfowlers' Association and the local naturalists; one of the reserve wardens acts as secretary. The author has been the naturalists' representative since 1964 – she was present at the declaration

meeting at Belford – and she is now the sole survivor of the original panel.

With the growth of the reserve, and the recognition of the importance of its general natural history, another committee was appointed. This, the Joint Scientific Advisory Committee, includes the members of the Wildfowl Panel as well as representatives of organisations such as the Society, the Northumberland Wildlife Trust and the Northumberland County Council. Its chairman is Dr W A Clark, chairman of the Society's botanical section.

Mention must be made of an earlier example of the Society's involvement in conservation. In January 1943, following a request from the Nature Reserves Investigation Committee, a subcommittee was appointed to collate information about areas of natural history interest in Northumberland and Durham. G W Temperley acted as secretary and in March 1944 the subcommittee produced a report on eleven areas which, it recommended, should be treated as nature reserves. The list, which was revised three years later, included a considerable stretch of the north Northumberland coast between Seaton Point and Goswick sands, the Northumbrian loughs, Castle Eden Dene and upper Teesdale.

The Society played an important part in the setting up of a third coastal reserve, namely Coquet Island. This small island, some twelve hectares in extent, is owned by the Duke of Northumberland and since 1927, when recolonisation started, it has been the most southerly breeding station of the eider on the east coast of Great Britain.

By 1961, some two hundred eiders, together with four to five hundred terns, were nesting and there were fears that local fishermen might organise sightseeing trips from Amble, on the nearby mainland. Such trips would obviously have serious effects on the breeding birds and it was, therefore, decided that would-be visitors must first obtain a permit: these would be issued only by the Alnwick Castle Estates Office, Trinity House or the Society.

The numbers of breeding birds continued to increase and in 1968 there were approximately three hundred eider ducks, 2750 pairs of terns (including one hundred and fifty pairs of roseate terns) as well as a recently established puffin colony which was estimated to contain two hundred pairs. In this situation, it was apparent that some form of protection, preferably as a reserve, was essential. Various possibilities were considered and in 1970 the trustees of the 9th Duke of Northumberland, deceased, granted a lease to the Royal Society for the Protection of Birds. The lease was to run for fifty years from 25 March 1970, at an annual rent of £5.

The reserve is managed by a committee consisting of representatives of the RSPB, the Northumberland Wildlife Trust, the lessors, Trinity House and the Society, and this met for the first time on 18 July 1974. Prior to this meeting, there had been careful deliberations as to who should be appointed chairman and it was finally decided to approach Lord Howick. Unfortunately, he died suddenly before his reply was received and the author was subsequently appointed to this office.

Farne Islands grey seals. Goddard was the first person to make detailed observations of the Farne Islands seals. Between 1926 and 1938 he paid twelve winter visits to the islands and his field notebooks are virtually the only source of information about the colony at that time. Unfortunately, he made few attempts to obtain accurate counts of the numbers present; moreover, much of his knowledge was not committed to paper. Nevertheless, on several occasions, when he found dead seals, either young or old, he brought them or parts of them, back to the museum where he carried out careful postmortems.

His main interest was probably photography and he was certainly rewarded for in the Country Life International Exhibition of Nature Photography, held at the British Museum (Natural History) from December 1935 to January 1936, he was awarded a silver plaque (now in the possession of the Society). This was one of six plaques given by Lord Desborough for the best photographs executed entirely by the exhibitor. Goddard's exhibit was unique in that, instead of the usual single photograph, he showed seven prints which together provided a picture of the life history of the grey seal.

Goddard's activities were a purely private venture although the exhibition was subsequently shown in the museum, and the Society first became involved in the vexed question of the Farne Islands seals when, on 12 April 1938, a conference was held in the museum to consider whether or not the allegations of damage done by these animals could be substantiated. Several members of the Society attended this meeting and Goddard gave his expert opinion of the situation.

After Goddard's death, the present honorary secretaries became interested in the seals and their expedition to the islands on 16 December 1951 when, for the first time, grey seals were marked with numbered tags, was the start of what is undoubtedly the most important field project ever undertaken by the Society. The recovery of seal no 1 (then aged five or six weeks) some 644 km away, near Stavanger in Norway, on 31 December 1951, proved a milestone in seal research.

Further developments included a programme of weighing and measuring calves and the creation of a system whereby the numbers of births could be assessed. This last involves the use of colour dyes (red, green and yellow, all kindly provided, without charge, by The Colne Vale Dye & Chemical Company Limited); when weather permits, the islands are visited at regular and frequent intervals and all calves found undyed are marked, the colours being changed with each visit. The total number of young born each year is obtained by adding together these figures, while a count of calves found dead on the breeding grounds enables the mortality rate to be calculated.

The result has been the longest period of continuous research in any British grey seal colony and, although most of the actual field work is now carried out by National Trust wardens, the final assessment of their results remains the responsibility of Peter Hawkey and the author. Full details of this work are given in the reports which are now a regular feature of the *Transactions* (see page 37).

Bird ringing. Today, the British Trust for Ornithology is the recognised body responsible for British ringing, but it is sometimes forgotten that it was H F Witherby who started the British scheme. Witherby introduced a series of rings – they bore the inscription 'Inform Witherby, High Holborn, London' and in all but the large sizes the number was engraved on the inside and not, as now, on the outside of the ring – which was used at least until 1939. Despite the fact that they were made of aluminium, some of these rings survived on birds for a considerable time and eleven of the arctic terns found breeding on the Inner Farne between 1953 and 1961 carried Witherby rings. Indeed, what was at the time (1965) the oldest ringed British bird had been marked YS 581 [Witherby] in June 1938 and this ring was still in excellent condition when the tern was caught and reringed on 11 June 1965.

Accordingly, it is interesting to discover that early in 1927 Witherby approached the Council with a view to enlisting its assistance in his ringing project. Unfortunately, the reply was that, while it was in sympathy with his

ideas, the Council was not prepared to accept responsibility for any actual ringing which, it felt, must be left to individual members. The letter added that, if possible, the curator would prepare a ringing exhibit and in June 1927 specimens of rings, record forms and so on, were duly received.

Nevertheless, despite the Council's decision, considerable numbers of birds were ringed on the Farne Islands during the 1930s by Mrs C Hodgkin, one of the Society's best known ornithologists, while between 1947 and 1948 Goddard marked 179 arctic terns, 199 Sandwich terns and seventy kittiwakes on the islands.

Early in 1949, following Goddard's death, H Tully and the author approached the Farne Islands Local Committee of the National Trust in the hope that the Society would be allowed to take over his work and, thanks to the forward-looking attitude of Earl Grey of Howick, then chairman of the committee, this permission was granted. So, after a lapse of twenty-two years, the Society became an official ringer, and for the past thirty years it has been the only body allowed to ring on the islands. During this period some 142300 seabirds have been marked and many thousands recovered, large numbers on their natal ground, but others in such unexpected or far distant places as central Czechoslovakia, Davis Strait, the pack ice of the antarctic ocean and Bateman's Bay, New South Wales, Australia.

Ringing plays an important part in conservation and management as was shown when the dinoflagellate eruption of 1968 hit the islands; a count of the large numbers of ringed birds subsequently found dead enabled an estimate to be made of the effect of this disaster on the total shag population of the islands. It also provides useful information about the age to which birds can live: mention has already been made of the twenty-seven year old arctic tern and the Farnes provided another age record for a British bird – a breeding puffin which was at least twenty-three years old.

Society ringing is now virtually confined to the Farne Islands, but during the 1950s and early 1960s, large numbers of birds, mainly young reared in nest boxes, were ringed in the state forests at Hamsterley, Kielder, Wark and Thrunton. The Hamsterley work, which was carried out by Miss D N Bell and Miss C Greenwell, extended from 1951 to 1968 and provided much valuable information about the birdlife of the forest, in particular the pied flycatchers.

Another interesting, but short-lived project involved kittiwakes. These are essentially a cliff-breeding species, but for many years they have also nested on buildings in urban areas. One such was the Brewery Store, a warehouse belonging to Smith's Dock Company Limited, near the ferry landing at North Shields. This site is still in use, but the two adjoining buildings, Clemmetsen's store and the ruins of Peter Brown's burnt-out biscuit factory, on which kittiwakes also nested, ceased to be available to these birds after the winter of 1953.

In 1951, R H Stephenson, managing director of Smith's Dock, suggested that the Society might ring the young kittiwakes that had been reared on window ledges at the Brewery Store. The idea was accepted with alacrity and seventeen young were marked; next year Mr Stephenson proposed that the plan should be extended to the other two buildings and in both 1952 and 1953 young were ringed at all three sites, the total being seventy-six. An unusual feature of this latter ringing was that, because of the dangerous condition of the biscuit factory's walls, Mr Stephenson enlisted the aid of the area's Chief Fire Officer and ringers used a fire escape ladder to reach the birds!

1955 was the last year of Society ringing at North Shields, but the warehouse

subsequently became the location of one of Durham University's most important and long-continuing research programmes.

The Farne Islands study centre. There was considerable concern in the autumn of 1950 when it was learnt that Dr E A R Ennion intended to launch his projected field study centre under the auspices of the 'Farne Naturalists' Trust'. Fortunately, he appreciated the problems to which such a name would give rise and, instead, called it 'Monks' House bird observatory'.

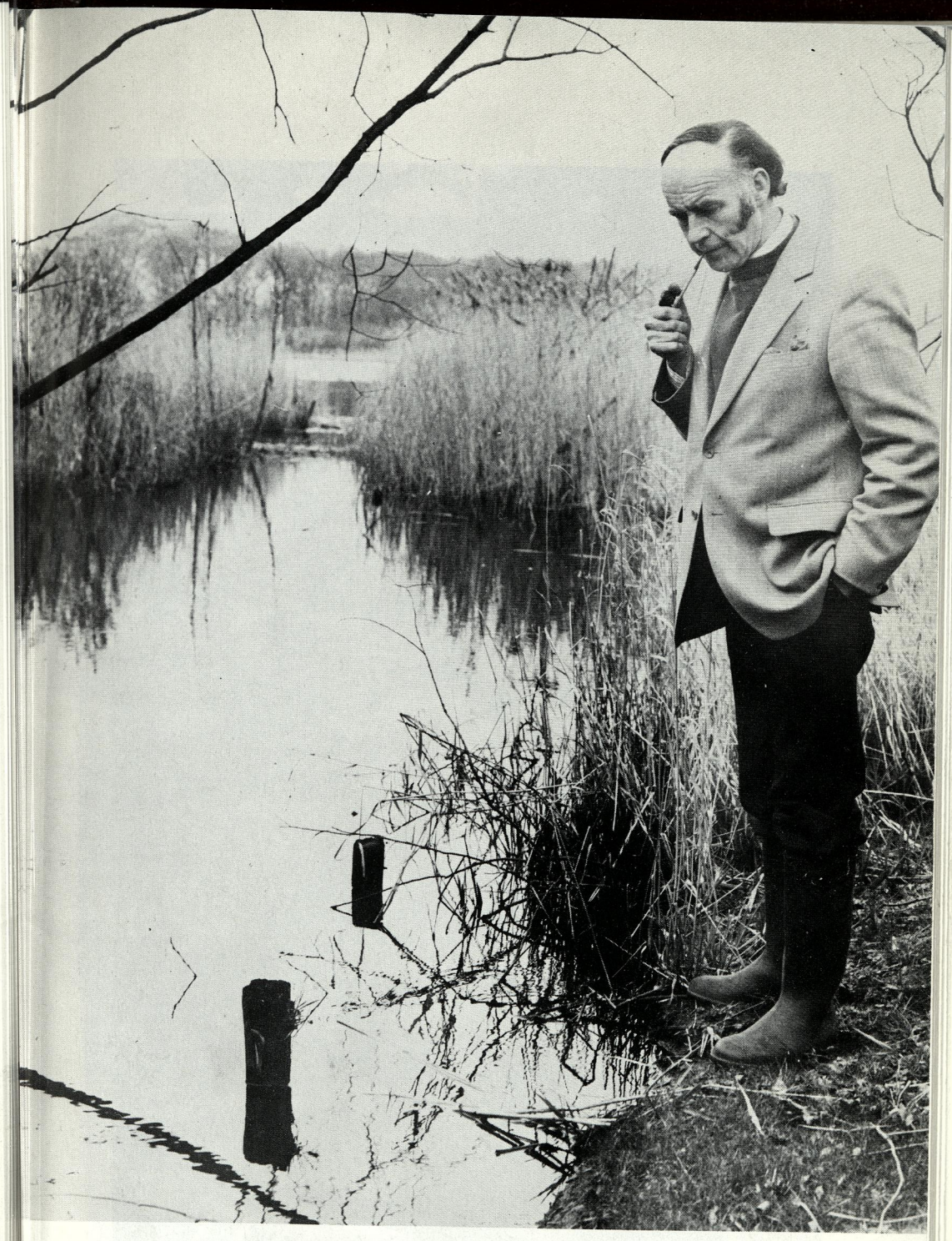
The Farne Islands were an obvious attraction for his visitors and two years later it was suggested that it might be possible to provide accommodation for students in Prior Castell's Tower on the Inner Farne. The Farne Islands Local Committee of the National Trust duly approved this proposal and promised to lease two rooms to the Society at a peppercorn rent. For its part, the Council agreed that up to £300 might be appropriated from the funds of the Percy Hedley Trust to equip this accommodation (in actual fact, £284 18s 11d was spent). A set of management rules was prepared by Earl Grey, chairman of the Farne Islands committee; these included the provisos that the 'observatory' should be controlled by a small committee made up of representatives of the committee and the Society and that, in order to cover ordinary running costs, visitors should be charged 2s 6d a day (or 10s 0d a week). In 1954, this daily charge was increased to 5s 0d while the weekly rate became £1 0s 0d; twelve years later, in 1966, there was a further increase to 7s 6d per day.

One of the early difficulties in opening the centre (as the 'observatory' was finally called) was the lack of sanitary facilities: the original proposals proved much too costly and simpler plans, which involved the conversion of the old outbuildings to the northwest of the tower, were finally carried out by a Seahouses builder.

Bird trapping, and ringing with the aid of Heligoland traps, were some of the most important activities undertaken at Monks' House and, realising the very large numbers of migrants that normally pass through the Farne Islands in spring and autumn, Dr Ennion was anxious to have one of these traps on Inner Farne. The greatest difficulty was lack of cover – there were only a few stunted elder bushes – but he decided that the old garden might provide a suitable site and in 1953 a trap was constructed there. Unfortunately, the winter storms caused serious damage and in September 1954 it was suggested that the trap might have a better chance of survival if it was moved to St Cuthbert's Gut. However, after careful consideration, it was decided that the whole operation was too expensive – it cost over £1 0s 0d to catch one bird – and the plan was abandoned.

The first visitors arrived on 26 February 1953: they were Dr N Tinbergen from Oxford, three of his students and a visiting scientist, Professor W S Verplanck. The students, who remained throughout the summer, were J M Cullen, F McKinney and Dr Esther Sager: they were working respectively on arctic terns, eiders and kittiwakes. Up to six people could stay in the tower and from time to time the three 'residents' were joined by other naturalists, including some from the Society. Incidentally, the centre seems to have been an efficient matrimonial agency for when J M Cullen returned in 1954 he was accompanied by his wife – formerly Dr Sager.

It is impossible to name all those who have used the centre to study and enjoy the wildlife of the islands, but among those who visited it regularly were parties organised by C N Rollin, and members of King's College, Newcastle upon Tyne, who undertook valuable surveys of the flora and fauna. Among



A M Tynan in Gosforth Park Nature Reserve, April 1980

150th anniversary celebrations, 12 October 1979 (see page 50)

150th anniversary celebrations, 12 October 1979. The President greeting the Lord Mayor in the Council room, with Sir James Steel on right (see page 50)

Grace Hickling, Farne Islands, 30 October 1975

the most useful of these was W R Woof's work on the insects of the Inner Farne; his collection is now in the Hancock Museum and his PhD thesis (unpublished) provides the only comprehensive and up to date information on Farne Island entomology. Distinguished ornithologists included Dr D W Snow and Dr R G B Brown while some of Dr and Mrs Urry's wonderful photographs of birds in flight were taken when they were staying in the tower.

By 1961, the majority of visitors were students from the zoology department of Durham University, working under the direction of Dr J C Coulson. They included G R Potts, I R Deans, B M Springett, N M D Brown, I K Marshall and Mrs J Horobin, their research being mainly concerned with shags, terns, puffins and eiders.

As time went on, running the centre became an increasing problem. There were occasional disagreements between the National Trust wardens and the students and, much more serious, one or two of the latter behaved in a manner that called forth decidedly adverse criticism from the local fishermen. Moreover, it was far from easy to deal with the general management: steps had to be taken to see that the rooms were left tidy at the end of the summer and that everything was clean and dry when students returned in the following spring. The supervision of the equipment, too, was an onerous task and the author, at least, was greatly relieved when, following the appointment of Peter Hawkey as full time warden naturalist in 1970, it was decided that the centre should be closed. The furniture, blankets, pans and other articles were taken over at a valuation by the Farne Islands committee and since 1971 the whole tower has been used by the wardens.

The Hancock Prize competition. In 1891, the Rev Canon Tristram proposed that a prize be awarded annually for an essay on some natural history subject and that, in order to perpetuate the memory of John Hancock, this should be known as 'The Hancock Prize'. Money was collected to form an endowment, and by 1896 £170 had been invested and rules drawn up, among them being the stipulation that the prize was to be given for 'the best account of a ramble with special reference to the common objects noticed in the fields, in the woods or on the sea shore'. This proviso undoubtedly accounted for the fact that out of twelve essays submitted during the period 1898-1916, and now preserved in the Society's archives, nine include the word 'ramble'.

During the early years of the competition there seems to have been some confusion about who should be eligible for a prize, for writing to N H Martin, one of the honorary secretaries, in 1905, Canon Tristram says 'My one object was to encourage observation and a love of nature in the humbler and non-scientific classes – especially clerks, shop assistants, artisans and the like: and this was why I wished specially to exclude college students and scientific or medical men . . . Technical knowledge I should feel to be a disqualification.' Subsequently, it was made clear that entry was limited to amateurs, although no stipulation was made regarding the profession of an entrant.

There is no doubt that the competition did much to stimulate interest in natural history and several of the prize winning essays were published in the *Transactions*. Moreover, prize winners included people whose names became well-known as naturalists, among them being the Rev W J Wingate (1903), R S Bagnall (1905), G W Temperley (1906), W Eltringham (1911 and 1921) and T S Westoll, afterwards professor of geology in the University of Newcastle upon Tyne (1929).

In October 1944, H Tully gave a sum of £50 to augment the existing capital (then valued at £140) and this enabled the amount allotted annually for prizes

to be increased: the full prize remained at £5, but additional minor prizes, which varied from 5s 0d to £2, were given.

Unfortunately, in present circumstances, essay writing is not a popular occupation and attempts to stimulate entries have met with little success. During the 1950s leaflets describing the competition were sent to many of the schools in the area, as well as to various organisations involved in natural history, but few of the entries submitted by schoolchildren fulfilled the condition that only personal observations must be recorded. Nevertheless, some excellent essays were received from adults and with a view to encouraging more of these the value of the major prize was increased to £15.00 in 1972. During the following year new regulations were drawn up; in addition to emphasising that entries must deal with natural history, these stated that they must be prepared in a form suitable for publication in the *Transactions*. At the same time the amount awarded was again increased (to £25.00).

Prizes were duly presented in 1974, 1975 and 1976, although it became increasingly obvious that not only was the number of entries submitted too small to justify the title of 'competition' – there was seldom more than one or two – but also that a very considerable amount of editing and rewriting would be necessary before any of the papers could be published. Accordingly, it was decided that the competition should remain temporarily in abeyance, to be revived if circumstances justified such an action.

Legacies. In November 1933, the Society was offered, and accepted with gratitude, the Geoffrey Watson bird skin collection. Geoffrey Watson had been introduced to Holy Island by Abel Chapman in February 1920 and during the next ten years, until his death in 1930, he spent much of his time there. At the beginning he kept a daily log, and even towards the end of his life he continued to record information about rare migrants and to give details of birds shot for him.

He was the first 'modern' ornithologist to appreciate the importance of the island as a migration station and his collection, which consisted of 525 specimens, representing 154 species and subspecies, the majority migrants, was a very valuable addition to the museum's skin collection.

The next major acquisition of the period was that of the Joicey Collection of Lepidoptera. This had been made by James J Joicey (a member of the well-known Northumbrian family) and had been kept at his home The Hill, Witley, Surrey, in what was known as The Hill Museum. Joicey was described as 'the most lavish patron on entomology, in so far as butterflies and moths are concerned, that this country has ever boasted' and in pursuit of his hobby he purchased several major collections, including those made by H Grose-Smith and Roland Trimen. He also employed collectors throughout the world and when he died in 1931 his estate was so heavily encumbered that it was impossible to fulfil his bequests. His wife, Mrs Mary Joicey, died soon afterwards and in view of the possibility that the collection might have to be sold to meet Joicey's debts, her trustees referred the problem to the courts. As a result, it was decided that it might be dispersed by gift, and, accordingly, that the bequest to the British Museum (Natural History) of specimens already held there on loan, could stand, while the Natural History Society should be given first choice of the remainder.

Unfortunately, prior to this decision, the trustees had been forced to sell the storage cabinets: these (with the specimens still *in situ*) had been bought by Messrs J J Hill and Sons, entomological cabinet manufacturers in Willesden,

and in February 1934 Goddard visited this firm. On his return, he recommended that the British section should be accepted: he later advised the inclusion of a series of exotic butterflies of the section *Troides*. Despite the retention by the British Museum of all type specimens, this was a major collection, for, as G Talbot, sometime curator at The Hill Museum, wrote to Goddard, it consisted of 'About 15000 moths including *many rarities* with data. A representative coll. of butterflies but no rarities.'

Although the bequests of the specimens had been allowed, this decision did not include the cabinets and the Society was faced with the need to purchase (at a cost of £102) the three walnut cabinets in which the British lepidoptera were housed. As always, money was a problem, but with the aid of some generous donors, including the Hon J A Joicey of Longhirst who gave £100, some £225 was raised and the reconditioned cabinets, with their contents, arrived safely at the museum in late April 1934.

It seems probable that it was intended to use the surplus money to overhaul the collection, but nothing was done and the balance remained unspent.

In January 1939, an application for a grant was made to the Carnegie Trustees: this was to be used to reorganise the entomological collections. The application was successful and in June 1939 the Trustees promised £250 towards the cost of overhaul and rearrangement of the British lepidoptera on condition that the Society provided an additional £100. Three months later war was declared and on 24 November 1939 the Trustees wrote, saying that the grant would be kept open until hostilities ended. This promise was renewed in 1946 and the search for a suitable entomologist was started: it was, however, not until January 1949 that H Hargreaves commenced work. Because of ill health, he stayed only for thirteen weeks: he coordinated the macrolepidoptera, but the complete rearrangement was never finished and, as a result, only £125 of the promised grant was received. At a later date, the Trustees gave a further £50 to purchase exhibition cases and insect models: at the same time the remainder (£75) of the original grant was cancelled.

In 1965, the Society received a very valuable bequest from H Stevens of Tring. This comprised several thousand bird skins and some three hundred store boxes of lepidoptera from the north of India, Afghanistan and the Sikkim. With it came a sum of £100 to be used, according to the testator's wishes, to purchase an additional cabinet for the storage of the bird skins so that the bequest might be known as the 'Amy and Herbert Stevens bequest'.

An interesting, although certainly not a major legacy, was a picture of Ryton village, supposed to have been painted by Miss Hancock, given in 1953 by J Bell of Ryton. It had been presented to Mr Bell by the Misses Cooke of Wylam on the expiration of fifty years with their father's firm of Dinning and Cooke, formerly one of Newcastle's best known builders' merchants!

There were, of course, other legacies either of books or specimens, but it is impossible to deal with these in detail. Mention must, however, be made of G W Temperley's books and Weldon Watts' colour slides of British plants as well as the collection of spiders, made by A Shortt and given by his executors, and the fossils, collected in Redesdale by the late John Dunn, and donated by his sons. Two valuable gifts of manuscript material were received in 1949: these were nine volumes containing George Bolam's bird records (given by his sister, Miss S E Bolam) and Abel Chapman's catalogue 'Fauna Hauxtiensis', presented by T R Goddard's executors.

Pecuniary legacies ranged from Mrs C Hodgkin's £10 to the £5000 very generously given to the Society by H Tully (page 34) and by the executors of the late Percy Hedley: this last was treated as a trust fund to be used

specifically for the improvement and development of the museum.

In 1945, Miss C T Adamson, who had earlier donated a valuable collection of periodicals in memory of her brother, Colonel C H E Adamson, left £50 (later abated to £43 13s 8d) while in the following year a similar sum was received under the will of Miss A J Thompson: she had been a member since 1889 and was the niece of Thomas ('Tommy') Thompson of Winlaton whose mounted birds form an important part of the ornithological collection. Bequests of £100 were made by W E Beck, G W Burtt, J F Stewart and, in 1941, by Miss Elizabeth Wright, last surviving daughter of Joseph Wright, who had been custodian of the museum from 1853 to 1904 and many of whose books are in the library.

C Forster's original bequest of £200 in 1943 was increased by a further £126 when the residue of his estate was finally divided in 1956. Mrs J B Strachan's will specified that the residue of her estate should be divided among charitable institutions; the Society was among those selected by the executors and, accordingly, benefited by the sum of £728 18s 1d. In 1950, Miss J A Wilson bequeathed £500, while legacies of £1000 were received from G E Henderson (see page 8), Mrs M A Haslam, T Belt and Professor F C Pybus.

Thomas Belt, who died in 1941, gave the bequest in memory of his father, Thomas Belt, author of *The naturalist in Nicaragua,* whose collection of British plants (made in 1848-52) forms part of the museum herbarium and whose MS notes on many local plants are in the library. In this connection it is interesting to record that in December 1976 a letter was received from Mr K Hamylton Jones, H B M Ambassador in San José, in which he stated that Belt's memory was still green in Nicaragua. He added that, if funds permitted, it was hoped to buy Belt's former house in Santo Domingo, Chontales, and convert it into a geological and plan museum for the region. Some £900 was needed and, while the Council was unable to make a substantial contribution, it decided to send a small donation as a token of goodwill.

Professor F C Pybus, although forced by ill health to give up his membership, had been a generous benefactor, and his will, which expressed the desire that the legacy of £1000 should be applied to provide lectures on the broader aspects of natural history, made possible the Society's first endowed lecture, the Pybus Memorial Lecture.

The Society was one of six charities which, between 1963 and 1964, benefited under the will of Mrs E F Pyle; each share amounted to £1241 19s 8d. In 1944, under the will of Mr W J Harrison, a Newcastle surgeon, the Society acquired an interest in 21 Eldon Place. This was originally designed as a possible house for the curator, but in 1949 it was acquired by the City under a compulsory purchase order, the sum of £1150 being received in compensation.

Finally, mention must be made of the T B Short bequest. Mr Short, a miller, lived at Waren Mill and his will, made in 1941 a few days before his death, was a long and very complicated document. He had obviously been a magpie collector and he was determined that his collection should form the basis of a museum in north Northumberland. In order to achieve this, he arranged that his estate, after passing to named beneficiaries, should, subject to certain conditions, devolve on the Society. Chief among these conditions was that his trustees must establish and maintain a museum and library in one of his houses at Fenwick, and that, after the death of the beneficiaries, the Society must undertake this maintenance. He provided a sum of £200 per annum for the upkeep of this museum – a quite inadequate amount in view of the fact

that the trustees might have to undertake this task for at least fifty years.

In 1943, officers of the Society inspected the houses – Cherrytrees and the Manor House – as well as his collection and decided that, not only were the suggested premises quite unsuitable for a museum, but their location at Fenwick was not such as to attract visitors. Furthermore, the collection was virtually useless; nearly all the specimens were badly affected by damp, dirt and insect pests while few of the objects were authenticated by data. They did, however, remove a few of the more valuable birds which, they thought, it would be possible to treat and so preserve.

Because of the war, no other action was taken and for various reasons the matter remained virtually in abeyance until 1971 when the surviving legatees initiated steps with a view to settling the estate. Since then, negotiations have continued and it is hoped that, in the not too distant future, the Society will receive a capital sum (exact amount unknown) in settlement of this legacy.

POSTSCRIPT: THE 150TH ANNIVERSARY CELEBRATIONS

The anniversary was celebrated during October 1979, the main event being a reception, held in the museum, on the evening of Friday 12 October. The keynote of the party was informality; as already explained, the centenary was marked by two receptions and the presentation of congratulatory addresses from learned bodies, but this time it was essentially a family affair. This was emphasised in the wording of the invitation which said that 'the President and Council hope that . . . will join them in celebrating the 150th anniversary of the Society' and in the fact that dress was to be 'lounge suits'. Each member was allowed to bring one guest and there were also several Society guests although, unfortunately, not all those who were invited were able to accept.

Chief among these official guests was Professor L W Martin, Vice Chancellor of the University of Newcastle upon Tyne and the Lord Mayor, Mrs Peggie Murray, while among other organisations represented were the Literary and Philosophical Society (S T L Harbottle), the Yorkshire Geological Society (Dr G A L Johnson), the National Trust (R E Meyrick), the Royal Society for the Protection of Birds (I H Armstrong), the Northumberland Wildlife Trust (R A Edmonds) and the Tyneside Bird Club (K Dures).

The president, His Grace the Duke of Northumberland, opened the proceedings with a short address; he summarised the highlights of the past 150 years, in particular stressing the way in which the Society has not only kept up to date, but even forged ahead of its peers. The chairman, Sir James Steel, then introduced Professor Martin who read an address of congratulation from the University. The Lord Mayor added her felicitations and she was followed by Dr Johnson who conveyed congratulations and good wishes from the Yorkshire Geological Society.

The president next accepted gifts on behalf of the Society from two members who had decided that they wished to mark this auspicious occasion in a concrete fashion. James Alder presented a delightful model of a little owl, designed by him for the Worcester Royal Porcelain Company Limited; this is one of a limited edition and, very appropriately, he had chosen number 150! The author's contribution took the form of finely illustrated modern bird books; there were five of these, the most valuable being 'The bird paintings of Henry Jones', published by the Zoological Society of London in 1976 to commemorate its 150th anniversary.

The formal part of the evening ended, at least for the author, in a quite unexpected way when Miss Sue Turner, a member and the museum geologist, presented her with a beautiful bouquet.

No specific entertainment was provided, but both the library and the Council room were open, various treasures being displayed; explanatory leaflets were available and, in addition, guides were present to answer queries. Mr Alder gave a short talk on the steps involved in the preparation of his gift and this proved exceedingly popular. There was unanimous praise for the new geology gallery and the unexpected preview of parts of the redesigned bird room called forth general admiration.

And last, but by no means least, mention must be made of the excellent refreshments. These were organised by Mr and Mrs D F McGuire, with the assistance of a team of hard working voluntary helpers, and the result was both attractive in appearance and appetising in flavour. There was a choice of red and white wine and various small savouries, most of them homemade, were provided. It is worth mentioning that the total cost was £151.76, an incredibly small sum compared with the present cost of professional catering.

Some 270 people attended and at 2130, when the function ended, there was general agreement that it had been a most successful evening.

Twenty-eight days later, a very generous and quite unexpected birthday present was received – a cheque for £2000 from the Knott Trustees. This gift, from a charitable fund that has, in the past, often helped the Society, is greatly appreciated and it is planned to use it to publish this history so providing all members with a lasting memento of a momentous year.

A fortnight later the author gave a talk 'The Natural History Society of Northumbria, 1929-79', which was based on this account.

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CATALOGUE OF THE CARBONIFEROUS AMPHIBIANS IN THE HANCOCK MUSEUM NEWCASTLE UPON TYNE

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Dedicated to Thomas Atthey

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CATALOGUE OF THE CARBONIFEROUS AMPHIBIANS IN THE HANCOCK MUSEUM NEWCASTLE UPON TYNE

by

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The Hancock Museum, Newcastle upon Tyne

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INTRODUCTION

This is the first complete catalogue of the Carboniferous (Westphalian) amphibian specimens held in the Hancock Museum and it is intended to be the first part of a new catalogue of all the type, figured and important specimens in the geological collections of the museum. This catalogue is one of the priorities of the newly formed Geological Curators Group and it follows the requirements of the International Code of Zoological Nomenclature (Bassett, 1975). It was decided to make a complete review of the fossil remains of the Amphibia because these are relatively rare and the collection has been a prime one in the study of the form and evolution of this vertebrate group. Also, much of the early literature is not readily available. The cataloguing of the specimens has recently been completed with the aid of assistance given by the Job Creation Scheme. The data from the collection is being placed onto the University of Newcastle upon Tyne NUMAC computer using the SPIRES information storage and retrieval system, developed at Stamford University, which will aid all future researchers and museum users and facilitate future production of catalogues.

The Natural History Society of Northumberland, Durham and Newcastle upon Tyne (now the Natural History Society of Northumbria) was founded in 1829 as an offshoot of the Literary and Philosophical Society of Newcastle upon Tyne. One of its main objects was to maintain a museum and this (the 'Old Museum') was situated not far from what is now the Central railway station. In 1884, the present building was opened by HRH The Prince of Wales and seven years later, in 1891, it was formally named The Hancock Museum, thus commemorating two of the Society's most distinguished members, John and Albany Hancock. The Society was the foster home of many of the leading vertebrate palaeontologists of the last century and the museum, now financed by its longtime ally, the University of Newcastle upon Tyne, still caters for vertebrate palaeontologists working in the city.

The Coal Measure amphibians were all found between 1860 and 1880 in Scotland and the north of England. Richard Howse, curator of the museum from 1848 to 1901, produced the first guide to the museum's collection of local fossils in 1889 (Howse, 1889). On page 46, he sets out the six genera and species which, at that time, had been described by local naturalists, while Goddard (1929) gives a complete list of the new genera and species described in the Society's *Transactions*. D M S Watson, in a series of scientific works from 1912 to the 1950s, brought the Hancock amphibians to the attention of a new generation when, initially with the help of the then curator, E L Gill, he reviewed and studied the specimens. A L Panchen, his colleagues and students, have restudied this material, using modern techniques, and have added greatly to our knowledge of the relationships and structure of the early amphibians. Museum specimens are listed in certain recent papers (e.g. Panchen 1964, 1966, 1972; Beaumont, 1977).

The main part of this unique collection of amphibians is from the roof of the Low Main Seam at Newsham colliery, near Blyth, Northumberland, and it represents merely a portion of several hundreds of vertebrate and plant specimens collected by one man, Thomas Atthey. The only significant new specimen found to date in the northeast of England in this century is the skull of *Anthracosaurus russelli* from Usworth colliery, Co. Durham, now housed in Sunderland Museum (Tyne and Wear) (Panchen *et al*, 1967). However, this review has brought to light at least one new addition to the

faunal list of Newsham amphibians, an incomplete, but well-preserved lysorophid postcranial skeleton, discovered in the Atthey collection (Boyd, 1980b).

Thomas Atthey was one of a rare breed of men who become enamoured of the study of fossil vertebrates and spend much of their time searching for, collecting and preparing the objects of their attention, in this case fossil amphibians. He had few counterparts in this country, and his dedication was so total that eventually it nearly destroyed him. He was born at Kenton, near Newcastle, in 1814, the son of a corver, and after only an elementary education was sent down the pit. He soon followed his father into the corve shop where he made corves, the large wicker baskets in which coal was transported to the surface. His next job was as superintendent corver of a Manchester mine, but in 1850, when newly introduced iron tubs replaced wicker corves, he was made redundant. From then on he made his living by opening grocers' shops to serve the mining community, first at Cramlington and, later, in Gosforth.

Encouraged by a meeting with John Hancock in Gosforth Park when young, he became an enthusiastic amateur naturalist and accomplished microscopist. His discoveries began with a visit to the pit heaps at Newsham and the finds he made in the Newsham Low Main coal shale were to preoccupy him for the rest of his life. He would work on his fossils, preparing them with the aid of mounted needles at the back of his shop, while his family looked after the business. He had little financial acumen, however, and would barter groceries with his miner friends for the latest fossil finds. Because of this, the shop did not prosper; he became virtually bankrupt and eventually his health failed. His eyesight deteriorated and he suffered a stroke whilst working on the vertebral column of *Eogyrinus*. Fortunately, Lady Armstrong bought the fossil collection, so making the family solvent; in August 1878 she presented it to the museum and Atthey was thus able to see his 'treasures' cared for and worked on by colleagues. He died two years later, in 1880, and was buried at Gosforth church.

In the bibliography (pages 21 to 22) we have set out all the amphibian papers written by Thomas Atthey and his colleagues from 1868 to 1889. His work was certainly of the highest quality and he patently deserved the Associateship of the Linnean Society he was later to receive. His papers published in collaboration with Albany Hancock include able descriptions of most of the amphibians and fish found in the Newsham shale. Perhaps his most important discovery was the large, almost complete, skull and scattered postcranial remains of an amphibian referred by him to *Anthracosaurus russelli* Huxley, but later distinguished by Watson (1926) as *Eogyrinus attheyi*.

Albany Hancock (1806–1873) was the elder of the two Hancock brothers. Well-known in Victorian scientific society, he was the most eminent local zoologist to interest himself in vertebrate palaeontology and undoubtedly encouraged Thomas Atthey to begin his scientific work. From 1868 to 1871, he published a series of papers with Atthey on the fish and Amphibia from Newsham. The papers were often illustrated and, possibly, actually written by Hancock, the palaeontological insight and preparatory work being Atthey's. The descriptive standard achieved was very high, far outshining that of such contemporary Amphibia workers as Huxley and Cope.

Another local collector of this period was Alderman Thomas Pallister Barkas FGS (1819–1891) who accumulated a large private collection. Barkas was a remarkable man who chose to ignore all the available material, ideas and descriptions of his contemporaries; instead, he published his own

views in an illustrated guide (1873), which remains a valuable source of senior synonyms. Much of his figured material was later presented to the Society.

The third major part of the fossil amphibian collection was donated by James Walter Kirkby FGS (1834–1902), who was born in Sunderland and was related to the Hancocks. In 1867, he moved to Fife as manager of Pirnie colliery near Leven, which yielded 'Parrot Coal', used for the production of paraffin. He, too, discovered fossil bones in coal shales, but was probably unaware of their significance. In November 1887, he deposited 'two boxes of fossils from the Carboniferous rocks of Fife' in the museum. The two most notable specimens, the type skulls of *Palaeoherpeton decorum* (Watson 1926) and *Baphetes kirkbyi* Watson 1929, were not recognised until the 1920s when they were prepared by Gill, prior to detailed description by Watson.

Two other men took a part in those early pioneering days. Dr Dennis Embleton (1810–1900), anatomist and honorary curator, was the first professor of medicine in the Newcastle Medical School. A close friend of, and occasional collaborator with, both Hancock and Atthey, he published a series of papers from 1873 to 1889. After Atthey's final illness, Embleton completed the description of the great length of vertebral column, now designated as *Eogyrinus attheyi* Watson, which, sadly, despite attempts at conservation, has suffered the vagaries of pyritic decay, so that only a relatively short length remains. This specimen was first noticed by Barkas, collected and further described by Atthey (1884) and prepared and illustrated by William Dinning prior to Embleton's fine account in 1889. Dinning, the illustrator, completed the coterie of local palaeontologists working on amphibians. Like Embleton a Newcastle man, he was a prolific collector of fossil vertebrates and an able scientific observer. Many of his original drawings, some of which were used to illustrate the early amphibian papers after Albany Hancock's death, remain in the museum. He worked closely with John Hancock to raise money and produce plans for the new museum intended to house the growing collections; the latter included his own which he donated partly in 1874, when he joined the Society, and partly in 1894.

The Pirnie and Newsham horizons, from which come the great majority of the museum's specimens of Carboniferous Amphibia, lie within the Middle Coal Measures. The Parrot Coal of Pirnie, sometimes referred to as 'Earl David's Parrot', which yielded the holotype skulls of *Baphetes kirkbyi* Watson and *Palaeoherpeton decorum* (Watson), lies within the middle *modiolaris* Zone of the Middle Coal Measures (Panchen and Walker, 1961). The black shale overlying the Northumberland Low Main Seam at Newsham, although regarded by past workers as being lower *similis-pulchra* Zone in age, has been demonstrated by Land (1974) to lie within the upper *modiolaris* Zone of the Middle Coal Measures. Both Newsham and Pirnie are thus Westphalian B in age.

Newsham itself is of peculiar interest as the only Carboniferous tetrapod locality within the paralic Coal Measures of northwestern Europe from which a well-preserved amphibian fauna, both taxonomically diverse and rich in terms of number of specimens, has been recovered. It must be noted, nonetheless, that the known Newsham amphibian fauna is composed predominantly of aquatic forms, representatives of the more terrestrial groups of Carboniferous tetrapods, such as the conventional microsaurs and captorhinomorph reptiles, being absent. The organic black shale which contains the Newsham amphibian specimens is considered by Panchen

(1970) to have been deposited as a sapropelic mud, deficient in oxygen, at the bottom of a large and deep lake in the surrounding coal-swamp forest; the absence of truly terrestrial vertebrates from such a deposit is perhaps not unexpected. The known amphibian, fish and invertebrate faunas of the Newsham black shale have been briefly summarised by Land (1974).

A curious feature of the Northumberland Low Main Seam is the presence within the seam of a linear trough-like 'swelly', of thick coal varying between 400–600m in width, which, flanked by thinner coal, extends eight kilometres between Backworth and Newsham. The 'swelly', although not following an absolutely straight course, certainly does not have the sinuosity expected of a river channel (Land, 1974). Its northern end is situated within the area of the fossiliferous Newsham black shale; the significance, if any, of this fact is uncertain.

The Hancock Museum Carboniferous amphibian collection was one of the first of its type to be systematically brought together in this country and is certainly one of the best. At present it contains five accepted holotypes and two lectotypes in addition to syntypes and numerous figured specimens. It is a measure of the value and importance of the collection that so many of its constituent parts have each been figured and described by a number of different workers between 1868 and the present day. Noteworthy also is the role played by this collection in the formulation of certain of the highly influential theories of D M S Watson relating to the origin and early evolution of the labyrinthodont Amphibia and tetrapods in general. A notable example is the suggestion by Watson (1912, 1926) that the embolomerous vertebra present in such anthracosaur genera as *Eogyrinus* and *Pteroplax* represented the primitive condition for tetrapods; this hypothesis, restated by Watson as late as 1951, was based largely upon the absence of other than embolomerous vertebrae from the Newsham amphibian collection, despite the presence in the known fauna of this site of both batrachosaur and primitive temnospondyl labyrinthodonts.

The loss of about two-thirds of the *Eogyrinus* vertebral column, mentioned previously, is part of a continuing battle to conserve this collection for future generations of workers. Attempts to reverse and control the effects of pyrite rot are continuing, by effecting control of relative humidity in the storage areas and monitoring humidity and temperature fluctuation.

Recently, a collection of Namurian amphibians has been acquired by the museum from Dora opencast site, Cowdenbeath (Andrews *et al*, 1977). These specimens are at present under study by A L Panchen and T R Smithson, and a short note on the find provides a supplement to this catalogue.

CHARACTERISTICS OF THE CATALOGUE

The zoological classification employed in this catalogue is, for the Temnospondyli and the 'lepospondyl' amphibian orders, based upon that proposed by Romer (1966), modified (in the case of the loxommatid temnospondyls) after Beaumont (1977). The classification employed for the Batrachosauria is that suggested by Panchen (1975).

For each Carboniferous amphibian species represented in the museum's collections the type specimen, if present, is noted first, followed by a list of all other registered specimens arranged in numerical order according to their present Hancock Museum catalogue numbers. Several of the more important Newsham labyrinthodont specimens described by Watson (1926) were allocated by this author a series of reference numbers prefixed by the letters DMSW and where these specimens have proved recognisable, the 'DMSW' number is given in brackets immediately following the present catalogue number. All type, figured and cited specimens are noted as such, together with full references to the appropriate publications and also to unpublished theses.

Unless it is otherwise stated, all specimens listed in the body of the catalogue are from the black roof shale overlying the Northumberland Low Main Seam at Newsham colliery, Northumberland, collected by Thomas Atthey and donated by Lady Armstrong in 1878.

Most of the important amphibian papers of the local nineteenth century workers have been included in the bibliography and it will be seen that Atthey, Hancock, Howse and Embleton sent many of their publications both to the *Annals and Magazine of Natural History* and to the Society's *Transactions*.

ACKNOWLEDGEMENTS

The authors would like to thank all those research workers who have given freely of their time, their permission and help to compile this catalogue, especially Dr A L Panchen, Dr Eileen Beaumont, Dr Angela Milner and Mr T R Smithson. Our thanks are also due to the curator of the Hancock Museum, Mr A M Tynan, for the opportunity to study the collections under his care and to Mrs Grace Hickling and Dr A G Long for their help in obtaining archival material. The cataloguing was partly financed by the Job Creation Scheme, while the Sponsorship Committee for Publications of the University of Newcastle upon Tyne made a generous contribution towards the cost of publication.

Finally, we should like to acknowledge the inspiration given by those early amphibian workers and members of the Natural History Society of Northumberland, Durham and Newcastle upon Tyne.

SYSTEMATIC GENERAL CATALOGUE OF THE AMPHIBIA

Class AMPHIBIA

Subclass LABYRINTHODONTIA Owen, 1861

Order TEMNOSPONDYLI Zittel, 1889

Suborder RHACHITOMI Cope, 1884

Superfamily LOXOMMATOIDEA Romer, 1966

Family Loxommatidae Romer, 1966

Genus *Megalocephalus* Barkas, 1873

Megalocephalus pachycephalus (Barkas, 1873)

G15.22 (DMSW 2). An almost entire skull, lacking the left quadrate ramus. Figured by Barkas (1873, figures 183–185) as *Orthosaurus pachycephalus* gen. et sp. nov. Figured also by Watson (1926, figures 6,7,8,9) and, as *Megalocephalus pachycephalus* (Barkas), by Tilley (Beaumont) (1971, plates I, II and figures 1,8) and Beaumont (1977, figures 6,8,9a).
HOLOTYPE specimen.

G15.21 (DMSW 1). A complete skull. Figured by Embleton and Atthey (1874, plates 1,2), Watson (1912, figure 1; 1926, figures 6,7,8) and Tilley (Beaumont) (1971, plates III, IV and figures 2,9).

G15.23 (DMSW 3). A skull lacking the snout region anterior to the orbits and also the occipital condyle. Figured in part by Embleton and Atthey (1874, plate 3, figure 1) and in its entirety by Tilley (Beaumont) (1971, plates V, VI and figures 3,10,13) and Beaumont (1977, figure 10).

G15.24 (DMSW 4). A skull minus the snout anterior to the antorbital vacuities. Specimen from Earl David's Parrot Coal, Pirnie Colliery, near Leven, Fifeshire, Scotland. Middle *modiolaris* Zone, Middle Coal Measures (L. Westphalian B) (Panchen and Walker, 1961). Kirkby collection.

G15.25 (DMSW 5). An incomplete skull, having been sheared diagonally, and consisting of the skull table, left quadrate ramus, left lateral half of snout, the palatal elements underlying these regions and the posterior part of the neurocranium.

G15.26 (DMSW 6). Left quadrate ramus of skull, with occiput and tabular region of skull table.

G15.27 (DMSW 7). Right quadrate ramus of skull with right tabular region of skull table. Figured by Watson (1912, plate 1), Tilley (Beaumont) (1971, figure 14) and Beaumont (1977, figure 11).

G15.28 (DMSW 8). A slab of shale bearing the anterior part of the left maxilla, in addition to the anterior portion of the left jugal, the entirety of the left prefrontal (the latter two elements being in articulation and defining the anterior part of the antorbital vacuity) and the left palatine with tusk in situ.

G15.29 (DMSW 9). An isolated basioccipital, associated with palatine and skull roof fragments.

G15.30 (DMSW 10). Section of snout region of skull some 70mm in antero-posterior length, at a level immediately anterior to the antorbital vacuities and posterior to the nasal – premaxilla suture. Dermal bones of the skull roof and palate are represented.

G15.31 (DMSW 11). An incompletely preserved isolated left vomer with the anterior tusk in situ.

G15.32 (DMSW 12). A right palatine pertaining to skull specimen G15.23, showing the posterior margin of the choana and part of the course of the naso-lachrymal duct. Figured by Tilley (Beaumont) (1971, figure 10) and Beaumont (1977, figure 10(a)).

G15.33 (DMSW 13). An isolated left vomer with the anterior tusk in situ.

G15.34 (DMSW 14). A premaxilla, showing a perforation for the parasymphysial tusk of the dentary. Figured by Hancock and Atthey (1868, plate XIV, figure 3).

G15.35 (DMSW 15). An isolated right tabular.

G15.38 (DMSW 18). A fragment of the central part of the length of a left mandibular ramus.

G15.39 (DMSW 19). The anterior 220mm of the left mandibular ramus. Figured by Embleton and Atthey (1874, plate 3, figure 3), Watson (1926, figures 10, 11), Tilley (Beaumont) (1971, figure 22(c)) and Beaumont (1977, figures 14, 15).

G15.40 (DMSW 20). A length of the right mandibular ramus at the level of the II and III coronoids and the anterior part of the adductor fossa. Figured by Watson (1926, figures 10, 11), Tilley (Beaumont) (1971, figure 22(b)) and Beaumont (1977, figures 14, 15).

G15.41 (DMSW 21). A length of the left dentary and associated dermal bones. Figured by Watson (1926, figures 10, 11) and Beaumont (1977, figures 14, 15).

G15.42 (DMSW 22). The articular extremity, including the articular condyle, of a left mandibular ramus. Figured by Watson (1926, figures 10, 11) and Beaumont (1977, figures 14, 15).

G15.43 (DMSW 23). The posterior part of a right mandibular ramus, including the adductor fossa but lacking the articular condyle. Figured by Watson (1926, figures 10, 11), Tilley (Beaumont) (1971, figure 22(a)) and Beaumont (1977, figures 14, 15).

G15.44 (DMSW 24). A length of the mid-section of a right mandibular ramus. Figured by Watson (1926, figures 10, 11) and Beaumont (1977, figures 14, 15).

G15.45 (DMSW 25). The anterior 95mm of a right mandibular ramus. Figured by Watson (1926, figures 10, 11) and Beaumont (1977, figures 14, 15).

G15.46 (DMSW 26). A right mandibular ramus. Figured by Embleton and Atthey (1874, plate 3, figure 2), Watson (1926, figures 10, 11), Tilley (Beaumont) (1971, plate X and figures 21, 23) and Beaumont (1977, figures 14, 15).

G15.47 The right jaw articulation, including articular, quadrate and part of the pterygoid.

G15.48 A fragment of ornamented dermal bone bearing three incomplete teeth.

G15.49 The snout and right orbital region of a skull.

G15.50 An isolated section of the dermal skull roof of the snout, comprising both frontals and the right prefrontal.

G15.51 A fragment of dentary.

G15.53 A fragment of ornamented dermal bone.

G15.54 An isolated left premaxilla.

G15.56 An incomplete isolated (? left) premaxilla, bearing a length of lateral line sulcus.

G15.58 An isolated left jugal.

G15.59 An isolated left vomer with the anterior tusk in situ.

G15.60 Vomerine tusk on fragment of dermal bone.

G15.62 A fragment of ornamented dermal bone bearing one (sectioned and polished) tooth base.

G15.63 The anterior 55mm of a left dentary, bearing a parasymphysial tusk.

G15.64 Two fragments of ornamented dermal bone.

G15.65 A fragment of ornamented dermal bone.

G15.66 A fragment of ornamented dermal bone.

G15.68 A fragment of ornamented dermal bone.

G24.29 Two isolated teeth.

G24.32 (DMSW 17). A large fragment of a mandibular ramus.

G37.88 An isolated neural arch closely resembling those figured as pertaining to *Megalocephalus lineolatus* (Cope) by Beaumont (1977, figure 16(b)).

G40.27 The anterior extremity of a right mandibular ramus. Figured (as *Pteroplax cornutus* Hancock and Atthey, 1868) by Barkas (1873, figure 195). Barkas collection.

G53.30 An isolated tooth.

G55.56 An isolated left maxilla, lacking its anterior and posterior extremities.

G86.43 A slab of shale bearing two large fragments of ornamented dermal bone.

G86.44 Twenty isolated teeth.

G86.45 Twenty-two isolated teeth.

G86.46 A fragment of ornamented dermal bone.

G86.60 A fragment of ornamented dermal bone.

G86.62 A large left quadrate in association with fragments of the left quadratojugal and pterygoid.

G90.21 A fragment of a (? right) premaxilla.

G90.28 A fragment of ornamented dermal bone.

G90.29 A fragment of ornamented dermal bone.

G90.30 A fragment of ornamented dermal bone.

G140.63 A slab of shale bearing the impression of loxommatid dermal bone ornament.

G141.30 A section of the tooth row, including the crowns of three successive teeth.

G142.95 An isolated left nasal. Figured by Boyd (1978, figures 8c, 8d).

G143.05 Twelve isolated teeth.

Genus *Baphetes* Owen, 1854

Baphetes kirkbyi Watson, 1929

G15.69 The impression of the dorsal surface of the right side of the skull roof.

G15.70 The impression, incomplete in its mid-region, of the palate.

G15.91 The skull table and underlying basicranial region.

The three specimens listed above form the constituent parts of a single skull, described by Watson (1929) as the HOLOTYPE of *Baphetes kirkbyi* sp. nov.

The specimen is from the Earl David's Parrot Coal of Pirnie, near Leven, Fifeshire, Scotland. Middle *modiolaris* Zone, Middle Coal Measures (L. Westphalian B) (Panchen and Walker, 1961).

Figured by Watson (1929, figures 18, 19); Tilley (Beaumont) (1971, plates XVIII – XX and figures 52, 56, 57); Beaumont (1977, figures 18, 19, 21, 22, 23). Kirkby collection.

Order BATRACHOSAURIA Efremov, 1946

Suborder ANTHRACOSAURIA Säve-Söderbergh, 1934

Infra-order EMBOLOMERI Cope, 1880

Family Anthracosauridae Cope, 1875

Genus *Anthracosaurus* Huxley, 1863

Anthracosaurus ?russelli Huxley, 1863

G24.35 A mandibular fragment attributed to *Anthracosaurus russelli* on the structure of the teeth seen in cross-section, and the absence of well-defined ornament on the well-preserved bone surface. First identified possible specimen of this species from Newsham (Panchen, personal communication. 1980).

G24.39 Isolated jugal attributed to *Anthracosaurus russelli* (J. Agnew, personal communication. 1980).

Family Eogyrinidae Watson, 1929

Genus *Eogyrinus* Watson, 1926

Eogyrinus attheyi Watson, 1926

G13.71 (DMSW 27). An almost complete skull, with both mandibular rami, and rib fragments. Figured by Atthey (1876, plate VIII, figure 1; plate IX; plate X, figures 1,2) as *Anthracosaurus russelli* Huxley, 1863.

Also figured by Watson (1912, figure 2), Watson (1926, figure 20) as *Eogyrinus attheyi* type specimen and Panchen (1970, figures 4(a), 14(c); 1972, figures, 2,4,5,6,7,8,11,12).

Designated the LECTOTYPE of *E. attheyi* Watson, 1926 by Romer (1963).

G13.72 (DMSW 28). At least twelve vertebrae, six ribs, a number of dermal scutes and a femur. Figured in part by Atthey (1876, plate X, figures 3,4) as *A. russelli* Huxley and, also in part only, by Panchen (1966, figure 6b; 1972, figure 14).
Originally associated with the lectotype skull and pertains to the same individual.

G13.73 (DMSW 29). Three pleurocentra in association with their respective neural arches, and two intercentra.

G13.74 (DMSW 30). An isolated neurocranium. Figured by Watson (1926, figure 18) and Panchen (1972, figure 9).

G13.75 (DMSW 31). A fragment of the snout at the level of the palatine tusk pairs. Described by Hancock and Atthey (1869a) as *A. russelli* Huxley, and by Watson (1926) as *E. attheyi* Watson.

G13.76 (DMSW 32). A slab of shale bearing two centra, three ribs and a number of ventral dermal scutes. Figured in part by Watson (1926, figure 24) and by Panchen (1966, figures 6(a), 6(c)).

G13.77 (DMSW 33). An articulated length of vertebral column, including twenty-four presacral vertebrae, the sacrum and a number of proximal caudal vertebrae. Also a number of presacral and caudal ribs. Figured by Barkas (1873, plate VI), Embleton (1889, plate VI), Watson (1926, figure 21) and Panchen (1966, figures 1-10).

G13.78 (DMSW 35). An isolated skull table. Figured by Atthey (1877b, plate XIII, figure 1) as *Pteroplax cornutus* Hancock and Atthey, and by Watson (1926, figure 19) as *E. attheyi* Watson.

G13.79 (DMSW 36). An isolated right articular condyle. Dinning collection.

G13.80 (DMSW 37). The articular region, including the articular condyle, of a left mandibular ramus.

G13.83 An isolated neural arch. Figured by Watson (1926, figure 22).

G13.84 An isolated pleurocentrum bearing a neural arch from which the neural spine is absent. Figured by Hancock and Atthey (1868, plate XV, figure 2) as *P. cornuta* Hancock and Atthey. Described by Panchen (1966).

G13.85 A slab of shale bearing an isolated pleurocentrum, the articular head of one dorsal rib and a length of the shaft of the same, or a second, dorsal rib. Figured, in part, by Panchen (1966, figure 6(e)).

G13.86 A pleurocentrum, an intercentrum and a short length of the shaft of a dorsal rib.

G13.87 A posterior trunk rib. Figured by Panchen (1966, figure 6(g)) as representing an immediately presacral rib.

G13.88 An isolated dorsal rib, described by Panchen (1966) as possibly representing a rib underlying the scapulocoracoid.

G13.89 A slab of shale bearing a large dorsal rib of the right side.

G13.90 A slab of shale bearing the proximal part, including the articular head, of a posterior dorsal rib.

G13.91 The proximal part, including the articular head, of a dorsal rib.

G15.83 An isolated palatine with tusk pair, both members of which are present simultaneously – presumably a transient condition. Described by Panchen (1972, page 293).

G15.84 A slab of shale bearing the intercentrum and neural arch of a dorsal vertebra, in addition to five dermal scutes. Figured in part by Panchen (1972, figures 15(b), 15(c)).

G15.85 A pleurocentrum in articulation with its neural arch.

G15.86 An isolated pleurocentrum.

G15.87 An isolated pleurocentrum.

G15.88 An isolated left quadrate in association with a fragment of the quadrate ramus of the pterygoid. Described by Panchen (1972, page 295). Pertains to lectotype G13.71 (J. Agnew, personal communication. 1980).

G15.89 (?*Eogyrinus*). An isolated interclavicle, referred to *A. russelli* Huxley by Hancock and Atthey (1868, page 277) and figured as possibly pertaining to *Eogyrinus attheyi* Watson by Panchen (1972, figure 13).

G15.90 The proximal part of an anterior dorsal rib.

G24.24 An isolated quadratojugal, possibly that described by Atthey (1876, page 164) as pertaining to *A. russelli* Huxley.

G24.28 A slab of shale bearing a single small dermal scute with the morphologically external (*cf.* Panchen, 1972, page 318) surface exposed.

G24.31 A slab of shale bearing a dermal scute with the morphologically external surface exposed.

G24.33 A length of the shaft of a dorsal rib.

G24.34 An anterior dorsal rib lacking the distal section of the shaft.

G24.85 A pleurocentrum in articulation with an incompletely preserved neural arch, which lacks the distal part of the neural spine and the left diapophysis, and with an incomplete intercentrum.

G24.97 An isolated pleurocentrum.

G25.01 An isolated pleurocentrum.

G25.04 An isolated central element (?intercentrum) lacking a ventrolateral covering of smooth periosteal bone.

G25.05 An isolated pleurocentrum.

G25.06 An isolated pleurocentrum.

G25.08 An isolated pleurocentrum.

G25.09 An isolated pleurocentrum.

G25.10 An isolated intercentrum.

G25.11 An incompletely preserved isolated central element (?pleurocentrum).

G25.13 An isolated pleurocentrum.

G25.15 An isolated neural arch.

G25.18 An isolated pleurocentrum.

G25.51 A slab of shale bearing five dermal scutes preserved with their morphologically external surfaces exposed, three dermal scutes preserved in morphologically visceral view, a small fragment of a ninth and the impressions of three further scutes.

G25.52 A slab of shale bearing two dermal scutes, apparently preserved with their morphologically visceral surfaces exposed. Figured by Panchen (1972, figures 15(e), 15(f)).

G25.53 A slab of shale bearing a single scute with the visceral surface exposed.

G25.54 A slab of shale bearing a single dermal scute preserved with the external surface exposed. Figured by Panchen (1972, figure 15(a)).

G25.55 A slab of shale bearing a single dermal scute with the morphologically visceral surface exposed. Figured by Panchen (1972, figure 15(g)).

G25.56 A slab of shale bearing a single scute preserved with the visceral surface exposed.

G25.57 A slab of shale bearing a single dermal scute preserved in visceral view.

G25.58 A slab of shale bearing a single dermal scute which is incompletely preserved.

G25.59 A slab of shale bearing a single dermal scute preserved in visceral view.

G25.60 Two isolated dermal scutes, one of which may represent the specimen figured by Atthey (1876, plate VIII, figures 2,3) as pertaining to *A. russelli* Huxley. Figured, in part, by Panchen (1972, figure 15(d)).

G40.28 An isolated right maxilla with tooth row. Barkas collection.

G53.28 A slab of shale bearing a single dermal scute with the external surface exposed.

G53.32 A slab of shale bearing an isolated neural arch, sections of the shafts of three dorsal ribs, one dermal scute and the impressions of a further two scutes.

G86.47 A slab of shale bearing three dermal scutes and the impressions of a further two scutes.

G86.50 A number of short fragments of the shafts of two anterior trunk ribs.

G86.51 An incompletely preserved pleurocentrum, apparently lacking a ventro-lateral covering of periosteal bone.

G86.52 An incompletely preserved central element (?pleurocentrum).

G86.53 A pleurocentrum in articulation with the pedicels of its neural arch.

G86.54 An isolated neural arch.

G86.55 An isolated neural arch lacking the neural spine.

G86.56 An incompletely preserved neural arch, consisting of one diapophysis and one zygapophysis.

G86.58 An isolated neural arch.

G86.59 (DMSW 39). An isolated proximal caudal intercentrum bearing a haemal arch, in association with two incompletely preserved dorsal ribs. Figured in part (intercentrum) by Watson (1926, figure 23).

G89.54 A slab of shale bearing lengths of the shafts of two trunk ribs, two large scutes and the impressions of two further scutes.

G90.24 An isolated pleurocentrum.

G90.25 An isolated neural arch.

G90.26 An isolated intercentrum.

G141.24 A pleurocentrum in articulation with a neural arch lacking the neural spine.

G141.25 A severely distorted central element (?pleurocentrum).

G141.26 A slab of shale bearing two dermal scutes preserved in visceral view, a number of crossopterygian scales and a tooth of the loxommatid temnospondyl *Megalocephalus pachycephalus* (Barkas).

Genus *Pteroplax* Hancock and Atthey, 1868

Pteroplax cornutus Hancock and Atthey, 1868

G15.72 An isolated skull table and two dorsal ribs, preserved together on a small slab of shale. Figured by Hancock and Atthey (1868, plate V, figure 1); Atthey (1877b, plate XII); Panchen (1970, figure 14(a)); Boyd (1978, plate 1 and figures 1,2,3,4,5,6). Designated the LECTOTYPE of *P. cornutus* H and A by Romer (1963).

G4.83 A caudal intercentrum with a fused haemal arch. Figured by Boyd (1978, figure 21; 1980a, figure 4(A)–(C)).

G15.73 At least seven articulated dorsal vertebrae, preserved in association with four anterior dorsal ribs. Referred to *Megalocephalus pachycephalus* (Barkas) (as '*Loxomma*') by Hancock and Atthey (1870d). Figured by Boyd (1978, plate II and figures 13,14; 1980a, figure 1(A)).

G15.76 (*?Pteroplax*). A presacral rib from the mid-trunk region. Figured by Boyd (1978, figure 25(b); 1980a, figure 5(B)).

G15.77 (*?Pteroplax*). A slab of shale bearing an incompletely preserved mid-trunk rib and a posterior trunk rib. Figured, in part, by Boyd (1978, figure 25(g); 1980a, figure 5(G)).

G15.78 (*?Pteroplax*). A presacral rib from the mid-trunk region. Figured by Boyd (1978, figure 25(c); 1980a, figure 5(C)).

G15.79 (*?Pteroplax*). A presacral rib from the anterior or mid-trunk region.

G15.80 (*?Pteroplax*). A presacral rib from the posterior trunk region. Figured by Boyd (1978, figure 25(d); 1980a, figure 5(D)).

G24.25 A single isolated dermal scute, preserved with the morphologically external surface exposed.

G24.26 A single isolated dermal scute, preserved with the morphologically external surface exposed.

G24.30 An isolated tooth resembling those preserved in the premaxilla of specimen G24.40 (see below).

G24.40 A right nasal and associated premaxilla, the latter bearing four well-preserved teeth. Figured by Boyd (1978, figures 7,8(a),8(b)).

G25.45 (*?Pteroplax*). An isolated left pterygoid. Figured by Boyd (1978, figure 11).

G83.68 A dorsal pleurocentrum, dorsal intercentrum and one poorly preserved central element, together with two incomplete neural arches and the proximal parts of three ribs. Referred to *P. cornutus* H and A by Atthey (1877b, page 374), but not figured by this author. Figured by Boyd (1978, plate IV and figure 23; 1980a, figure 1(C))

G83.69 A slab of shale bearing two exceptionally well-preserved dorsal pleurocentra, two dorsal intercentra and fragments of five trunk ribs. Figured by Boyd (1978, plate III and figure 15; 1980a, figure 1(B)).

G83.72 (*?Pteroplax*). A presacral rib from the posterior trunk region. Figured by Boyd (1978, figure 25(e); 1980a, figure 5(E)).

G83.73 (*?Pteroplax*). A presacral rib from the (?) pectoral region of the trunk. Figured by Boyd (1978, figure 25(a); 1980a, figure 5(A)).

G83.74 (*?Pteroplax*). A presacral rib from the posterior trunk region. Figured by Boyd (1978, figure 25(f); 1980a, figure 5(F)).

G83.75 Fragments of the shafts of three anterior trunk ribs, probably pertaining to the same individual as the vertebrae of specimen G83.69.

G86.48 Several ventral dermal scutes closely resembling those of the embolomeres *Eogyrinus attheyi* Watson (Panchen, 1972) and *Pholiderpeton scutigerum* Huxley (Huxley, 1869), but probably attributable on stratigraphical grounds and by reason of their size to *P. cornutus* H and A. Figured by Boyd (1978, figure 29(d)).

G86.57 An isolated neural arch possessing a clearly defined supra-neural canal.

G86.61 A caudal intercentrum, probably somewhat more distal in its original situation than specimen G4.83, bearing a fused haemal arch terminating in an elongate spine. Figured by Boyd (1978, figure 22; 1980a, figure 4(D)–(G)).

G90.27 The proximal part, including the articular head, of a dorsal rib.

G93.56 Several dermal scutes closely resembling those of specimen G86.48. Figured by Boyd (1978, figures 29(d), 30).

Genus *Palaeoherpeton* (Watson, 1926)

Palaeoherpeton decorum (Watson, 1926)

G15.71 An incompletely preserved skull, consisting of the neurocranium and a natural mould of the skull roof and palate. HOLOTYPE. Figured by Watson (1926, figures 12–17) as type specimen of '*Palaeogyrinus decorus*' Watson gen. et sp. nov., (genus preoccupied Schlechtendal, 1894), and by Panchen (1964, figures 2b,3,4,5,6,7,8,10,11,12,13,14; 1970, figures 1,2).
Holotype skull from Earl David's Parrot Coal, Pirnie, near Leven, Fifeshire, Scotland. Middle *modiolaris* Zone, Middle Coal Measures (L. Westphalian B) (Panchen and Walker, 1961). Kirkby collection.

G55.82 A slab of shale bearing three ventral dermal scutes and the impressions of two further scutes. Pirnie. Kirkby collection.

G56.03 A slab of shale bearing a single central element from an embolomerous vertebra (?intercentrum), six incompletely preserved dermal scutes and the impressions of six further scutes. Figured, in part, by Boyd (1978, figure 29(c)). Pirnie. Kirkby collection.

Labyrinthodont indet.

G5.16 An isolated phalanx, some 35 mm in total length. Described by Hancock and Atthey (1868, page 275) as the femur of *Pteroplax cornutus* H and A.

G13.81 (DMSW 38). An isolated interclavicle, referred to *Eogyrinus attheyi* Watson by Watson (1926, page 235), and figured as possibly pertaining instead to the loxommatid *Megalocephalus pachycephalus* (Barkas) by Tilley (Beaumont) (1971, figure 33). Also figured by Boyd (1978, figure 26), as possibly representing the interclavicle of *Pteroplax cornutus* H and A.

G15.67 A fragment of dermal bone bearing 'pit and ridge' ornament of an unusually regular and sharply-defined nature.

G25.03 An isolated neural arch, the neural spine of which terminates in a broad, dorsally-directed articular facet.

G25.44 An isolated pterygoid, possibly pertaining to a large embolomere.

G43.68 An isolated posterior trunk rib.

G53.29 An isolated anterior trunk rib.

G55.27 An isolated anterior trunk rib.

G110.51 An isolated neural arch.

G141.13 The proximal part of an anterior trunk rib.

G141.14 The proximal part, including the articular head, of an anterior trunk rib.

G141.19 Two fragments of the shaft of an anterior trunk rib.

G141.21 A fragment of the shaft of an anterior trunk rib.

Subclass LEPOSPONDYLI Zittel, 1889

Order NECTRIDEA Miall, 1875

Family Keraterpetontidae Romer, 1945

Genus *Batrachiderpeton* Hancock and Atthey, 1870

Batrachiderpeton reticulatum (Hancock and Atthey, 1870)

Comb. Milner (1978, page 60)

G25.28 and 30 An imperfect skull and incomplete postcranial skeleton, in counterpart. Figured by Steen (1938, text figure 9B) as possibly representing a specimen of *Keraterpeton galvani* Huxley, and by Milner (1978, figures 26,27,31a).
HOLOTYPE specimen. Originally described by Hancock and Atthey (1869a) as type specimen of '*Urocordylus reticulatus*' and later referred by Watson (1913) to '*Keraterpeton reticulatum* (Hancock and Atthey)'.

G24.74 (?*Batrachiderpeton*) An isolated nectridean presacral vertebra.

G24.96 (?*Batrachiderpeton*). A natural mould of a nectridean caudal vertebra.

G25.12 (?*Batrachiderpeton*). An isolated nectridean caudal vertebra.

G25.17 (?*Batrachiderpeton*). An isolated nectridean caudal vertebra.

G25.29 Trunk region of juvenile individual, exposed in ventral aspect. Includes pectoral girdle. Figured by Milner (1978, figure 30).

G25.31 and 32 Skull and disarticulated postcranium preserved in counterpart. Distal tail absent. Juvenile specimen. Figured by Milner (1978, figures 28,31b,31c).

G25.33 An incomplete skull of a juvenile individual. Figured by Milner (1978, figure 29).

G25.36 An almost complete, but crushed skull. Figured by Hancock and Atthey (1870b, plate I, figures 1,2,4,5,6,7) as holotype of '*Batrachiderpeton lineatum*'. Also figured by Watson (1913, plate XCVI, figures 1,2 and text figure 163) as 'Specimen I' of '*B. lineatum* Hancock and Atthey' and by Milner (1978, figures 32,33).

G25.37 A complete crushed skull with the right cheek region folded over onto the palate. Figured by Watson (1913, plate XCVII, figures 4,5 and text figures 162,164) as 'Specimen II' of '*B. lineatum* Hancock and Atthey'. Also figured by Milner (1978, figures 34,35).

G25.38 The left half of a crushed skull. Cited by Watson (1913, page 949) as 'Specimen IV' of '*B. lineatum* Hancock and Atthey', figured by Milner (1978, figures 36,37). Dinning collection.

G25.39 A disarticulated palate and part of the pectoral girdle, together with one complete and one incomplete mandibular ramus. Figured by Watson (1913, plate XCVI figure 3B and text figures 162–166) as 'Specimen III' of '*B. lineatum* Hancock and Atthey' Also figured by Milner (1978, figures 38,39).

G25.40 A complete, but distorted right mandibular ramus. Figured by Watson (1913, text figure 166) as 'Specimen V' of '*B. lineatum* Hancock and Atthey'. Also figured by Milner (1978, figure 40).

G25.41 An incomplete left mandibular ramus. Figured by Hancock and Atthey 1870e, plate I, figure 3) as '*B. lineatum* Hancock and Atthey.' May represent 'Specimen VII' cited, but not figured, by Watson (1913, page 953).

G25.42 (?*Batrachiderpeton*). A fragment of dentigerous dermal bone.

G25.43 Two fragments of left mandibular ramus.

G34.43 (?*Batrachiderpeton*). An isolated trunk rib.

G43.72 (?*Batrachiderpeton*). A natural mould of an isolated nectridean caudal vertebra.

G143.52 An isolated right mandibular ramus. Figured by Watson (1913, plate XCVI, figure 3A and text figure 166) as 'Specimen VI' of '*B. lineatum* Hancock and Atthey'. Barkas collection.

Nectridean indet.

G23.51 An isolated trunk vertebra.

G25.56 An isolated caudal vertebra.

Order LYSOROPHIA Williston, 1908

Family Lysorophidae Williston, 1908

Lysorophid gen. et sp. indet.

G91.15 An incompletely preserved postcranial skeleton, comprising twenty-one articulated presacral vertebrae with their associated rib pairs, the left scapulocoracoid and the proximal part of the left humerus. Cited by Boyd (1978, page 176 and figured by Boyd (1980b, figure 1(a)–(d)).

G152.04 (?*Lysorophid*). An isolated presacral vertebra. Specimen is from Coal Measures (?Westphalian A) of Low Moor, near Bradford, West Yorkshire. *Ex* geology collection of Wigan College of Technology. Figured by Boyd (1980b, figure 1(h)–(i)).

Order AÏSTOPODA Miall, 1875

Family Ophiderpetontidae Schwarz, 1908

Genus *Ophiderpeton* Huxley, 1867

Ophiderpeton nanum Hancock and Atthey, 1868

G25.34 and 35 The disarticulated skull and anterior part of the postcranial skeleton of a (?) juvenile individual, preserved in counterpart. Described, but not figured, by Hancock and Atthey (1868, pages 276,277) and cited by Steen (1938, page 223).
HOLOTYPE specimen.

Lepospondyl indet.

G24.98 An isolated interclavicle of apparently rhomboidal shape, the posterior extremity being absent, and having a maximum width of 16mm.

Amphibian indet.

G94.65 An isolated interclavicle some 40mm. in total preserved length. The specimen appears to lack a parasternal process and bears a weakly-developed ornament of pits and ridges radiating from the presumed centre of ossification. Anterior margin deeply indented. Coal Measures (precise horizon unknown), Northumberland.

THE NAMURIAN AMPHIBIANS

Until recently, the Hancock Museum's collection of Carboniferous amphibians consisted almost entirely of specimens collected from restricted exposures in the productive Coal Measures of Northumberland and Fife. In 1974, however, Mr S P Wood (now at the Hunterian Museum, Glasgow) discovered fossil amphibian and fish remains in a richly fossiliferous bone bed in Carboniferous rocks of Namurian age at the Dora opencast site, southeast of Cowdenbeath, Fife. Stanley Wood was well-known as a fossil collector to the University of Newcastle upon Tyne and fossil fish collected by him were being studied in the Department of Zoology. Thus, through him, Dr A L Panchen succeeded in securing a share of the bone bed recovered from the site for the University and the Hancock Museum.

The bone bed was originally exposed as a section approximately 30m long, but with the assistance of the Murphy Group, contractors to the National Coal Board, the overburden was removed to expose the upper surface of the bed. After gridding the outcrop into 0.33m squares to preserve relationships between associated remains, the richest part of the bone bed was collected by hand, together with material from transects extending outside the richly fossiliferous area. After a delay from October to December 1975, to facilitate collection, opencast operations removed all the surrounding and underlying strata. A brief account of the discovery and its significance appeared in *Nature* (Andrews *et al*, 1977).

Work began on the study of the bone bed in October 1976 and almost four tons of rock have been prepared. Traditional preparatory methods proved inadequate and time consuming. However, a new technique was developed by Smithson and Wood: this involved immersing the blocks of bone bed in a bath of hot water, and leaving it to cool. The blocks were then removed and left to dry and this usually resulted in the bone bed splitting along horizontal planes of weakness to reveal fossils lying in the bedding planes. Using this method all the bone bed was completely prepared by autumn 1978.

The amphibian fauna from the Dora opencast site comprises at least six species, five of which are represented in the Newcastle collection. This is accessioned, but has not yet been deposited in the museum and, therefore, a complete list of specimens is not given here; at present it has Department of Zoology numbers. More than 350 amphibian specimens have been recovered from the bone bed and some are clearly associated, although most occur as isolated elements.

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SUPPLEMENT TO THE CATALOGUE OF THE CARBONIFEROUS AMPHIBIANS IN THE HANCOCK MUSEUM NEWCASTLE UPON TYNE

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SUPPLEMENT TO THE CATALOGUE OF THE CARBONIFEROUS AMPHIBIANS IN THE HANCOCK MUSEUM NEWCASTLE UPON TYNE

(CORRIGENDA ET ADDENDA)

by

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INTRODUCTION

In 1980, an attempt was made, in volume 46 of these *Transactions*, to present a complete catalogue of the Westphalian (Upper Carboniferous) amphibian specimens in the collections of the Hancock Museum. This was intended also to include full references, where appropriate, to both published papers and unpublished research theses in which specimens had been figured or cited. However, as was almost inevitable in the preparation of such a work, numerous errors, both of fact and of omission, were made and these are corrected in the present supplement. The opportunity is also taken to bring the catalogue up to date by relisting, in addition, those specimens which have been figured or cited since 1980, together with the appropriate references. The present work is intended to be used in conjunction with the earlier catalogue; specimens correctly and fully described by Boyd and Turner (1980), and which have not since been figured or cited, are not included. The amphibian specimens which are listed below appear in the same sequence as in the earlier catalogue and within the same taxonomic framework. The latter is solely to facilitate cross-reference between the two works and should not be taken, for instance, to indicate disagreement with the recent suggestions of Panchen (1980; 1985) and Smithson (1982) that the 'labyrinthodont' Superfamily Loxommatoidea should be removed from the Order Temnospondyli.

Each of the specimens listed in this supplement falls into one or more of the following groups:-

1. Specimens listed in the original catalogue, but with incomplete references to publications and theses in which they had been figured or cited.
2. Specimens listed in the catalogue, but with inaccurate references to publications and theses in which they had been figured or cited.
3. Specimens not included in the catalogue.
4. Specimens which have been figured or cited since the catalogue was published.

As in the catalogue, the accession number of each specimen listed is given first. This is followed by any necessary corrections and/or additions to the information given by Boyd and Turner (1980). Descriptions of the anatomical nature of specimens are not given unless the material in question was completely omitted from the earlier work.

Most of the nineteenth-century papers on Carboniferous amphibians written by Thomas Atthey, Dennis Embleton and Albany Hancock were, as noted by Boyd and Turner (1980), published first in the *Annals and Magazine of Natural History* and then, again, in the *Transactions* of what is now the Natural History Society of Northumbria. For specimens figured or cited in these twice-published papers, the present work follows the convention established in the earlier catalogue of giving the locations of illustrations and descriptions in the former of the two journals only. Both 'versions' of each paper are, however, listed in the bibliography which concludes the present work.

SYSTEMATIC LIST OF *CORRIGENDA ET ADDENDA*

Class AMPHIBIA
Subclass LABYRINTHODONTIA Owen, 1861
Order TEMNOSPONDYLI Zittel, 1889
Suborder RHACHITOMI Cope, 1884
Superfamily LOXOMMATOIDEA Romer, 1966
Family Loxommatidae Romer, 1966
Genus *Megalocephalus* Barkas, 1873
Megalocephalus pachycephalus (Barkas, 1873)

G15.21 (DMSW 1). *Corrigendum*: for 'Embleton and Atthey (1874, plates 1,2)' read 'Embleton and Atthey (1874, plates 4,5)'. *Addenda*: specimen also described by Hancock and Atthey (1871, page 77) and cited by Beaumont (1977, page 48).

G15.23 (DMSW 3). *Corrigendum*: for 'Embleton and Atthey (1874, plate 3, figure 1)' read 'Embleton and Atthey (1874, plate 6, figure 1)'. *Addenda*: specimen also described by Hancock and Atthey (1870d) and cited by Watson (1926, pages 208, 210, 213).

G15.24 (DMSW 4). *Addendum*: specimen also cited by Watson (1926, page 208).

G15.25 (DMSW 5). *Addendum*: specimen also cited by Watson (1926, pages 208, 210).

G15.27 (DMSW 7). *Addendum*: specimen also cited by Watson (1926, pages 208, 210).

G15.28 (DMSW 8). *Addendum*: specimen also cited by Watson (1926, page 213).

G15.29 (DMSW 9). *Addenda*: specimen also cited by Watson (1912, page 2). Watson (1926, pages 208, 213) and Beaumont (1977, pages 48, 65), and figured in part by Panchen (1980, figure 9 (d)-(e)).

G15.30 (DMSW 10). *Addendum*: specimen also cited by Beaumont (1977, page 48).

G15.33 (DMSW 13). *Addenda*: specimen also cited by Watson (1926, page 212) and Beaumont (1977, pages 48, 58).

G15.34 (DMSW 14). *Addendum*: specimen also cited by Beaumont (1977, pages 48, 50).

G15.35 (DMSW 15). *Addendum*: specimen also cited by Watson (1926, page 210).

G15.39 (DMSW 19). *Corrigendum*: for 'Embleton and Atthey (1874, plate 3, figure 3)' read 'Embleton and Atthey (1874, plate 6, figure 3)'.

G15.46 (DMSW 26). *Corrigendum*: for 'Embleton and Atthey (1874, plate 3, figure 2)' read 'Embleton and Atthey (1874, plate 6, figure 2)'.

G24.32 (DMSW 17). *Addendum*: specimen also cited by Watson (1926, page 213).

G37.88 *Addenda*: specimen figured by Tilley (Beaumont) (1971, figure 32) and cited by Boyd (1984, pages 375, 381).

G140.81 *Addendum* (specimen not listed by Boyd and Turner (1980)): an isolated right jugal measuring 72 mm in length. Cited by Boyd (1984, page 382).

Genus *Baphetes* Owen, 1854
Baphetes kirkbyi Watson, 1929

G15.91 *Addendum*: specimen also cited by Clack (1983, page 144).

Order BATRACHOSAURIA Efremov, 1946
Suborder ANTHRACOSAURIA Save-Soderbergh, 1934
Infra-order EMBOLOMERI Cope, 1880
Family Anthracosauridae Cope, 1875
Genus *Anthracosaurus* Huxley, 1863
Anthracosaurus russelli Huxley, 1863

G24.35 *Addenda*: specimen figured by Panchen (1981, figures 1,2) and cited by Boyd (1984, page 377).

G24.39 *Addendum*: specimen cited by Boyd (1984, page 377).

Family Eogyrinidae Watson, 1929
Genus *Eogyrinus* Watson, 1926
Eogyrinus attheyi Watson, 1926

G13.72 (DMSW 28). *Addendum*: also cited by Watson (1926, pages 222, 228).

G13.73 (DMSW 29). *Addenda*: specimen figured, in part, by Atthey (1876, plate X, figure 4), cited by Watson (1926, pages 222, 228, 229) and cited by Panchen (1966, pages 200, 204).

G13.76 (DMSW 32). *Addendum*: specimen also cited by Panchen (1972, page 285).

G13.78 (DMSW 35). *Addenda*: specimen also cited by Panchen (1972, pages 285-288) and (as more probably pertaining to *Anthracosaurus russelli*) by Boyd (1984, page 377).

G13.79 (DMSW 36). *Addendum*: specimen cited by Panchen (1972, page 285).

G13.80 (DMSW 37). *Addenda*: specimen cited by Hancock and Atthey (1871, page 76) and Panchen (1972, pages 285, 306).

G13.83 *Addendum*: specimen also cited by Panchen (1966, page 201).

G13.86 *Addendum*: specimen figured by Panchen (1966, figure 2).

G13.89 *Addendum*: specimen cited by Panchen (1966, pages 201, 209).

G13.90 *Addendum*: specimen cited by Panchen (1966, page 201).

G13.91 *Addendum*: specimen cited by Panchen (1966, page 201).

G15.85 *Addendum*: specimen figured by Embleton and Atthey (1874, plate 6, figure 4).

G24.34 *Addendum*: specimen figured by Embleton and Atthey (1874, plate 7, figure 1).

G25.51 *Addendum*: specimen cited by Panchen (1972, pages 285, 319).

G25.53 *Addendum*: specimen cited by Panchen (1972, page 285).

G25.56 *Addendum*: specimen cited by Panchen (1972, page 285).

G25.57 *Addendum*: specimen cited by Panchen (1972, page 285).

G25.58 *Addendum*: specimen cited by Panchen (1972, page 285).

G25.59 *Addendum*: specimen cited by Panchen (1972, page 285).

G86.59 *Addendum*: specimen also cited (as 'G13.82') by Panchen (1966, page 201).

Genus *Pteroplax* Hancock and Atthey, 1868

Pteroplax cornutus Hancock and Atthey, 1868

G15.72 *Corrigendum*: for 'Hancock and Atthey (1868, plate V, figure 1)' read 'Hancock and Atthey (1868, plate XV, figure 1)'. *Addendum*: specimen also cited by Boyd (1984, page 380).

G4.83 *Addendum*: specimen also cited by Boyd (1984, page 380).

G15.73 *Addendum*: specimen also cited by Boyd (1984, page 380).

G24.40 *Addendum*: specimen also cited by Boyd (1984, page 380).

G25.45 *Addendum*: specimen also cited by Boyd (1984, page 380).

G83.68 *Addendum*: specimen also cited by Boyd (1984, page 380).

Genus *Palaeoherpeton* (Watson, 1926)

Palaeoherpeton decorum (Watson, 1926)

G15.71 *Addendum*: specimen also figured by Clack (1983, figure 2).

Labyrinthodont indet.

G13.81 *Addendum*: specimen also cited by Boyd (1984, pages 375, 381).

G25.03 *Addendum*: specimen figured by Boyd (1984, figure 2 (c)-(d)).

Subclass LEPOSPONDYLI Zittel, 1889

Order NECTRIDAE Miall, 1875

Family Keraterpetontidae Romer, 1945

Genus *Batrachiderpeton* Hancock and Atthey, 1870

Batrachiderpeton reticulatum (Hancock and Atthey, 1869)

G25.36 *Corrigendum*: for 'Hancock and Atthey (1870b, plate I, figures 1,2,4,5,6,7)' read 'Hancock and Atthey (1870e, plate I, figures 1,2,4,5,6,7)'. *Addendum*: specimen also cited by Boyd (1984, page 374).

G25.38 *Addendum*: specimen also described by Hancock and Atthey (1870e, pages 61, 62).

G25.39 *Addendum*: specimen also cited by Boyd (1984, page 383).

G88.02 *Addendum* (specimen not listed by Boyd and Turner (1980)): two articulated presacral vertebrae.

Nectridean indet.

G23.51 *Addenda*: specimen figured by Boyd (1982b, figure 1 (b)-(c)) and cited by Boyd (1984, pages 374, 379).

G23.56 *Addenda*: specimen figured by Boyd (1982b, figure 1 (a),(c)) and cited by Boyd (1984, pages 374, 379). This specimen (listed as G25.56 by Boyd and Turner (1980)) and G23.51 are both parts of a single caudal vertebra pertaining to a member of the nectridean Family Urocordylidae (Boyd, 1982b).

Order LYSOROPHIA Williston, 1908

Family Lysorophidae Williston, 1908

Lysorophid *gen. et sp.* indet.

G91.15 *Addendum*: specimen also cited by Boyd (1984, pages 374, 379).

Order AÏSTOPODA Miall, 1875

Family Ophiderpetontidae Schwarz, 1908

Genus *Ophiderpeton* Huxley, 1867

Ophiderpeton nanum Hancock and Atthey, 1868

G25.34 and 35 *Addenda*: specimens figured by Boyd (1982a, figures 1, 2) and cited by Boyd (1984, pages 374, 378).

Lepospondyl indet.

G24.98 *Addendum*: specimen figured by Boyd (1984, figure 2(a)-(b)) as more probably pertaining to a member of the temnospondyl Family Colosteidae.

Amphibian indet.

G94.65 *Addendum*: specimen figured by Boyd (1984, figure 2 (e)-(f)) as probably pertaining to a member of the Order Batrachosauria.

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GREY SEALS AT THE FARNE ISLANDS AND THE ISLE OF MAY: 1979 AND 1980

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THE GREY SEAL *HALICHOERUS GRYPUS* (FABR.) AT THE FARNE ISLANDS: 1979 AND 1980

by

GRACE HICKLING AND PETER HAWKEY

Farne Islands Committee of the National Trust
and Natural History Society of Northumbria

INTRODUCTION

This report covers the 1979 and 1980 breeding seasons; it also deals with attempts to explore the feasibility of spring culling as a means of controlling the grey seal population of the Farne Islands.

Further steps were taken towards attaining the management plan's aim of one thousand breeding females and, as in 1977 and 1978, the main objects were to prevent the vegetated islands being used as seal nurseries and, at the same time, to remove part, if not all, of the annual increase in the numbers of breeding cows. Past experience had shown that the presence of resident National Trust wardens on Brownsman was an effective deterrent to the use of that island as a nursery, but that additional measures, including the shooting of established cows, were necessary on Staple Island and the Wideopens. Accordingly, it was planned to put the wardens out on 23 October 1979, but because of continuing gales and a heavy swell, this had to be postponed until 31 October. Unlike 1978, there were no births on the Wideopens and the wardens did not move to Inner Farne: they returned to the mainland on 6 December.

In 1980, the wardens settled on Brownsman on 21 October and remained there until 5 December; because of bad weather the plan to stay on Inner Farne was abandoned.

PH was responsible for the organisation of the field work: his principal helpers were the wardens G Wren, J Walton, R Pymm, R Heywood and A Dixey, GH, R E Meyrick, the Trust's regional director for Northumbria, and J Prime of the Sea Mammal Research Unit (SMRU).

THE BREEDING SEASON

Weather. In 1979, despite the initial delay in settling on Brownsman, the weather was reasonable and, although there were the usual occasional gales, it was possible to make weekly counts throughout November and early December. Conditions changed in the second week of December with north or northeast gales and a very heavy swell: indeed, the forecast on 17 December spoke of southwest or west winds 'occasionally hurricane force 12'. These winds not only prevented further counts, but also resulted in a spate of stranded seals along the mainland coast. So numerous were these seals that the RSPCA inspector at Alnwick warned would-be rescuers that their efforts made them liable to a fine of £500 or three months in prison!

By contrast, 1980 was exceptionally stormy and conditions for field work were among the worst ever encountered. Although the wardens were able to make regular counts on Staple Island in late October and also visited most of the outer islands on 27 October, it was not until 4 November that PH could make a complete count. Previous to this there had been almost continuous east, northeast and north gales and by 5 November these had resumed; they persisted throughout much of November with only very brief lulls. One of the results of these winds was a very heavy swell, often more than four metres in height, and it seems certain that considerable numbers of calves, both undyed and dyed, must have been washed off the nurseries. (On 10 November, for example, thirty-nine of the 113 red-dyed calves present on Northern Hares on 4 November were missing, the majority from the low rocks on the east side of the island.)

Weather such as this made counting very difficult: PH and the wardens visited the inner group on 24 November, and the outer islands on 27 November, but after that they were virtually marooned on Brownsman until 5 December when, during a brief lull, W Shiel managed to bring them ashore. There were further gales throughout December and the first fortnight of January and, as a result, only one additional count (on 11 December) could be made.

Time of breeding. Estimated dates for the first births (which have been calculated as in Hickling and Hawkey (1975)) are given in table 1. As usual, the first calves were seen by members of the Shiel family. On 13 October 1979, R Shiel saw a calf on South Wamses, while on 15 October 1980 W Shiel noticed one on the Staple Island flat.

Table 1
Estimated date of first births

	1979	1980
Staple Island	24–25 October	15 October
Brownsman	—	—
North Wamses	26–27 October	26–27 October
South Wamses	*ca.* 13 October	*ca.* 18 October
Big Harcar	24–31 October	before 27 October
Longstone rocks	before 7 November	before 27 October
Scarcars and Wideopens	'early November'	27 October–4 November

Calf population and mortality rate. The numbers of calves known to have been born in 1979 and 1980 were respectively 1302 and 1118 (table 4), the comparable figures for 1977 and 1978 being 1243 and 1162. Examination of this table suggests that, during 1980, there was a marked drop both in total births and in the numbers found dead on the islands, but it should be emphasised that many calves (including some that had not yet been counted) were undoubtedly washed off the nurseries (above). Accordingly, the final figures are considerably less accurate than in a year such as 1979, while the fact that no visit could be made after 11 December contributed to the decline.

Hickling and Hawkey (1979) refer to the apparent shortfall in births in 1977 and 1978 and speculate about possible reasons for this. Further consideration was given to the problem in 1979 and 1980 and among the suggested explanations put forward by the SMRU were a decrease in the

fecundity rate and the effects of heavy metals such as PCB. A similar shortfall was again observed in 1980 and there was very considerable interest when, on 18 November, 313 calves were found on the Isle of May. Near the edge of the water was a cow bearing what appeared to be a 1970 Farne freeze brand 'S'.

Following a further count on 6 December Prime (1981) estimated that 499 calves had been born on this island and he considered it likely that this group was part of the Farne breeding population, a theory that provides a reasonable explanation for the shortfall mentioned above.

Distribution of breeding groups. Hickling *et al.* (1978 and 1979) described the effect of the so called 'disturbance plan' on the distribution of breeding groups during 1977 and 1978. They pointed out that, while numbers on Brownsman and Staple Island fell markedly, there was a major increase both on North Wamses and also on islands such as the Northern Hares and the Wideopens.

The situation in 1979 and 1980 is shown in table 4 and it is obvious that, providing wardens are resident on Brownsman throughout the breeding season, the North and South Wamses and the Northern Hares are now the favoured islands. It is also apparent that given the opportunity (as happened in 1979 when the wardens' arrival on Brownsman was delayed) Staple Island would still be the preferred nursery. Strangely, there is no indication that Big Harcar is regaining its pre-1939 popularity; in fact, the 1979 and 1980 figures (respectively sixteen and twenty-three births) are considerably smaller than the 1977 total of sixty. The very marked drop in the Crumstone colony in 1979 (thirty-two compared with 164 in 1978) was probably due more to the numbers (247) breeding on Staple Island than to unfavourable weather conditions although these latter were undoubtedly the reason for this island's virtual abandonment in 1980.

It also seems probable that the size of the 1979 Staple Island colony may explain the desertion of the Wideopens in that year for these islands were again used (eighty-three calves born) in 1980.

Colony management. Once again adults were shot only on the vegetated islands, *i.e.* on Staple Island, Brownsman and the Wideopens (table 2), killing on 'other islands' being limited to ailing calves. Cows continue to be very wary, coming ashore only briefly to feed their calves, and the numbers taken in 1979 and 1980 are related to the calf population of these four islands (table 4). It is this fact that explains the very considerable drop in cows killed in 1980 (thirty-five), compared with seventy-one in 1979.

A further attempt, using mechanical means, was made to prevent seals coming ashore. In the past, electric fencing had proved unsuccessful and in 1980 experiments were carried out on Staple Island using two different types of bird scarers. In the first, two strings of 'scarers' were set up and ignited: unfortunately, they tended to go out in the rain or, if it was windy, to explode prematurely. In the second, a gas-gun operated by compressed propane gas was stationed in the garden. Despite some initial snags, this continued to fire at intervals of fifteen to twenty minutes during the period from 21 November (when it was set up) to the departure of the wardens on 5 December. It must, however, be borne in mind that the gun's effectiveness as a seal deterrent has not really been tested, for both types of scarers were installed only after Staple Island had already been cleared of seals – a situation in which further colonisation was most unlikely.

Table 2

Numbers of animals (including ailing and starveling calves) shot 1979 and 1980; 1978 figures are included, for comparison, in brackets

	Staple Island	*Brownsman*	*East Wideopens*	*West Wideopens*	*Other islands*	**Total**
Males						
(1978)	(8)	–	(1)	(1)	–	(10)
1979	8	–	–	–	–	8
1980	1	1	–	–	–	2
Females						
(1978)	(35)	(2)	(3)	(8)	–	(48)
1979	71	–	–	–	–	71
1980	14	–	2	19	–	35
Calves						
(1978)	(51)	(8)	(25)	(28)	(5)	(117)
1979	147	4	–	–	7	158
1980	13	–	2	20	–	35

OUT OF SEASON CONTROL

It is becoming increasingly difficult to take adults during the breeding season and it was, therefore, decided to investigate the feasibility of killing between January and March when moulting animals haul out, in very large numbers, on islands such as Brownsman, Staple Island, the Wamses and Big Harcar. No licence is required; on the other hand the weather is frequently appalling and it is virtually impossible to shoot any significant number of animals for, despite careful stalking, only a few shots can be fired before the seals reach the sea. Furthermore, once a concentration is disturbed, there is no incentive, such as exists during the breeding season, to make them return to a particular haul-out ground.

Experimental killing was carried out by National Trust wardens between 28 March and 3 April 1979 and again from 25 February to 5 March 1980, but the results (table 3) were not very satisfactory. Seventy-four males and

Table 3

Animals taken out of season

	Brownsman	*North Wamses*	*South Wamses*	*Longstone rocks*	*Big Harcar*	*Blue Caps*	*Crumstone*	*Other* islands*	**Total**
Males									
1979	1	–	15	5	8	12	15	10	66
1980	–	–	15	10	6	2	5	2	40
Females									
1979	–	–	1	9	8	–	2	4	24
1980	1	2	–	3	3	–	3	5	17

*Other islands = Nameless Rock, Scarcars, Megstone and Knivestone

twenty-five females were taken in 1979 and forty males and seventeen females in 1980: unfortunately, there was a predominance of males and immatures – in 1979, for example, the figures included twenty-one male and twenty female immature animals.

Both experiments were costly and it was apparent that they could only be justified as a means of colony control if no other method of taking adult females was available.

MARKING SEALS

Tagging. Between 1951 and 1971 some 5300 young seals were tagged on the Farne Islands, first by members of the Society and, subsequently, by scientists of the Seals Research Division (now SMRU). Several different types of tag were used, but none appeared to remain in place for any length of time – up to 1976 the longest period was just over four years – and in 1971 W N Bonner, then head of the Seals Research Division, decided to limit the amount of tagging carried out, using it mainly as a means of identifying animals on the breeding grounds. He felt that further tagging was unlikely to add greatly to information about seal movements and, moreover, that the actual tagging operations contributed significantly to the disturbance of seals during the breeding season (Bonner and Hickling, 1971). In fact, 130 seals were tagged in 1971, but the practice was then abandoned.

Attempts to find a more permanent type of tag had, however, continued and in 1979 Dr J Harwood, head of SMRU asked the National Trust if experiments with an improved tag could be carried out at the Farnes.

After careful consideration, this request was approved and 349 calves were double tagged between 7 November and 1 December 1979, while an additional 235 were marked in 1980 (26 November to 1 December). Many of these animals have been recovered (table 5), but up to date there has been no new information about calf dispersal; the degree of permanence of these new tags will only become apparent when several years have elapsed.

In 1980, the Trust agreed to a further development in marking: this was the addition of a coloured plastic streamer, approximately 15 cms by 2.5 cms, to one of the tags put on the hind flippers. The colour of the streamer varies according to the colony of origin and to the year of application – in 1980, for example, Farne streamers were blue while those used on North Rona were orange. Their use is comparable with the practice of colour-ringing birds and provides an easy method of colony identification even when it is not possible to read the accompanying tag number (see table 5(c)). It is too early to assess their durability, but they have already proved their value as recognition agents.

Recoveries of Farne-marked animals. Recent recoveries have shown that some of the early tags remain in position for much longer than had been thought. Prior to 1979, the oldest known tagged animal (marked with a jumbo rototag) was a female shot on West Wideopens in November 1977 when aged six years five weeks (Hickling *et al.*, 1978).

Between 1979 and 1981, four females, all marked in either 1970 or 1971, have been recovered (table 5(a)); they were shot in the course of the SMRU's investigation into the reproductive biology and diet variation of grey seals. Three of them were at least nine years old and A2800, at nine years and twenty weeks, is the oldest recorded tagged seal. The tags were not immediately obvious, becoming apparent only when the carcass was examined, and it may well be that, in the future, even older tagged animals will be discovered.

In 1979, the SMRU tagged a small number of adult females on North Wamses and three of these have subsequently been recovered; two were shot, but it was interesting to find that the third (22329) occupied almost the same breeding site on North Wamses as she had in 1979. With the exception of 6400 and A1573, all the other recoveries relate to calves marked in 1979 and 1980 and they were, therefore, less than eighteen months old when found.

Although 208 calves were freeze-branded between 1968 and 1971, few of these branded animals have been identified as adults. However, a male was shot on Staple Island in November 1979 and a female found breeding on the Isle of May in November 1980 (table 5(b)) appeared to carry an 'S' brand.

There were numerous reports of colour-marked seals in both 1979 and 1980. Most were found on the mainland within a few miles of the islands, at places such as Lindisfarne National Nature Reserve, Seahouses, Beadnell and Newton-by-the-Sea, but a very small red-dyed first coater was on Roker beach on 30 November 1979 and a yellow-dyed, half moulted calf, probably marked on 24 December 1979, was found dead at Seaton Carew, County Durham, on 13 January 1980.

Finally, mention must be made of 26326 (table 5(d)) which was seen, complete with orange streamer, as a second coater on Northern Hares on 10 November 1980. It had been marked at North Rona on 23 October and is the first animal from another colony known definitely to have visited the Farnes.

ACKNOWLEDGEMENTS

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Table 4

Calf population and mortality rate 1979 and 1980
Number of calves (alive and dead) born between counts

Date of count	*Brownsman*	*Staple Island*	*North Wamses*	*South Wamses*	*Northern Hares*	*Longstone End*	*Longstone main rock*	*Big Harcar*	*Little Harcar*	*Nameless Rock*	*East Wideopens*	*West Wideopens*	*Scarcars*	*Crumstone*	*Megstone*	**Total**
13.10.79	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
31.10.79	—	70	5	—	—	—	—	4	—	—	—	—	—	*	*	79
4.11.79	—	59	*	*	*	*	*	*	*	*	*	*	*	*	*	59
7.11.79	—	71	102	5	10	—	1	1	—	1	—	—	1	12	*	204
10–13.11.79	—	46	182	46	143	—	—	5	—	—	—	—	—	3	2	427
19–20.11.79	—	*	130	22	127	—	—	3	—	—	—	—	—	8	4	294
22–24.11.79	—	1	55	10	30	—	—	1	—	—	—	—	—	5	*	102
29.11–1.12.79	—	—	38	9	22	—	—	—	—	—	—	—	—	4	2	75
5.12.79	—	—	10	4	7	—	—	2	1	—	—	—	—	*	*	24
24.12.79	—	—	9	17	11	—	—	—	—	—	—	—	—	*	*	37
15.10.80	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
21–26.10.80	—	7	*	6	*	*	*	*	*	*	*	*	*	*	*	13
27–31.10.80	—	10	7	12	4	—	—	1	—	—	—	—	—	*	*	34
3–4.11.80	1	2	143	25	118	—	—	9	—	—	—	5	—	*	*	303
10–11.11.80	—	—	129	66	96	—	2	4	—	—	*	*	*	1	*	298
13–15.11.80	—	—	97	33	26	—	—	1	—	—	1	45	1	*	10	214
21.11.80	—	—	64	13	31	3	1	7	—	—	*	*	*	*	*	119
23–24.11.80	1	—	*	*	*	*	*	*	*	*	3	26	—	*	2	32
27.11.80	—	—	35	5	9	*	*	—	—	—	*	*	*	*	*	49
11.12.80	—	—	19	14	16	1	1	1	—	—	—	3	—	*	*	55
Nos born																
(1) 1979	—	**247**	**531**	**114**	**350**	—	**1**	**16**	**1**	**1**	—	—	**1**	**32**	**8**	**1302**
(2) 1980	**2**	**20**	**494**	**174**	**300**	**4**	**4**	**23**	—	—	**4**	**79**	**1**	**1**	**12**	**1118**
Nos found dead on islands																
(1) 1979	—	**43**	**137**	**19**	**61**	—	**1**	**2**	—	—	—	—	—	**2**	—	**265**
(2) 1980	—	**3**	**70**	**31**	**58**	—	—	**1**	—	—	—	**8**	—	—	—	**171**

NOTE: An * indicates that no landing was made

Table 5
Recoveries and sightings of marked seals

(a) Tagged on the Farne Islands

No	*Date marked*	*Recovery details*	*Date recovered*
6400	17.12.60	Longstone. Tag only found	21.10.80
A 1573	30.11.68	Big Harcar. Tag only found on sea bed	mid-September 1979
A 2279	14.11.70	Staple Island. Pregnant female shot (9 years)	10.11.79
A 2449/50	1.11.71	Big Harcar. Female shot (9 years 10 weeks)	6.1.81
A 2717/8	14.11.71	Longstone End. Female shot (7 years 20 weeks)	2.4.79
A 2800	28.11.71	Megstone. Female shot (9 years 20 weeks)	31.3.81
*22327	27.11.79	Brownsman. Female shot	25.2.80
*22329	,,	North Wamses. Female with calf	(1) 1.11.80 (2) 21.11.80
*22881	5.12.79	West Wideopens. Female shot	24.11.80
22903/4	29.11.79	Tynemouth, Northd.	19.12.79
22907/8	,,	Bamburgh, Northd. Found dead	27.12.79
22925/6	,,	Big Harcar. Shot	1.12.80
22933/4	,,	Isle of May	15.5.80
22943/4	,,	Lossiemouth, Morayshire. Caught in salmon net	May 1980
22951/2	30.11.79	124km E by S of Humber. Drowned in gill net	16.5.80
22961/2	1.12.79	Runswick Bay, N.Yorks.	24.12.79
22977/8	,,	Bamburgh	13.12.79
22993/4	,,	Esbjerg, Denmark. Drowned in net	3.2.80
25013	7.11.79	Nr Johnshaven, Kincardineshire	27.2.80
25032	12.11.79	Newbiggin-by-the-Sea, Northd. Found dead in cod net	15.2.80
25058	23.11.79	Nr Beadnell, Northd. Found dead	10.2.80
25060	,,	On fishing grounds 45km N E of Humber. Put back into sea	17.1.80
25079	,,	Big Harcar	5.3.80
25087	,,	Terschelling, W Frisian Islands, Netherlands. Found dead	15.2.80
25092	,,	Filey Brigg, N Yorks. Found dead	25.12.79
25097	,,	Redcar, N Yorks. Found dead	20.4.80
25098	,,	Eyemouth, Berwickshire. Found dead	2.2.81
25108	,,	Big Harcar. Shot	26.2.80
25132	26.11.79	Krakenes, Norway. Caught in saithe storage net	28.1.80
25139	,,	Helgoland, Germany. Injured; destroyed	2.1.80
25141	,,	Largo Bay, Fife. Drowned in stake nets	*ca.* 23.3.81
25142	,,	Norwick, Unst, Shetland. Found dead	16.1.80
25146	,,	Redcar. Found dead	6.5.80
25157	,,	Isle of May	3.4.80
25167	,,	Wee Bankie grounds. 27km E of Isle of May. Drowned	25.9.80
25173	,,	Vlieland, W Frisian Islands, Netherlands. Died	31.12.79
25175	,,	Schiermonnikoog, Netherlands	6.1.80
25176	,,	South Shields, Co Durham	12.12.79
25178	,,	North Wamses	25.2.80
25184	,,	Petten, Netherlands. Died	28.12.79
25187	,,	Filey	4.1.80
25190	,,	Isle of May	15.5.80
25199	27.11.79	North Wamses	25.2.80
25205	,,	Fraserburgh, Aberdeenshire. Found dead	16.1.80
25215	,,	Nr Whitby, N Yorks. Found dead	18.2.80
25221	,,	Cley, Norfolk	19.12.79
25226	28.11.79	53km NNW of Tyborøn Canal, Denmark. Caught alive in gill net	4.1.80
25228	,,	Whitley Bay, Northd. Found dead	15.1.80
25229	,,	48km ESE of Eyemouth. Found dead	20.1.80
25233	,,	Saltwick, nr Whitby. Caught in net; released	14.1.80
25253	,,	North Sea 57° 17′N 5° 24′E. Caught in net	29.1.80

No	*Date marked*	*Recovery details*	*Date recovered*
25258	28.11.79	Inchkeith, Firth of Forth. Drowned in net	22.2.80
25269	,,	Scarborough, N Yorks. Caught in net	13.2.80
25274	,,	,, ,, ,, ,, ,,	15.2.80
25278	,,	North Wamses. Shot	25.2.80
25289	,,	Eday pier, Orkney. Found dead	6.2.80
25310	26.11.80	North Sea 52°47′N 3°45′E. Found dead in net	15.12.80
25326	,,	Brownsman	9.2.81
25339	,,	Flamborough Head, N Yorks. Tag and streamer only found	28.12.80
25346	,,	Firth of Oosterscheld, Netherland. Captive, to be released	16.12.80
25353	,,	Jutland, Denmark. Tag and streamer only found	2.2.81
25366	,,	Lunan Bay, nr Montrose. Found dead	1.2.81
25372	,,	Crumstone	9.3.81
25376	,,	Megstone. Tag and streamer only found	31.3.81
25384	,,	Dover Harbour. Injured; taken to zoo	30.12.80
25387	,,	At sea off Ijmuiden, Netherlands. Died of exhaustion	13.12.80
25462	27.11.80	Beadnell, Northd. Tag and streamer only found	3.4.81
25498	1.12.80	North Sea 5°28′E 56°00′N. Drowned in net	15.1.81
25499	,,	Seaham, Co Durham. Exhausted; later put back into sea	9.12.80
25503	1.12.80	Saltfleetby, Donna Nook, Lincs. Injured; taken to zoo	7.1.81
25505	,,	St Osyth, Clacton-on-Sea, Essex. In poor condition; retained in captivity	4.1.81
25530	,,	Cresswell, Northd.	8.12.80
25535	,,	(1) Port Seton, E Lothian. Returned to sea (2) Portobello, Edinburgh. Found dead	24.12.80 27.12.80

(b) Branded on the Farne Islands

Date branded	*Type of brand*	*Recovery details*	*Date recovered*
1970	freeze 'S'	Staple Island. Male shot	9.11.79
,,	,, (probable)	Isle of May. Breeding female	18.11.80

(c) Sight records of Farne marked animals

Year marked	*Type of mark*	*Sighting details*	*Date seen*
1979	tag	Clove Car	(1) 27.4.81
			(2) 29.4.81
,,	,,	Crumstone	9.3.81
,,	,,	Megstone	11.3.81
			31.3.81
,,	,,	Longstone End	30.3.81
1980	streamer	Filey	12.12.80
,,	,,	Isle of May	(1) 11.12.80
			(2) 25.12.80
,,	,,	Redcar	30.12.80
,,	,,	Tynninghame Sands, E Lothian	6.1.81
,,	,,	Norderney, E Frisian Islands, Germany	(1) 30.12.80
			(2) 10.1.81
,,	,,	Brownsman	9.2.81
,,	,,	Crumstone	(1) 9.3.81
			(2) 11.3.81
,,	,,	Longstone End	30.3.81
,,	,,	Megstone	31.3.81
			29.4.81

(d) Tagged on North Rona

No	*Date marked*	*Recovery details*	*Date recovered*
26326	23.10.80	Northern Hares. Orange streamer in place	10.11.80

NOTES:
1. * Marked as adult female
2. Unless otherwise stated all animals have been recovered alive and in a number of cases are known to have returned to the sea

599.745

BREEDING GREY SEALS ON THE ISLE OF MAY, 1980

by

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BACKGROUND

Since 1972, when the first major cull of adult grey seals took place at the Farne Islands, the apparent fecundity (number of pups born divided by the estimated number of cows in the population) of the mature cows in that colony has fallen from around 90% (Harwood and Prime, 1978) to a minimum figure of 43% in 1978 (Prime, 1980).

One probable reason for this shortfall is the disturbance created during breeding season culls, which results in cows failing to haul out (Summers and Harwood, 1978). This effect was first noticed in 1972 when over 400 fewer pups than expected were born at the Farne Islands (Bonner and Hickling, 1974).

In 1972 and 1975 large adult culls were used to control the population, but since 1977 wardens have been stationed on Brownsman during the breeding season and from there they make frequent visits to Staple Island. These activities are sufficient to prevent all but a few seals pupping on these islands. Since 1977 pup production has remained within the range 1100 to 1350, the 1980 figures (twenty on Staple Island and two on Brownsman) being the lowest recorded.

Some of the pups that would normally have been born on Staple and Brownsman have been redistributed among other islands of the Farnes group (Hickling, Hawkey and Harwood, 1978). A possible extension of this redistribution would be for pregnant cows to leave the Farnes area altogether and give birth elsewhere. Until recently direct evidence to support this hypothesis was lacking.

Following the 1979 grey seal breeding season the Sea Mammal Research Unit (SMRU) received reports that many more pups than usual had been born on the Isle of May, in the Firth of Forth, 'about 300' being reported for 1979. At the time of the last aerial survey carried out by the SMRU over the Isle of May on 2 December 1977, seventeen grey seal pups were counted (SMRU unpublished data), indicating a total production for the island of around twenty-five.

It was, therefore, considered vital to identify the extent of grey seal breeding on the Isle of May in 1980.

SURVEYS

The first grey seal pup survey on the Isle of May was carried out on 18 November 1980 when over 300 pups were found (table 1). Following this survey it was apparent that many more young were likely to be born there before the end of the breeding season, and so a second survey was arranged. This took place on 6 December 1980 when the total number of pups counted was 373 (table 1).

Table 1

Classified grey seal pup counts, Isle of May, 1980

	White coats			*Moulting*	*Moulted*		
Date	*I*	*II*	*III*	*IV*	*V*	*Dead*	**Total**
18 November	118	100	69	12	–	14	313
6 December	2	44	40	82	140	65*	373

*includes 5 starveling pups which would have died within a day or two

On both occasions the survey team travelled to the Isle of May by helicopter from Edinburgh airport, taking the opportunity to survey by air other islands in the Firth of Forth. These were Fidra, Craigleith, Bass Rock, Inchkeith and Inchmickery, none of which contained any seals.

The majority of the pups (over 80%) were found at the north end of the Isle of May (text-fig. 1), on and around the Rona and North Ness areas where

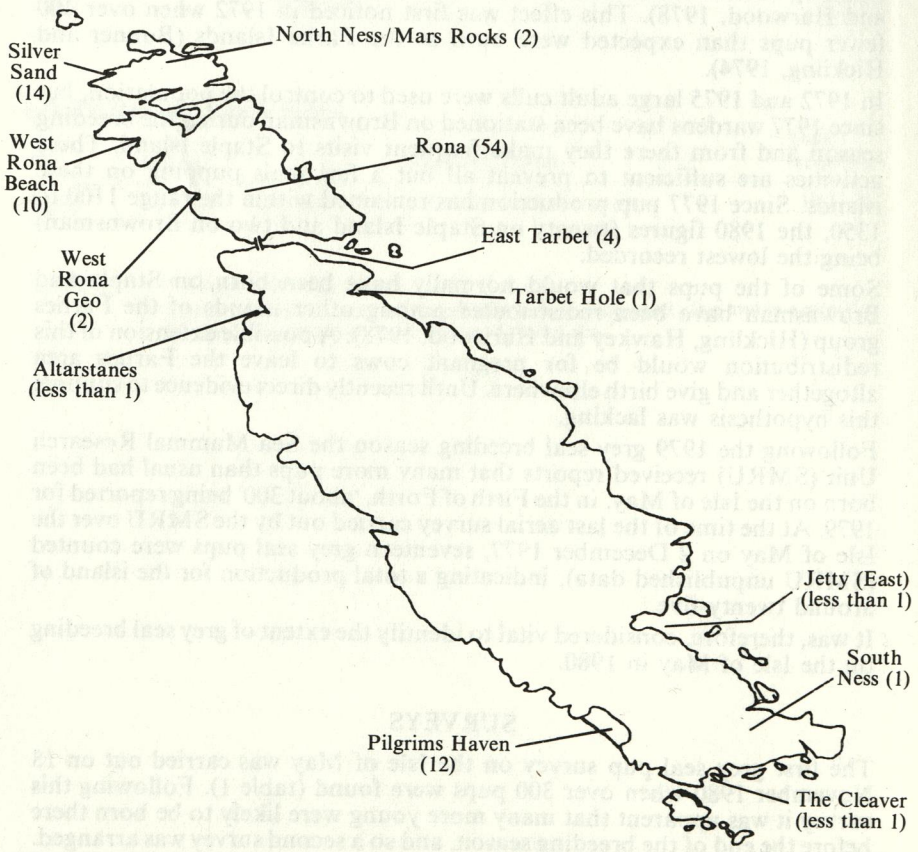

Figure 1. Grey seal pupping sites, Isle of May, 1980, with percentage of pups born in each area.
Scale – 4 inches to 1 mile.

access for the seals is relatively straightforward. There was also a large increase in numbers at the small, traditional breeding site at the south end of the island, Pilgrims Haven. Over forty pups were present on each visit, indicating a total production for the site of about sixty compared with the twenty-five previously mentioned for 1977.

In addition to the two censuses conducted by the SMRU, the Nature Conservancy Council, Edinburgh, arranged for two of the Northern Lighthouse Board keepers, stationed on the island, to make regular counts throughout the breeding season. These were made at approximately weekly intervals and the results have been used to calculate a figure of 499 (range 450–532) for the total grey seal pup production in 1980.

The method of calculating this production from the figures given in table 1 is as follows:

Live pups present on 18 November 1980	299
Whitecoat pups present on 6 December 1980 and therefore born since 18 November	86
60% of moulting pups present on 6 December 1980*	49
Dead pups present on 6 December 1980	65
Total	499

*an estimate of the population born between the two visits

In calculating the minimum estimate, all the moulting pups present on 6 December 1980 are excluded, giving a figure of 450. For the maximum estimate all the moulting pups are included in the calculations producing an estimate of 532. This allows for the longest and shortest times that pups have been observed to spend in class IV.

Another method of estimating pup production is to treat the highest count (373 on 6 December) as if it was the result of an aerial survey and multiply it by the factor of 1.4 usually used for the Farne Islands (Summers, 1978). The resulting figure of 522 falls between the calculated production of 499 and the maximum estimate of 532.

Pup mortality was low, and calculated to be 4.5% on 18 November increasing to 12.9% (minimum 12.1%, maximum 14.3%) on 6 December.

Whilst the pups at Pilgrims Haven were being counted on 18 November, a cow bearing what appeared to be an 'S' shaped freeze brand was observed at the water's edge. It was not possible to be absolutely certain that the mark was a brand as the cow was frequently covered by the breaking waves and it was also pouring with rain. However, if it was an 'S' brand then the seal would have been born in 1970 at the Farne Islands.

In addition to branded animals there are a number of other marked seals in the British grey seal population. In 1980, the SMRU applied tags carrying coloured plastic streamers (see Hickling and Hawkey, 1981) to over 1700 grey seal pups at various breeding sites in Scotland and England. As well as the colours mentioned, green was used in the Outer Hebrides, yellow in Orkney and white at Shetland. Pups from two of these sites were seen by lighthouse keepers on the Isle of May in 1980 – three from North Rona were present on 22 November, while one from the Farnes was sighted on 11 December and another on 25 December.

DISCUSSION

The recent marked increase in grey seal pup production on the Isle of May, documented here for 1980, could be related to the decrease in pup production at the Farne Islands. This seems likely because the increase has occurred since 1977 when the National Trust initiated their disturbance measures. If this is the case, then the apparent decrease in fecundity of the Farne cows in recent years is not as great as estimated. However, even if all the extra seals on the Isle of May are from the Farne Islands, the combined pup production is still lower than expected. No pups were seen on any of the other Firth of Forth islands and no reports have been received of a significant increase at other grey seal sites along the British east coast.

One possible site to which some of the 'missing' cows may have emigrated is Orkney, where the grey seal population is so large that the immigration of a hundred or so females from the Farnes each year might well go unrecognised. Another is the extensive, isolated areas of the Norwegian coastline where many pups could go unnoticed during the period they spend ashore.

If, as seems likely, disturbance measures continue at the Farne Islands for the foreseeable future, grey seal pup numbers could continue to increase at the Isle of May, and the apparent fecundity of the Farne Islands/Isle of May cows may again approach 90%.

The Isle of May seems eminently suitable as a grey seal breeding site – it is isolated, relatively undisturbed and there is good access for the seals to haul out. It was also particularly noticeable that the pups were extremely healthy and well fed, the majority being likely to survive during their transition to independent feeding at sea.

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NOTES ON THE SILURIAN (WENLOCK) STRATA OF COQUET HEAD, NORTHUMBERLAND AND ROXBURGHSHIRE

and

A UROCORDYLID NECTRIDEAN (AMPHIBIA) FROM THE WESTPHALIAN OF NORTHUMBERLAND

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NOTES ON THE SILURIAN (WENLOCK) STRATA OF COQUET HEAD, NORTHUMBERLAND AND ROXBURGHSHIRE

by

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SUMMARY

A modern description of the Coquet Head inlier is provided. The sediments comprise a tightly folded, homogeneous sequence of shales and greywackes, in which sedimentary 'way-up' criteria are the best means of elucidating structural features. New graptolite discoveries enable the sediments to be assigned to the top of the *Monograptus riccartonensis* zone of the Wenlock.

INTRODUCTION

The basement rocks to the Cheviot Hills igneous complex consist of a steeply dipping sequence of grey-green shales and greywackes, and have been assigned to the Silurian system since the earliest survey work (e.g. Clough, 1888). The largest outcrop of these strata is the Coquet Head inlier, on the Scottish border, and the most accurate published map of this region is that of Robson (1976, fig. 1), which partially amends the Geological Survey work. The Silurian sequence is unconformably overlain by the basal Old Red Sandstone agglomerate in the east, and by lower Carboniferous sediments in the south and west, though much of this boundary is faulted (text-fig. 1).

Although Clough (1888) gave a concise description of the Silurian sequence, little new information was added by Carruthers *et al.* (1932), when the district was resurveyed, and Clough's account was requoted. Moreover, Johnson (1980), in the recently published 'Geology of North East England' makes only passing reference to the Coquet Head inlier in his description of the Lower Palaeozoic basement to the region.

The present account attempts to provide a modern description of some aspects of these neglected strata. Whilst Clough's original comments (1888) contain many acute observations it is clear that he misinterpreted some features which were imperfectly understood in the nineteenth century. For example, his description, '....conglomerates contain big round masses, sometimes 8 or 10 inches long, of clay shale' probably refers to flute or load casts.

PALAEONTOLOGY AND STRATIGRAPHY

The stratigraphical position of the Coquet Head strata has never been exactly defined owing to the lack of a completely diagnostic fauna. Miller and Clough (1887) noted the discovery of specimens of *Monograptus flemingii* and *Orthoceras* sp. from a locality near Ramshope (NT7304). The graptolite indicates a Silurian (Wenlock) age. However, further discoveries of graptolites from a locality in the Coquet valley (NT810098) were apparently misidentified and assigned to the Ludlovian (*Monograptus*

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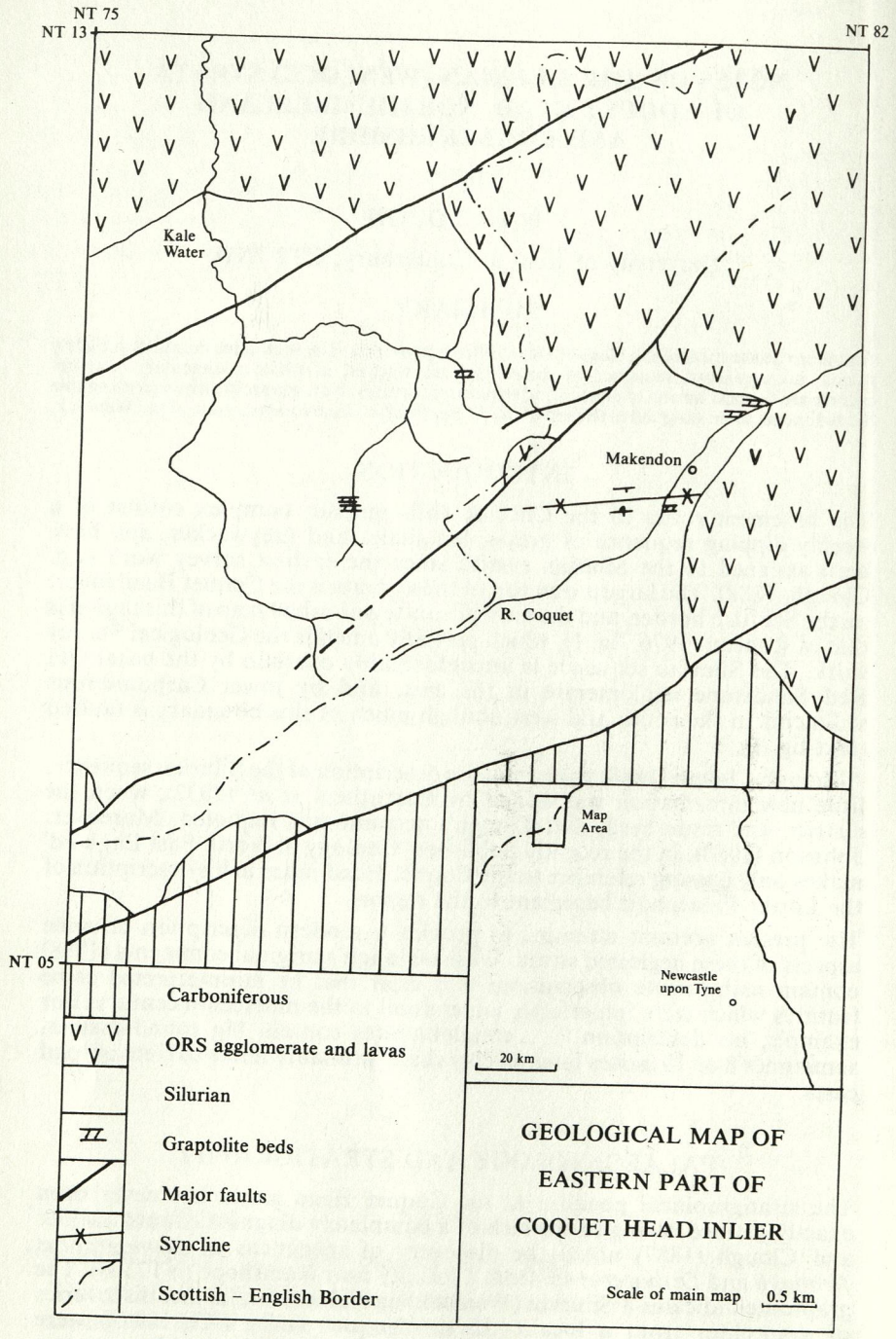

Fig. 1. Geological map of eastern part of Coquet Hill inlier

nilssoni zone). Warren (1964) discussed this evidence and documented, at the same locality, the occurrence of *Monograptus dubius, Monograptus flemingii*? and *Monograptus priodon*?. From this assemblage he assigned the beds to the Wenlock, without specifying a biozone.

A complete list of the fauna discovered by the present author is recorded in table 1, and the fossiliferous localities are indicated in text-fig. 1. Plate 1 illustrates typical examples of *Monograptus priodon*. The new graptolite beds define the stratigraphy with some precision, since the composite evidence points clearly to an horizon at the top of the *Monograptus riccartonensis* zone of the Wenlock (Rickards, 1976). This allows a direct correlation with the Penchrise Burn Beds (defined by Warren 1963, 1964) of the nearby Riccarton and Hawick inliers. However, the 'Berryfell Grit', a coarse greywacke, which forms a distinct marker at the base of the Penchrise Burn Beds, has not been recognised in the Coquet Head area.

Table 1. Fossiliferous localities in the Coquet Head inlier

Grid reference (NT)	Fauna	Remarks
774091	*Monograptus priodon*	
774090	*Monograptus priodon*	late forms
	Monograptus flemingii	early form
	Pristiograptus meneghini	
	Monograptus radotinensis?	fragment of distal portion, difficult to distinguish from *M. riccartonensis*
	Monograptus flumendosae	
	Atrypa? sp.	crushed
	Orthoceras? sp.	crushed
784101	*Monograptus priodon*	
	Monograptus sp.	3 crushed specimens
810099 and 809098	*Monograptus* sp.	not specifically identifiable
802092	*Monograptus* sp.	
800086	*Helminthoida* sp.	trace fossil

SEDIMENTARY AND STRUCTURAL FEATURES

The sequence consists of a marked and repeated alternation of fine grained shales and coarser greywackes. Grain size variation in the greywackes is sufficiently prominent to justify the nomenclature of Warren (1963), who defined the terms 'greywacke-siltstone' and 'greywacke-mudstone'. However, this nomenclature, whilst useful in detailed petrographic studies,

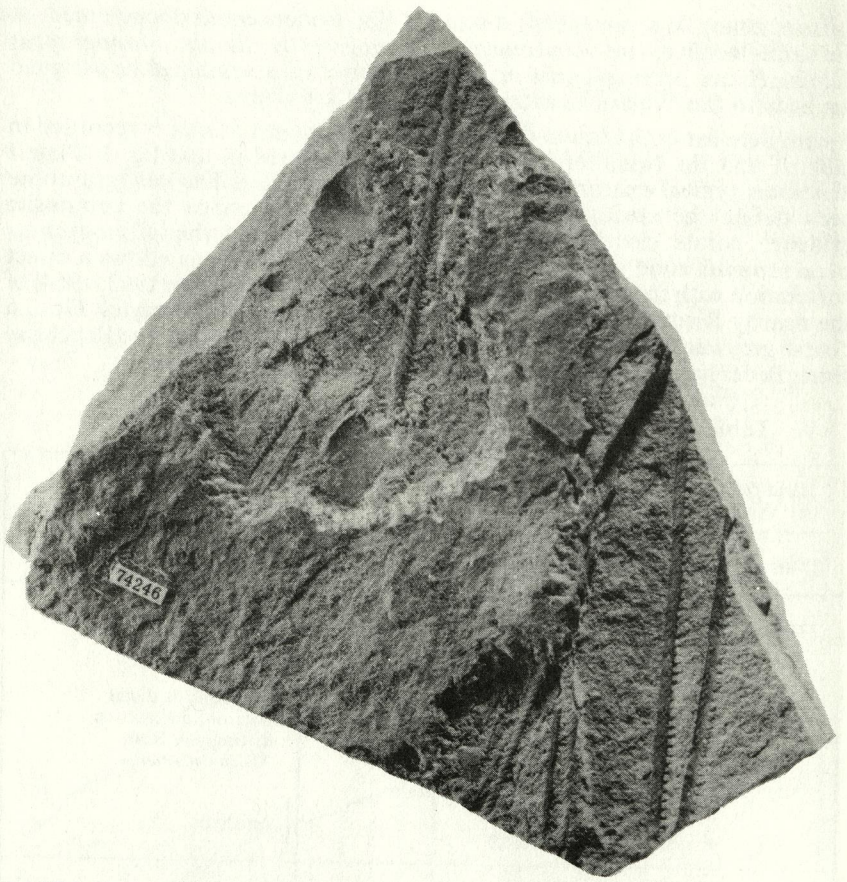

PLATE 1 Current aligned specimens of *Monograptus priodon* in greywacke from Hindhope Burn, Roxburghshire (NT774090). Scale x 1.5

is of less value in the field, where the distinction is somewhat arbitrary. The coarser greywackes are often graded, with a sharp transition in grain size within a bedded unit.

Petrographically, the greywackes are similar to those found in the Silurian inliers southeast of Hawick, and described in detail by Warren (1963). A typical hand specimen is texturally unsorted, with fragments varying from well-rounded to angular. In thin section, many sources are represented, though detrital quartz is the commonest fragment. Varieties of quartz include: (i) rounded grains, probably sedimentary in origin, (ii) 'metamorphic' quartz, with strain or 'shatter' extinction and (iii) rare 'volcanic' quartz, with euhedral faces and embayed margins. Feldspar (plagioclase and microcline) is subordinate. Rock fragments include metamorphic quartzite, mica schist, chert, rhyolite and granite. The matrix is fine grained chlorite, quartz and muscovite.

Sedimentary structures are common, and examples can be found at many outcrops in the Coquet valley, and in the upper reaches of the Kale Water

tributaries. Among localities where clear examples were noted are: NT777091 (flute casts); NT800086 (prod, groove and flute casts); and NT801087 (graded bedding in greywackes). Current scour structures, and especially flute casts, are more frequently developed than tool casts. The flute casts range in size from lcm long (1mm deep) to giant forms 20cms long (3–4cms deep). These latter forms are rare however. Tool casts include prod casts, groove casts, brush casts and skip casts. Palaeocurrent directions were measured from twenty-seven structures, and these indicate a dominant current flow direction from the east (text-fig. 2).

The structure of the Coquet Head inlier is difficult to elucidate since the homogenous bedded sequence has no marker horizons, and axial closures and minor folds are apparently absent. Moreover, many of the exposures in the valley sides are of limited value owing to the occurrence of hill creep, and reliable dip and strike measurements are largely confined to stream beds. However, by using 'way-up' criteria in the steeply dipping beds, it is possible to distinguish inverted sequences, and to infer fold axes, which are indicated by changes in the direction of 'younging'. The density of sedimentary structures and amount of exposure sometimes allows the positioning of a fold axis to within a few metres, though there is frequently a wider margin of uncertainty in areas of poor exposure. Several fold axes are tentatively positioned in text-fig. 1; the most readily definable is the syncline south of Makendon.

Preliminary studies suggest that the folding is overturned, and 'tight' rather than isoclinal, with an angle of separation between the inverted and non-inverted limbs of about 15°. The axial planes strike a few degrees north of west, dipping to the south at about 75°. The thickness of the sequence is approximately 600m.

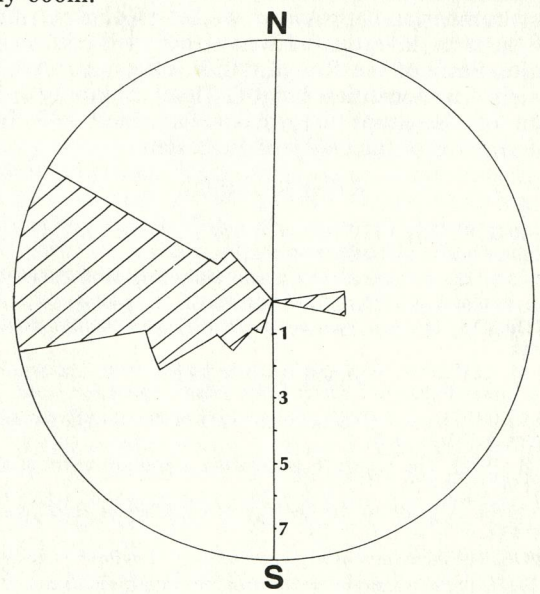

Fig. 2 Rose diagram of current directions. 20° class intervals; graduated radius represents frequency of readings

COMMENT

The sediments of the Coquet Head inlier correspond to the definition of flysch deposits, and contain the diagnostic characteristics which are taken to indicate deposition by turbidity currents (e.g. Selley, 1976).

Although few in number, the palaeocurrent data are important in a consideration of Wenlock palaeogeography. According to Warren (1963, fig. 6), the dominant current directions for the Hawick and Riccarton inliers indicate a derivation of material from the northwest. The easterly derivation implied by the Coquet Head data is not, however, inconsistent with Warren's interpretation. The latter author postulates a Silurian landmass to the east of Coquet Head, and it is therefore logical to expect currents from this direction. The dominance of flute casts over groove and tool casts suggests the turbidity currents were relatively close to their source. Although the greywackes clearly indicate a variety of source rocks, no detailed studies on provenance have been performed.

A recent study of the Southern Uplands (Leggett *et al.*, 1979) has interpreted the Lower Palaeozoic sediments as an accretionary prism which developed on the continental margin of the Iapetus Ocean. Within this model, the Coquet Head sediments represent (together with the Riccarton inlier) the youngest part of the prism; they were deposited in deep water, probably at the margin of an oceanic trench.

ACKNOWLEDGEMENTS

I am indebted to Dr P T Warren and Dr R B Rickards for their advice on the specific identification of some of the graptolites, and to Dr R J Aldridge, who critically commented upon the manuscript. Mr and Mrs J Dixon of Rochester, Northumberland, provided warm hospitality during the field work. Part of the area investigated lies within artillery ranges, and I am grateful to Major Petty of the Range Office, Otterburn Army Group, for permission to visit these localities. Dr R G Clements kindly arranged for the temporary loan of the graptolite specimens which now belong to the Department of Geology, University of Leicester.

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A UROCORDYLID NECTRIDEAN (AMPHIBIA) FROM THE WESTPHALIAN OF NORTHUMBERLAND.

by

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SUMMARY

An isolated caudal vertebra referable to the nectridean family Urocordylidae is described. The specimen is from the Westphalian B of Newsham, Northumberland, and represents the only urocordylid to have been described from any horizon between Westphalian A and Upper Westphalian D. It is also the first recorded instance of a member of this family occurring in a Coal Measure lacustrine facies.

INTRODUCTION

The Nectridea is an order of small, mostly aquatic, 'lepospondyl' amphibians from the Carboniferous and Permian of Europe and North America. The nectrideans have most recently been reviewed by Milner (1980), who has given diagnoses for the order and its constituent families. The family Urocordylidae has a recorded stratigraphic range extending from the Lower Westphalian A of Jarrow in Co. Kilkenny, Eire, to the Lower Permian Wellington Formation of Oklahoma (Milner, 1980). However, no urocordylid has hitherto been described from any horizon between Lower Westphalian A and Upper Westphalian D. The occurrence of a nectridean referable to this family as part of the Westphalian B tetrapod assemblage from Newsham, Northumberland, is thus worthy of note. The available material consists of an isolated caudal vertebra, preserved in counterpart. The two halves of the specimen are registered in the Hancock Museum, Newcastle upon Tyne, as G23.56 and G23.51, the latter consisting largely of an incomplete natural mould (text-fig. 1b). The vertebra is from the black shale overlying the Northumberland Low Main Seam and is thus Upper *Modiolaris* zone and Middle Coal Measures in age (Land, 1974).

DESCRIPTION

The vertebra (text-fig. 1a-c) is characteristically nectridean in possessing a holospondylous and amphicoelous centrum to which the neural and haemal arches are fused. The neural and haemal spines are greatly elongated and originate from their respective arches opposite one another, at roughly the mid-point of the centrum. The neural spine is narrow, becoming slightly expanded towards its distal end, which is absent. The haemal spine is a much broader structure, grooved throughout its length and having a crenellated distal margin with a central notch. Near its base the haemal spine bears an anterior and a posterior articular flange. Both are incompletely preserved and their form in the restoration of the vertebra (text-fig. 1c) is partly

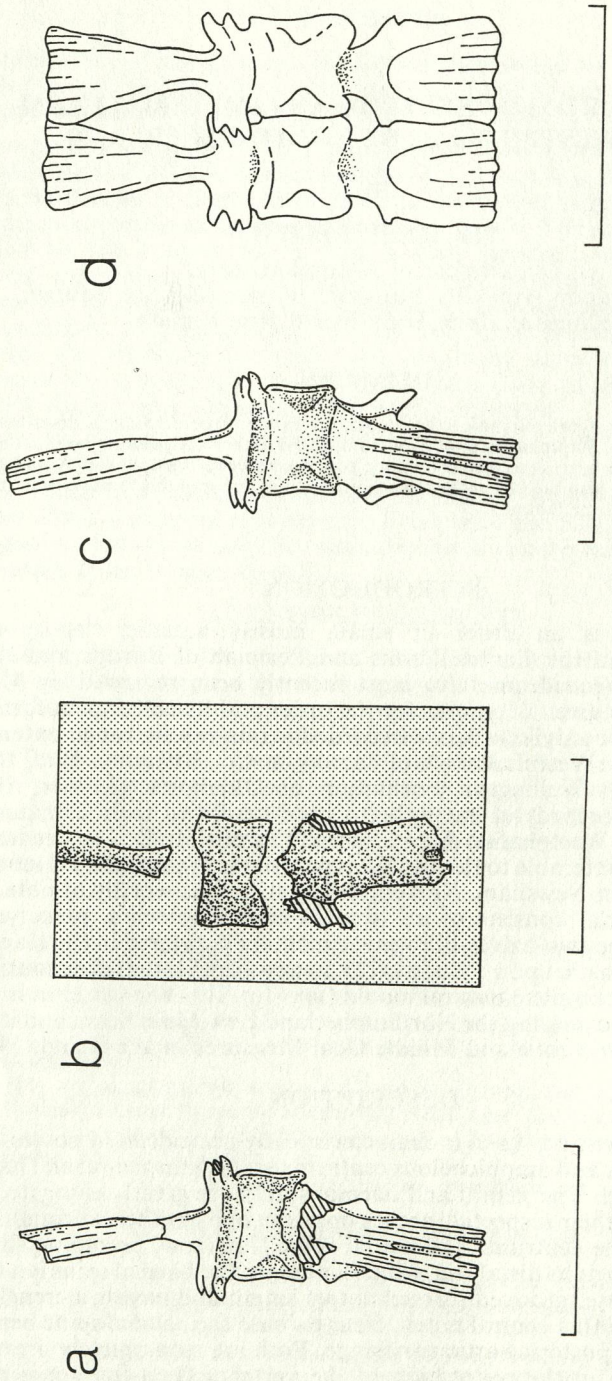

Fig. 1. Caudal vertebrae of urocordylids. a, Hancock Museum specimen G23.56 as preserved; b, Hancock Museum specimen G23.51 as preserved; c, restoration of specimens G23.56 and G23.51 in right lateral view; d, pair of articulated anterior caudals of *Urocordylus wandesfordii* in right lateral view (d modified after Milner, 1980). All scale bars represent 10mm Matrix stippled. Hatching indicates broken bone surface

conjectural. The haemal and neural spines are inclined posteriorly, suggesting that the vertebra is a posterior caudal. In *Urocordylus wandesfordii* Wright and Huxley, which has approximately eighty tail vertebrae, those posterior to the thirty-sixth caudal bear backwardly inclined neural and haemal spines (Huxley, 1867). As preserved, the zygapophyses have a conventional orientation. Mesial and dorsal to the zygapophyses are the extra articulations which are characteristic of nectridean vertebrae. Two pairs of such articulations lie between the post-zygapophyses. Two pairs also seem to have been present between the pre-zygapophyses; however, the lateral member of the right (and only visible) pair has been broken off.

DISCUSSION

That the above vertebra pertains to a member of the Urocordylidae is indicated by the combined presence of:

1. Narrow, elongate neural and haemal spines with, at least in the latter, a crenellated distal border.
2. Haemal articulations.

Haemal articulations also occur in the caudal vertebrae of the Scincosauridae, but the neural and haemal spines in this family are shorter and differ markedly from the urocordylid pattern in abutting throughout their depth. Keraterpetontid nectrideans possess relatively short neural and haemal spines and the latter, which lack articulations, merely overlap distally (Milner, 1980).

Milner (1980) has noted (after Bossy, 1976) that the Urocordylidae apparently includes two distinct morphological types, distinguished on the basis of a number of derived skull and vertebral characters. The presence of more than one pair of extra articulations on the neural arch, and of haemal articulations close to the centrum rather than at the tips of the haemal spines, suggest that the Newsham urocordylid belongs to the *Ptyonius* – group, comprising the described genera *Ptyonius, Ctenerpeton* and *Urocordylus*. Of these, only *Urocordylus*, represented by the sole described species *U. wandesfordii* Wright and Huxley 1866, is recorded from the British Isles. Four poorly preserved specimens are known from the Westphalian A site at Jarrow, Eire (Milner, 1980) and the dimensions of the larger specimen described by Huxley (1867) are compatible with the size of the Newsham vertebra. However, in the absence of more diagnostic material, it seems inadvisable to attempt reference of the Newsham specimen to a formal taxon below family level.

The Newsham black shale appears to represent a sapropelic deposit laid down in a large and deep lake (Panchen, 1970). The urocordylid vertebra from this site is the only specimen representative of this family to have been recorded from a Coal Measures lacustrine facies. With the exception of a single, erratic, specimen of *Ptyonius* from the Westphalian D of Mazon Creek, Illinois (Milner, 1980), all previously published Carboniferous urocordylids come from three localities representing smaller water-bodies of the coal-swamp pool type. Two species (six specimens) occur at Jarrow. In the Upper Westphalian D, three species (more than twenty-three specimens) are known from Linton, Ohio, and one species (at least thirty-two specimens) from Nýřany, Czechoslovakia (data from Milner, 1980).

The atypical environment of preservation, and the nature of the only specimen, suggest the possibility that the Newsham urocordylid may be an erratic, derived probably from a smaller body of water. Some support for the suggestion that the rarity of urocordylids at Newsham is ecological rather than due, say, to collector bias is afforded by the relative abundance of the keraterpetontid *Batrachiderpeton reticulatum* (Hancock and Atthey) at this site, where it is one of the most common amphibians. At least nine individuals, including juveniles, are represented in the known material.

ACKNOWLEDGEMENTS

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THE FISH FAUNA OF THE ESTUARY OF THE RIVER BLYTH

by

P S DAVIS[1] and JUDITH L DUNN[2]

INTRODUCTION

Lists of fish occurring on the northeast coast have been compiled by Johnston (1838), Howse (1890), Meek (1905), Bolam (1919), Stephenson (1949) and Davis (in press). In addition, detailed studies by biologists at the Dove Marine Laboratory, Cullercoats, have resulted in authoritative accounts of local fish populations and their migrations (Meek, 1904 and 1916). Other literature on local fishes is extensive, although primarily concerned with rare or vagrant species (e.g. Bolam, 1879; Rudd, 1844). Little information has, however, been published on the fish fauna of small, well defined areas of the coastline – only that of Evans (1981) refers exclusively to fishes, although other studies (e.g. Nicol, 1933) list fish species found in specific areas.

The primary aim of the present study was to investigate the status and seasonal distribution of the fish fauna at one particular site, the estuary of the River Blyth (text-fig.1). The river flows some forty kilometres from source to mouth, and although it is relatively clean in the upper and middle reaches, there is evidence of pollution from sewage and heavy metals in the estuary (e.g. Cooper and Harris, 1974; Lobel, 1981; Howell, 1982). The main basin of the estuary is situated approximately three kilometres back from the river mouth and is sheltered from the east by a spit of land. The coastline immediately surrounding the mouth of the river consists of stretches of sand with rocky outcrops.

The Central Electricity Generating Board (CEGB) Power Station in the estuary presents a good opportunity for obtaining regular 'catches' of fish without dependence on boats or the vagaries of the weather. At the two intakes of the station (text-fig.1) some 700,000 gallons of seawater are filtered each minute by revolving metal grids. Any organisms present in the intake water are washed off the grids and pass along a channel into a collecting pit, which is periodically cleared by the CEGB pump-house staff. The animals collected in this way include molluscs, crustaceans, and coelenterates, but by far the most important catch in terms of abundance and species diversity is the fish. At certain times of the year, with the correct combination of wind and tide, vast numbers of fish are filtered from the intake water. This is obviously a severe biological problem for the CEGB, but, at the same time, provides ready access to fish specimens. Unfortunately, few of the fish survive the journey through the filters; indeed, physical damage is often apparent on large specimens. Mortality is, however, largely due to chlorination

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2 Formerly of the Department of Natural Sciences, Sunderland Museum, Sunderland. Present address: The Old School House, Newton-by-the-Sea, Northumberland

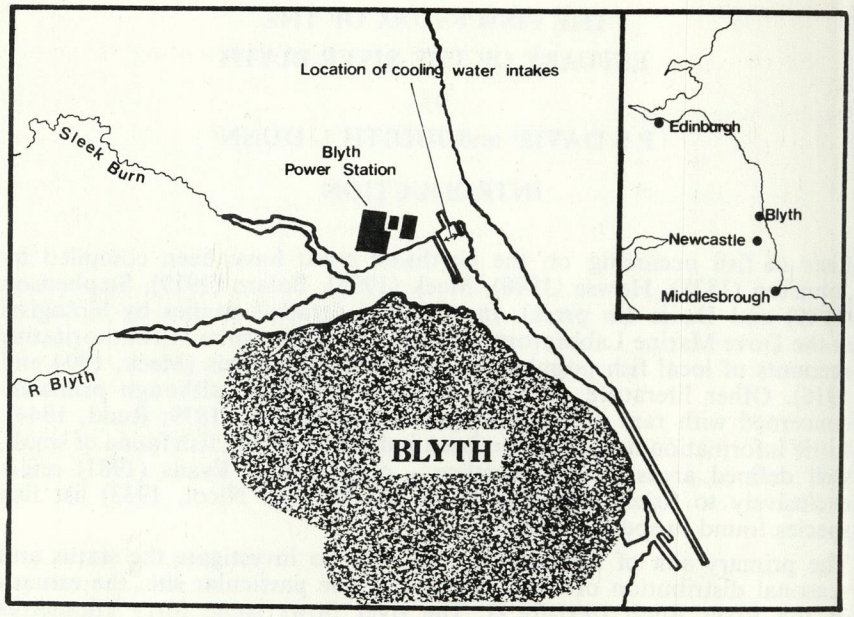

Fig. 1 The estuary of the River Blyth

of the intake water, a procedure carried out to prevent spat settlement (particularly of the edible mussel *Mytilus edulis* L.) within the extensive pipe-work of the power station.

An approach was made to the CEGB to permit us to monitor the catch. This was greeted with enthusiasm, not only by the management, but also by the pump-house staff. The co-operation of the latter has been a significant factor in the success of the monitoring process. With permission to enter the site and examine the collecting pits, the project began in September 1979; it was concluded in January 1982.

METHODS

During the course of the study sixty-one visits were made to the power station at approximately fortnightly intervals. On each visit species present in the collecting pits were listed, and any specimen not immediately recognisable was taken back to the laboratory for identification and subsequently added to the list. As a supplement to this procedure any unusual specimens which appeared in the pits between visits were deposited by the pump-house staff into a large plastic dustbin containing fixative (10% formalin solution). Specimens collected in this way were considered as part of the fish fauna on the day of the visit on which they were collected. Any fish not already represented in either the Hancock Museum or Sunderland Museum, or which were particularly good specimens, were taken for preservation in 1% propylene phenoxetol (Owen and Steedman, 1956; Steedman, 1976) and later added to the appropriate collection.

RESULTS

A. **Species list.** A total of fifty-three species, representing thirty-one different families, was recorded during the survey period and a systematic list, following Wheeler (1978), is given below. Notes comparing the present data with other published information on the status and seasonal distribution of each species are given.

Petromyzonidae

Lamprey *Petromyzon marinus* Linnaeus, 1758. A single specimen was found in April 1980. The species breeds in freshwater in May and June, and this animal may well have been ascending the Blyth in search of a suitable breeding site.

Lampern *Lampetra fluviatilis* (Linnaeus, 1758). This is a migratory lamprey which ascends rivers from August to November and the single record (in August 1980) may reflect this behaviour. However, although lamperns usually live in inshore waters and estuaries, the present data show that there is unlikely to be a resident population in the estuary.

Myxinidae

Hagfish *Myxine glutinosa* Linnaeus, 1758. Although the Northumberland and Berwickshire coasts have well-documented local populations of hagfish (Wheeler, 1969), this species does not normally tolerate low salinity and its presence in the estuary on two occasions is, therefore, rather unusual.

Triakidae

Starry smooth hound *Mustelus asterias* Cloquet, 1819. This is a rather uncommon shark in northern European waters and its occurrence in the estuary is of considerable interest.

Squalidae

Spurdog *Squalus acanthias* (Linnaeus, 1758). Five immature specimens were found at different times throughout the year. Although it is a very common shark in north European seas, larger individuals tend to inhabit deeper waters, and this may account for the fact that only small specimens were caught in the estuary.

Rajidae

Starry ray *Raja radiata* Donovan, 1806. This seems to be a regular winter visitor to the Blyth area, normally occurring sometime between the months of November and April (thirteen times in all). It is one of the most interesting fish recorded in the estuary as it is considered to be at the southern limit of its range in British waters and is rarely found close inshore.

Anguillidae

Eel *Anguilla anguilla* (Linnaeus, 1758). Data suggests that there is a resident population in the estuary for it was found throughout the year on twenty-four different visits.

Congridae

Conger *Conger conger* (Linnaeus, 1758). None has been seen by the authors, but there have been two reports of very large eels. Although the conger is common around all parts of the British Isles it is not usually found in soft-bottomed areas.

Clupeidae

Herring *Clupea harengus* Linnaeus, 1758. As expected from the literature, herrings are very common in the estuary. They were found on thirty-eight visits, being present in every month of the year except February. A significant spawning and nursery area has been identified off the Northumberland coast (Lee and Ramster, 1981) and this is reflected in the status of the species in the estuary.

Sprat *Sprattus sprattus* (Linnaeus, 1758). This species is considered as very abundant in northern European waters, and is clearly resident in the estuary. Not only was it recorded on fifty-one occasions, but also the numbers of individuals found were frequently extremely high, particularly during winter, when the massive non-feeding, overwintering shoals occur off the coast.

Salmonidae

Salmon *Salmo salar* Linnaeus, 1758. Its presence in the polluted waters of the estuary on four occasions is quite remarkable. Interestingly, two of the records were in autumn when migration from the sea to the freshwater spawning grounds would be expected.

Trout *Salmo trutta* Linnaeus, 1758. Migratory trout have been recorded in the estuary on eight occasions. Although sea trout are regarded as being common in northern European waters, this result is surprising in view of the pollution in the estuary.

Thymallidae

Grayling *Thymallus thymallus* (Linnaeus, 1758). Grayling are usually found in clean, cool, well-oxygenated rivers and are particularly sensitive to pollution. The single occurrence in March 1981, was recorded after a heavy flood and the specimen is thought to have been washed down-river.

Lophiidae

Angler *Lophius piscatorius* Linnaeus, 1758. Although often thought to be a deep water fish, the angler is relatively common in the North Sea below ten fathoms. It has been recorded six times during the project, both in winter and summer, and can be considered an irregular visitor to the estuary.

Gadidae

Cod *Gadus morhua* Linnaeus, 1758. There were twenty-four records indicating a characteristic inshore movement during the autumn and winter months. When cod were found during the summer only very small individuals were present.

Whiting *Merlangius merlangus* (Linnaeus, 1758). This member of the cod family was found to be very common, being recorded on forty-nine visits. It was present in all months of the year except May and June, but the number of individuals increased considerably during the winter, which is consistent with the expected inshore movements for the species.

Bib *Trisopterus luscus* (Linnaeus, 1758). Since this is a very common fish further offshore its presence in the estuary was unexpectedly rare; it was found on only eight occasions.

Pollack *Pollachius pollachius* (Linnaeus, 1758). Only one specimen was found during the survey and this is consistent with the general status of the species on the northeast coast where it is rarely recorded.

Saithe *Pollachius virens* (Linnaeus, 1758). One of the most abundant fish in the estuary, having been observed on fifty visits, often in large numbers.

Five-bearded rockling *Ciliata mustela* (Linnaeus, 1758). This common fish of the intertidal zone was recorded eighteen times during the study although it was never found between June and October.

Northern rockling *Ciliata septentrionalis* (Collet, 1875). The presence of this little-known rockling in the estuary on three occasions towards the latter part of the study is particularly interesting since this fish has only recently been found to occur on the Northumberland coast (Davis, 1981).

Three-bearded rockling *Gaidropsarus vulgaris* (Cloquet, 1824). The appearance of this rockling in the estuary on only two occasions is consistent with previous records of the normal offshore existence. It is interesting to note, however, that the species was not found until the last two months of the study.

Ling *Molva molva* (Linnaeus, 1758). Ling is a common species on rough ground off the northeast coast. It is essentially a deep water fish and its presence in the estuary on as many as five occasions was surprising.

Tadpole-fish *Raniceps raninus* (Linnaeus, 1758). Once thought to be rare, this species is probably under-recorded due to its solitary existence. Only one specimen was found – in April 1980.

Zoarcidae

Viviparous blenny *Zoarces viviparus* (Linnaeus, 1758). This common fish is clearly resident in the estuary having been recorded on forty-two visits.

Atherinidae

Sand-smelt *Atherina presbyter* (Valenciennes, 1835). The sand-smelt is usually regarded as a common inshore and estuarine fish and its scarcity in the estuary – it was present on only two visits – was, therefore, unexpected.

Gasterosteidae

Stickleback *Gasterosteus aculeatus* (Linnaeus, 1758). Although this stickleback can be expected to be found in estuaries, its appearance in the Blyth estuary was irregular; it was present only during March, April and May 1981, although in reasonably large numbers (between five and twelve individuals per visit).

Fifteen-spined stickleback *Spinachia spinachia* (Linnaeus, 1758). This is essentially a fish of rocky, algal-covered shores. It was recorded on five occasions, usually during winter.

Syngnathidae

Greater pipefish *Syngnathus acus* (Linnaeus, 1758). Since it is normally regarded as a moderately common species in shallow water over sandy or muddy bottoms, it was surprising to discover it on only two visits, both during April 1980.

Triglidae

Tub gurnard *Trigla lucerna* (Linnaeus, 1758). Tub gurnards are usually found in shallow inshore waters, but are regarded as rare on the northeast coast of England. One specimen of this handsome species was recorded – in November 1980.

Grey gurnard *Eutrigla gurnardus* (Linnaeus, 1758). This relatively common gurnard is usually found offshore on the northeast coast and its single occurrence in the estuary was predictable.

Cottidae

Bull-rout *Myoxocephalus scorpius* (Linnaeus, 1758). Interestingly, bull-routs were found only on four occasions during the early part of the survey, even though they normally inhabit a wide variety of sea bottoms from sand and mud, to rock, and are commonly caught by anglers near harbour walls.

Sea scorpion *Taurulus bubalis* (Euphrasen, 1786). Since specimens of this fish were present at all seasons of the year (on nineteen visits) it may be regarded as a resident member of the estuary fauna. This species is usually associated with rocky shores and dense algal growth, and it is perhaps a little surprising to find it in such numbers in a muddy estuary.

Agonidae

Hooknose *Agonus cataphractus* (Linnaeus, 1758). The hooknose is probably resident in the estuary, having been recorded during all months of the year except June and August (seventeen times). This result is consistent with the literature which states that the species is common in inshore waters on sandy bottoms.

Cyclopteridae

Lumpsucker *Cyclopterus lumpus* Linnaeus, 1758. The characteristic inshore movement of this species associated with spawning is evident from its occurrence in the estuary on five occasions between March and May during the first year of the study, and on five between April and August in the second year.

Montagu's sea-snail *Liparis montagui* (Donovan, 1805). This fish usually inhabits rocky shores, but was found in the estuary on two occasions during winter.

Perchichthyidae

Bass *Dicentrarchus labrax* (Linnaeus, 1758). This is a relatively uncommon species on the northeast coast and was recorded only once from the estuary.

Carangidae

Scad *Trachurus trachurus* (Linnaeus, 1758). The scad is an offshore, pelagic fish, often occurring in vast shoals and its irregular occurrence on five visits to the estuary was of interest.

Bramidae

Ray's bream *Brama brama* (Bonnaterre, 1788). The migration of Ray's bream down the east coast of Britain in the autumn and winter months has been well documented (Davis and Dunn, 1980) as specimens are regularly stranded on the Northumberland and Durham coastline from mid-October to early December. The single record in October 1979 is consistent with this pattern of movement, although more specimens had been expected in the two subsequent autumn seasons.

Mugilidae

Thick-lipped grey mullet *Chelon labrosus* (Risso, 1826). This species apparently occurs in large numbers at selected localities in Northumberland during the summer months (A. Taylor, pers. comm.). It is thought to be particularly common in harbour mouths and estuaries, and although scarce it is clearly present in the estuary where it has shown an interesting annual appearance during winter.

Trachinidae

Lesser weever *Echiichthys vipera* (Cuvier, 1829). A resident member of the estuary fauna, recorded on twenty-nine visits.

Blenniidae

Shanny *Lipophrys pholis* (Linnaeus, 1758). Although a common fish on rocky shores in Northumberland (JLD, pers.obs.) only one specimen was found in the collecting pits.

Butterfish *Pholis gunnellus* (Linnaeus, 1758). As a particularly common species of the rocky shores of Northumberland, its occurrence in the estuary on only seven visits was unexpected.

Ammodytidae

Sandeel *Ammodytes tobianus* Linnaeus, 1758 and **Greater Sandeel** *Hyperoplus lanceolatus* (Lesauvage, 1824). In the initial fifteen months of the survey all sandeels found were recorded as *Ammodytes,* but examination of preserved specimens has shown that *Hyperoplus* is also present in the estuary. (Two examples of each species were preserved.) The precise identification of those specimens which were not preserved remains unknown and because of this oversight it is impossible to comment on the relative status and seasonal distribution of the two species during this period. Nonetheless, records for the latter thirteen months of the study show that the two species each appeared eight times in the estuary. *Ammodytes* tended to occur during winter, whereas *Hyperoplus* was present at all seasons of the year.

Callionymiidae

Dragonet *Callionymus lyra* Linnaeus, 1758. Only one specimen was taken from the collecting pits, in May 1980, even though the species is relatively common offshore.

Gobiidae

Sand goby *Pomatoschistus minutus* (Pallas, 1770). This small goby, which normally inhabits inshore sandy grounds, was recorded fifteen times. The data show a distinct seasonal appearance of the fish in the estuary during winter, in contrast to reports that it moves into deeper water at this time.

Scombridae

Mackerel *Scomber scombrus* Linnaeus, 1758. This common summer visitor to the northeast coast has, surprisingly, been recorded only once during the survey – in February 1980.

Pleuronectidae

Plaice *Pleuronectes platessa* Linnaeus, 1758. A very common, resident member of the estuary fauna, which was recorded in every month except June (forty-seven times in all).

Flounder *Platichthys flesus* (Linnaeus, 1758). Flounders were very common, and were present throughout the year, on forty-six visits. Hybrids between plaice and flounder were also frequently found.

Dab *Limanda limanda* (Linnaeus, 1758). This species was recorded on nineteen occasions, but surprisingly few were present during the summer when an inshore migration might be expected.

Lemon Sole *Microstomus kitt* (Walbaum, 1792). This is primarly an offshore species, and its single appearance in the estuary was unexpected.

Soleidae

Sole *Solea solea* (Linnaeus, 1758). Sole is essentially a central and southern North Sea species inhabiting sandy and muddy grounds although young fish frequently appear in the shallow waters to the north of their range. Consistent with this, five small specimens were found in the estuary, on different occasions, usually in winter.

B. **Status.** In order to assess the relative status of the fish of the Blyth estuary the 'percentage occurrence' of each species has been calculated. This refers to the number of visits on which the species concerned was recorded, expressed as a percentage of the total number of visits (sixty-one). The fish have been grouped into five arbitrary categories according to their percentage occurrence from 'rare' to 'abundant' (table 1). The largest category, however, consisted of species found on less than five occasions.

Table 1.

The relative status of fish in the Blyth estuary

Status and % occurrence	Species	
Rare 1–5	Sea lamprey Lampern Hagfish Starry smooth hound Conger Grayling Pollack Three-bearded rockling Tadpole-fish Sand smelt	Greater pipefish Tub gurnard Grey gurnard Montagu's sea snail Bass Ray's bream Shanny Dragonet Mackerel Lemon sole
Uncommon 5-10	Salmon Trout Angler Bib Northern rockling Ling	Bull-rout Scad Grey mullet Butterfish Sole
Moderately common 10–30	Starry ray Five-bearded rockling Hooknose Lumpsucker	Sand goby Three-spined stickleback Fifteen-spined stickleback
Common 30–60	Eel Cod Rockling Sea scorpion	Lesser weever 'Sandeel' Dab
Abundant >60	Herring Sprat Whiting Saithe	Viviparous blenny Plaice Flounder

C. **Seasonal distribution.** It was interesting to observe that the numbers of different species present varied according to the time of year (text-fig. 2). Winter visits tended to be much more productive in terms of species diversity than were those made during the summer. Numbers of individuals also increased noticeably during winter.

The seasonal distributions of the individual species are presented in text-fig. 3, although care is needed in their interpretation owing to the lack of quantitative data. Thus, for example, a species which appears to be resident may actually show marked changes in the number of individuals recorded at different times of the year.

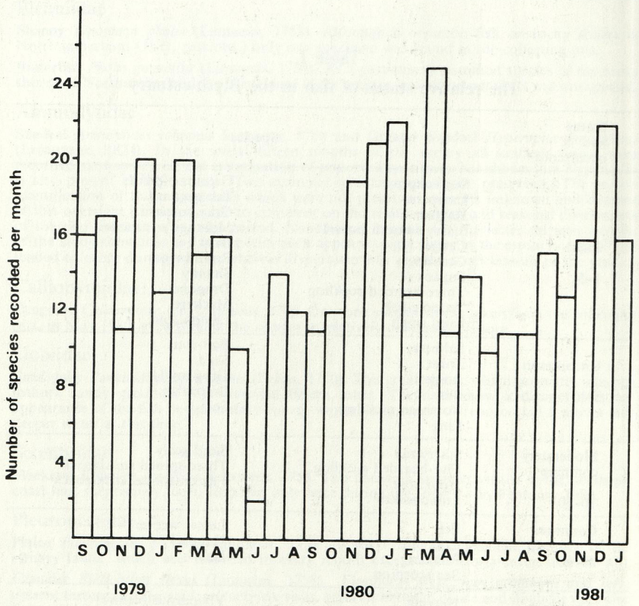

Fig. 2 The number of fish species recorded to occur in the River Blyth estuary per month

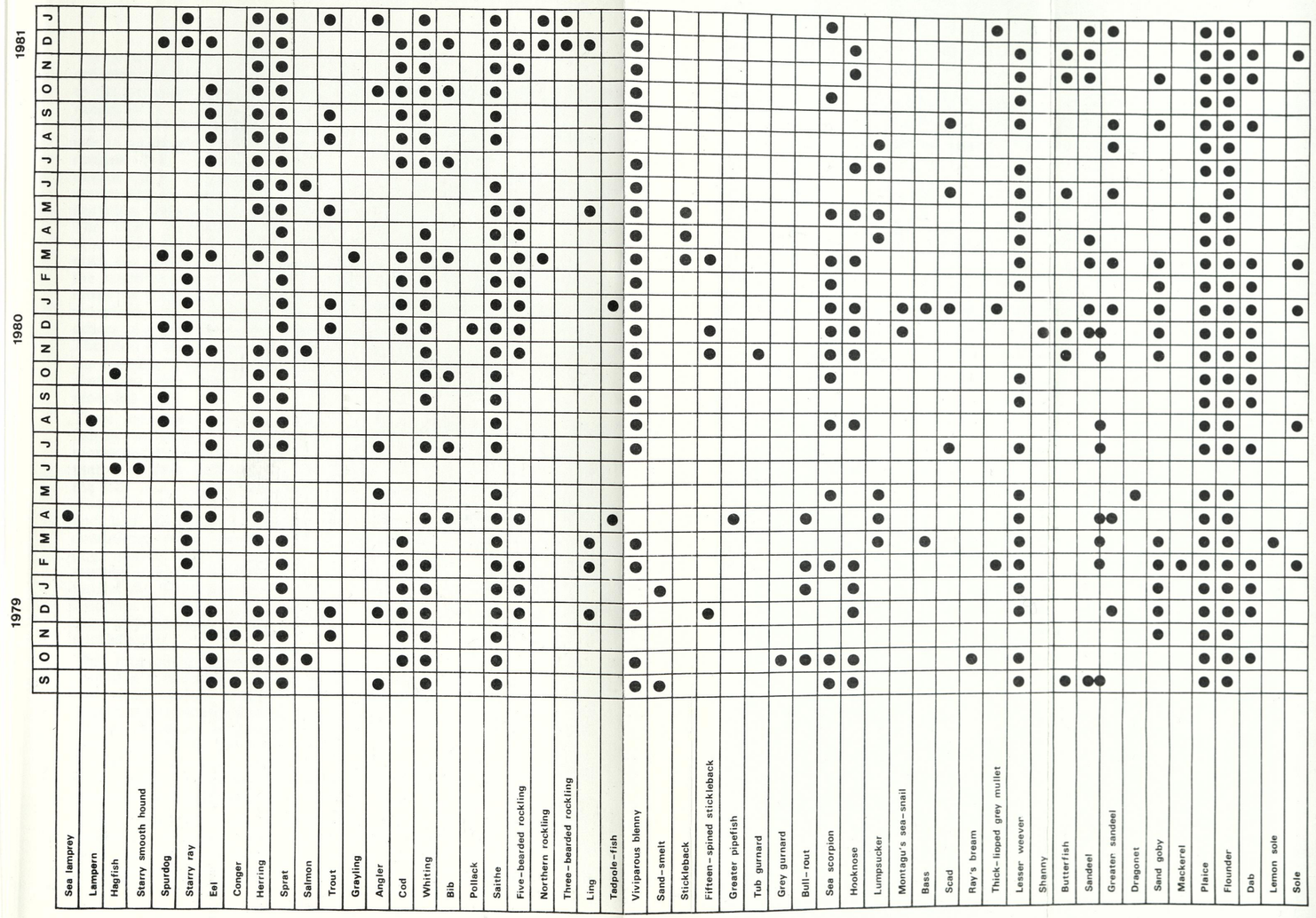

Fig. 3 The seasonal distribution of fish found in the River Blyth estuary, based on monthly records

DISCUSSION

The results of the survey have indicated that a surprising number of different fish frequent the estuary. The fish have been grouped according to the frequency with which they appeared in the collecting pits and this ranges from a single occurrence (rare) to an almost continuous presence (abundant). The occurrence of the 'common' and 'abundant' species was in accordance with expected results, indicating the presence of both resident fish, *i.e.* those occurring all the year round in consistent numbers (*e.g.* viviparous blenny, lesser weever) and those showing marked seasonality *i.e.* those present all the year round, but in numbers which fluctuate considerably depending on the time of year (*e.g.* sprat, cod). The 'rare', 'uncommon', and 'moderately common' categories, on the other hand, include a number of unexpected results. It is interesting to note, for instance, the presence of species previously regarded as rare on the northeast coast (*e.g.* starry smooth hound, tub gurnard), or at the limits of their range (*e.g.* starry ray). Other species (*e.g.* hagfish, sea scorpion) simply occurred more often than had been expected, whilst others (*e.g.* bib, sand-smelt, mackerel) were less frequent than predicted. The total absence of certain species was also of interest. Some fish, such as the thornback ray *Raja clavata* L. and the two-spotted goby *Gobiusculus flavescens* Fab. which might have been expected to appear, were not recorded at all.

There are several possible reasons for the unpredictable occurrence of fish in the estuary. Although environmental factors were not specifically monitored because of the preliminary nature of the survey, it is likely that they have had considerable influence on the results. The state of the tide and weather conditions preceeding visits to the site certainly seemed to affect the number and diversity of fish recorded. Rough seas and high tide usually provide optimum quantity and variety. These conditions often coincided with the presence of deeper-water fish (*e.g.* angler, ling) or fish which normally inhabit rocky algal-covered regions (*e.g.* five-bearded rockling, fifteen-spined stickleback, shanny, butterfish). They may thus be the explanation for the increased diversity recorded in winter. Influxes from the river system after high rainfall may also account for the occurrence of some species (*e.g.* grayling, stickleback).

The relationship between environmental factors and fish 'catch' is probably a complex one. For instance, Holmes (1975) showed that fish and weed catches at Fawley Power Station were higher after strong southwesterly winds, although this direction was actually away from the screens. Research at Dungeness Power Station (Turnpenny and Utting, 1980) revealed no correlation between wind velocity and direction and the number of sprats impinged. The effects of tides on fish capture or diel patterns of fish impingement at Dungeness Power Station have been discussed by Langford *et al.* (1977) and Turnpenny and Utting (1980).

Another possible cause of unpredicted results concerns the size of fish species. Smaller fish, such as Montagu's sea-snail, are more likely to have remained undetected, or to have escaped unscathed from the collecting pits. Five-bearded rockling and butterfish have often been

found alive in the collecting trays and can easily escape through the coarse mesh and into the flow of the outlet pipe.

It would appear that the intake and revolving grids sample selectively for small individuals of all species since very few large fish were obtained during the survey period. Fish will be trapped only if they are unable to swim against the inflow through the entrance tunnel. Holmes (1975) suggests that small fish such as sprats, or weak swimmers such as lumpsuckers, are unlikely to be able to escape, but larger and more powerful fish such as bass may be able to do so. Results obtained at Blyth appear to support this view. Recent research indicates that the swimming ability of fish is related to water temperature and may be a key factor in impingement (T E Langford, pers.comm.). Thus at higher water temperatures during summer, fish are able to withstand water currents more effectively and escape impingement. This may be an additional explanation for the discrepancy in the species diversity found in the summer and winter.

The position of the intake funnel may also have resulted in selective 'catches'. Although several pelagic fish, such as scad, were present in the samples, the relatively large numbers of bottom-living flatfish may well have been the result of the low position of the intake funnel. Furthermore, records of the occurrence of certain edible species may have been biased. Quite understandably, salmon, trout, and cod were rarely found in the container of fixative.

Clearly the recording techniques used in this survey are likely to have led to some of the anomalies found. Records of 'presence only' tend to over-emphasize the importance of the rarer species, many of which are represented by a single specimen. Quantitative sampling is obviously desirable in future work if a more objective assessment of the local fish populations is to be obtained. Nonetheless, these preliminary observations have not only provided information as to the extent of the fish fauna of the Blyth area, but have also resulted in the establishment of two reasonably complete local fish reference collections.

ACKNOWLEDGEMENTS

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ALTITUDINAL COMPARISONS IN THE ECOLOGY AND REPRODUCTION OF THE COMMON FROG (*RANA TEMPORARIA TEMPORARIA* L.)

by

P HOLMS*

SUMMARY

Common frog breeding ponds at an altitude of 500m in the Cumbrian Pennines were compared with ponds at lowland sites at 100m in south Northumberland.

In the wild, the process of pairing and oviposition occurred three to four weeks earlier in the lowland populations. However, development up to metamorphosis was about 33% faster in upland embryos. Control experiments involving the transference of spawn from each altitude to laboratory aquaria, under identical light and heat regimes, compared times of development with those of natural populations. Under laboratory conditions, lowland spawn took approximately 44% and upland spawn 56% longer to develop than in the field. Thereafter, growth rates under control conditions were similar for upland and lowland populations.

The results indicate little innate difference between the two *Rana temporaria* L. populations, though upland frogs appear to be adapted to short season development in upland pools where predation is low, but winters are long and severe.

INTRODUCTION

The genus *Rana,* to which the British frog species belong, is widely distributed over Europe, Asia, Africa and North America. In Great Britain the subspecies *Rana temporaria temporaria* L. breeds from sea level to altitudes above 900 metres in the Scottish Higlands. *R. temporaria* has a greater tolerance of cold and breeds earlier in the year than any other member of its genus (Smith, 1973).

Previous comparative studies of latitude or altitude are mostly concerned with continental *Rana* subspecies (Aebli, 1966 and Kozlowka, 1971). Harri and Koskela (1976) compared terms of spawning in southern and northern Finnish populations of *R. temporaria* under laboratory conditions. Pairing and oviposition was later in the northern population, suggesting an internal rhythm synchronized with local environmental conditions. Beattie (1977) compared the early development in *R. temporaria* spawn taken from sites in Durham with those in the upland Pennines. Beattie stripped the eggs from gravid females, placed them in a sperm suspension, and kept them in a constant temperature room. Upland spawn was found to be more cold tolerant and development was faster than lowland spawn.

This study forms a substantial part of a two year ecology course, the Certificate in Field Biology, run by the Extra Mural Department of London University. Its aim was to compare spawning dates and development of an upland and a lowland population of *R. temporaria.* Field observations were supported by records of performance under controlled conditions in the laboratory.

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STUDY AREAS

Lowland. The lowland pools were both located in woodland areas. Overhanging deciduous trees provided shelter and contributed a major part to the decaying matter of the pools (table 1).

The woodlands were adjacent to fertilised pasture and rough grazing land. Pools were fringed by *Cardamine amara* L. and *Ranunculus* sp., while open water was dominated by *Caltha palustris* L. Both sites received a moderate amount of human pressure, one pool being only five metres from a public footpath. Both pools were well frequented by *R. temporaria,* but newts (*Triturus* sp.) were absent during the sampling period.

Table 1
The study pools

Site	*Map reference*	*Altitude (mean OD)*	*Habitat*	*pH*	*Conductivity (microhms/cm)*	*Area (m^2)*
Lowland 1	NZ079785	128	Woodland	6.8	210	48
Lowland 2	NZ085784	122	Woodland	5.6	135	28
Upland 1	NY761329	566	Moorland	5.6	77	16
Upland 2	NY766327	548	Moorland	5.5	100	28

Upland. Both the upland pools were in open moorland. Some shelter was afforded by marginal rushes (*Juncus* sp.), but mainly the pools were of a very exposed nature. High altitude and low water pH was reflected in the surrounding vegetation. *Sphagum* moss and *Carex* sp. occupied margins while *Equisetum* grew in deeper water. This plant was hardly noticeable in the spring, but completely choked one of the pools by late summer. These upland sites were subject to sheep grazing, but so isolated that human interference was considered minimal.

METHODS

The upland study sites lay within the Moor House National Nature Reserve in Cumbria, owned by the Nature Conservancy Council. Comparative air temperature data from January to July 1979 was obtained from the permanent meteorological station (altitude 556m) only 300m and 650m from the two study pools respectively. A thermometer was placed at 5cm ground depth from January to April 1979 in order to find out the temperatures experienced by emergent common frogs. This was not possible in the lowland areas.

In the lowland site, near the village of Belsay in Northumberland, a Stevenson Screen containing maximum and minimum air thermometers was positioned 1.3m from the ground. This was an area shaded by trees 1.7km from the study pools and at the same altitude. The temperatures in the lowland site were read daily at 0900 GMT to be comparable with those at the official upland meteorological station (text-figs. 2 and 3).

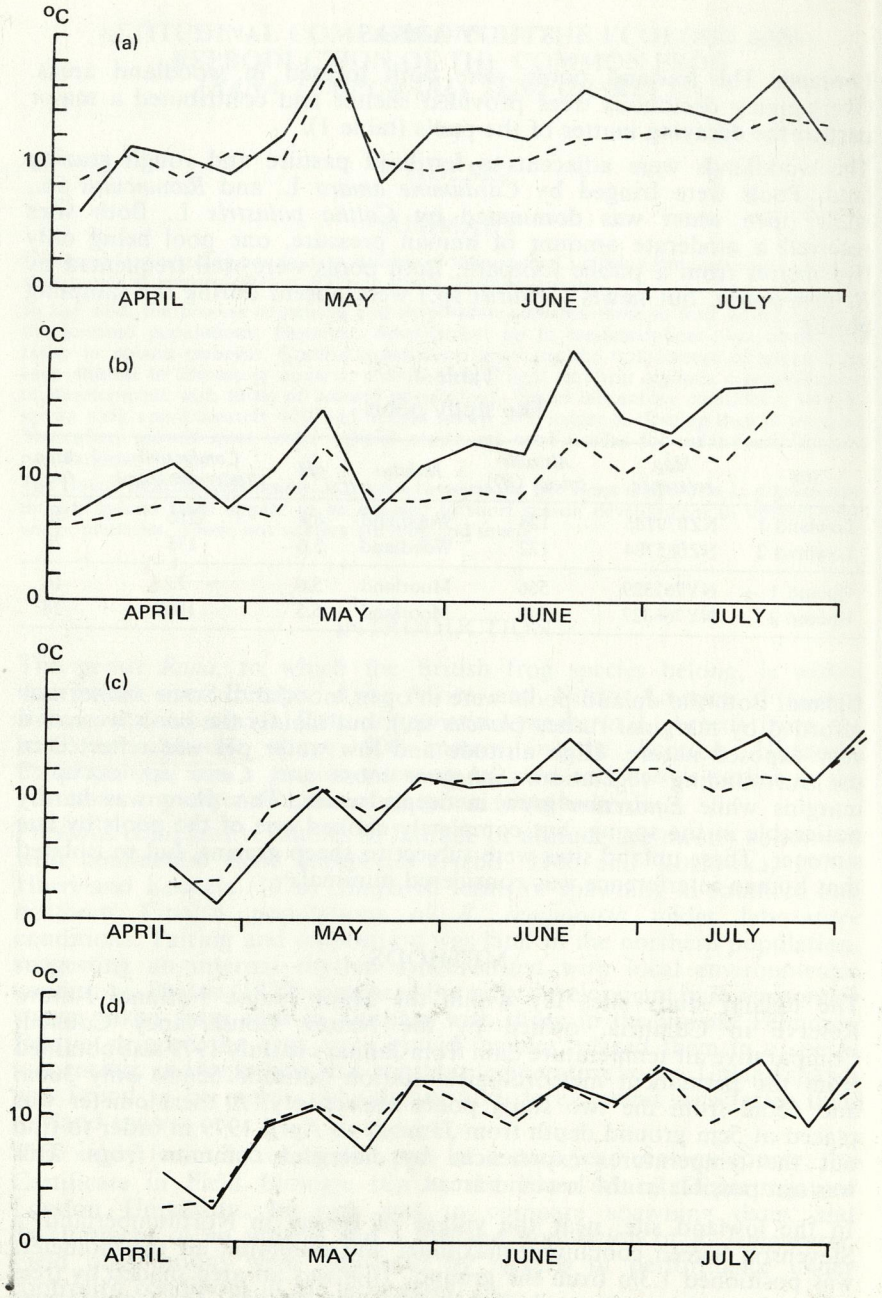

Fig. 1 Ambient air (___) and water (_ _ _) temperatures at study pools from April to July 1979. (a) lowland 1; (b) lowland 2; (c) upland 1; (d) upland 2

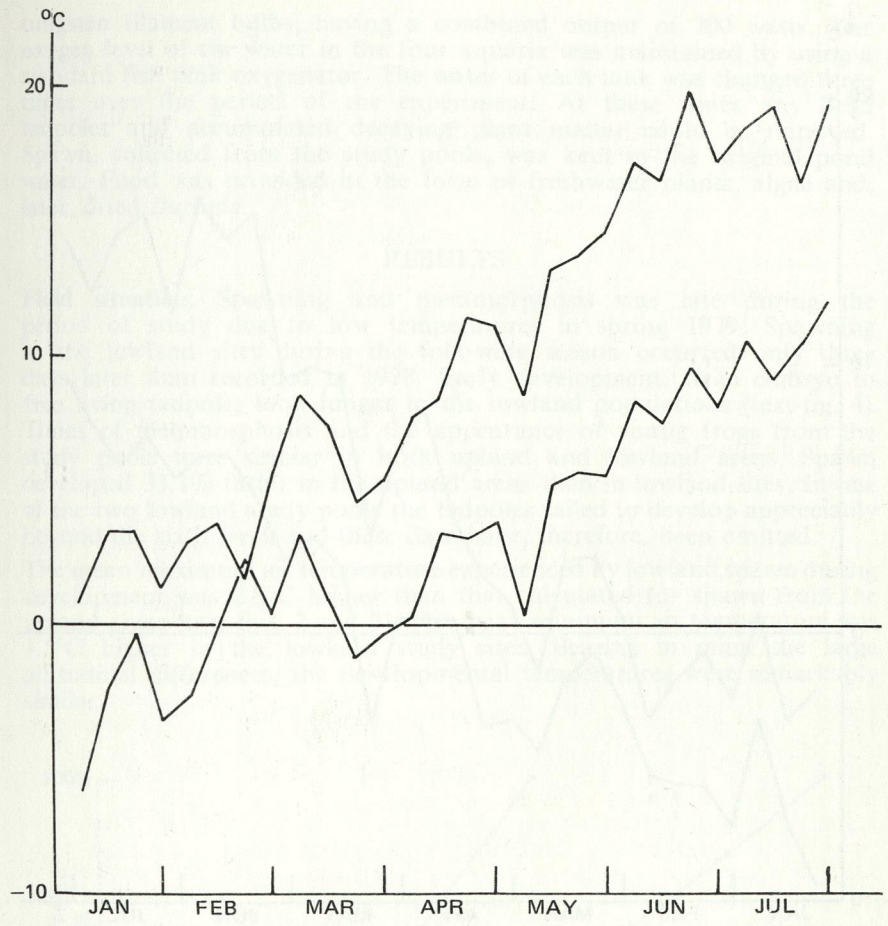

Fig. 2 Maximum and minimum air temperature weekly means at Belsay

Weekly ambient air temperatures were taken one metre from the pool edge and at 20cm height above ground and surface vegetation. The water temperatures were carried out at the same point 20cm in from the pool edge. From the initiation of spawning, pool temperatures were taken from the middle of the spawn mass and later from the area of highest tadpole density (text-figs. 1(a)-(d)).

As a representative sample of the population, ten tadpoles were removed from each study pool each week, measured, and the mean calculated. Measurements were made from snout to anus as the tips of tails become very worn in time.

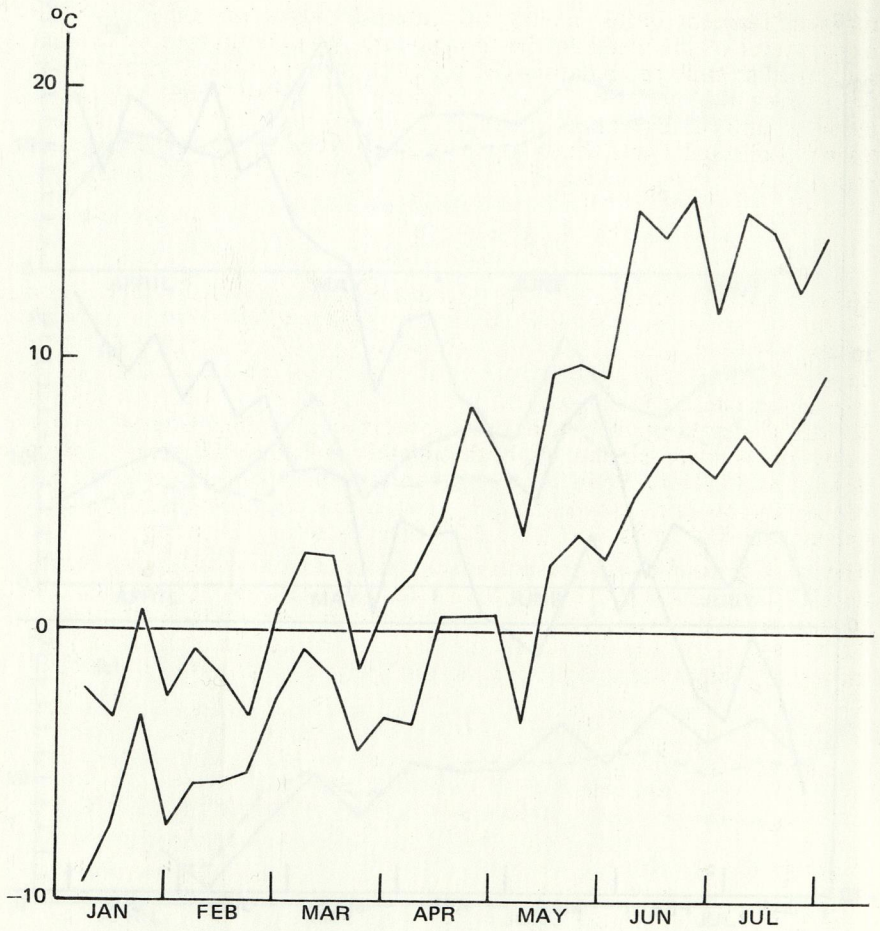

Fig. 3 Maximum and minimum air temperature weekly means at Moor House NNR

Conductivity and pH of the study pools were taken in June 1979. Conductivity is a measure of the water's ability to convey an electric current and is related to the concentration of the ions in the water. Highland pools tend to have a low level of ions, probably resulting from the high percentage input of rainwater, which contains few inorganic ions (Beattie, 1977) (table 1).

R. temporaria tadpoles from upland and lowland populations were kept in a light-proof room under identical temperatures and artificial light conditions until metamorphosis. A constant photoperiod of twelve hours from 0800 to 2000 was maintained daily. Illumination was by means of

tungsten filament bulbs, having a combined output of 200 watts. The oxygen level of the water in the four aquaria was maintained by using a standard fish tank oxygenator. The water of each tank was changed three times over the period of the experiment. At these times any dead tadpoles and accumulated decaying plant matter could be removed. Spawn, collected from the study pools, was kept in the original pond water. Food was provided in the form of freshwater plants, algae and, later, dried *Daphnia*.

RESULTS

Field situation. Spawning and metamorphosis was late during the period of study due to low temperatures in spring 1979. Spawning in the lowland sites during the following season occurred only three days later than recorded in 1978. Early development, from embryo to free living tadpole, took longer in the lowland populations (text-fig. 4). Times of metamorphosis and the appearance of young frogs from the study pools were similar in both upland and lowland areas. Spawn developed 33.1% faster in the upland areas than in lowland sites. In one of the two lowland study pools the tadpoles failed to develop appreciably beyond the sixth week and these data have, therefore, been omitted.

The mean maximum air temperature experienced by lowland spawn during development was 2.3°C higher than that calculated for spawn from the upland areas (text-figs. 2 and 3). The mean minimum air temperature was 1.5°C higher in the lowland study sites. Bearing in mind the large altitudinal differences, the developmental temperatures were remarkably similar.

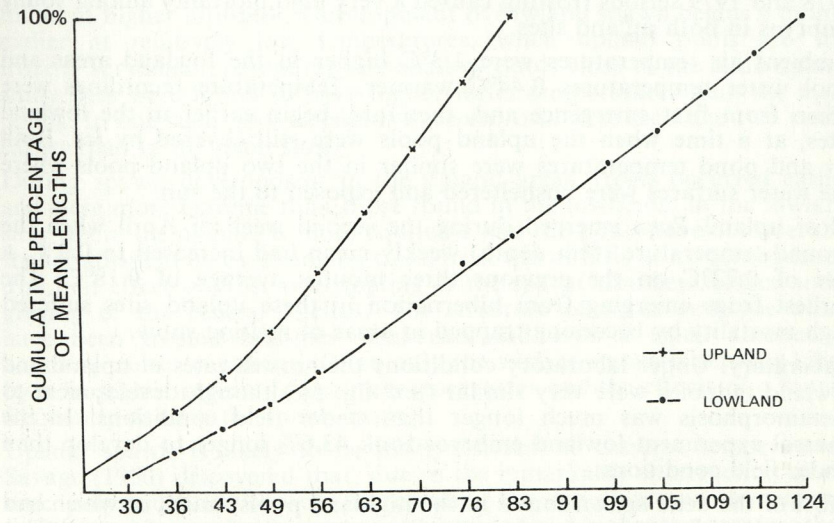

Fig. 4 Growth rates of *Rana* tadpoles in study pools (lowland and upland)

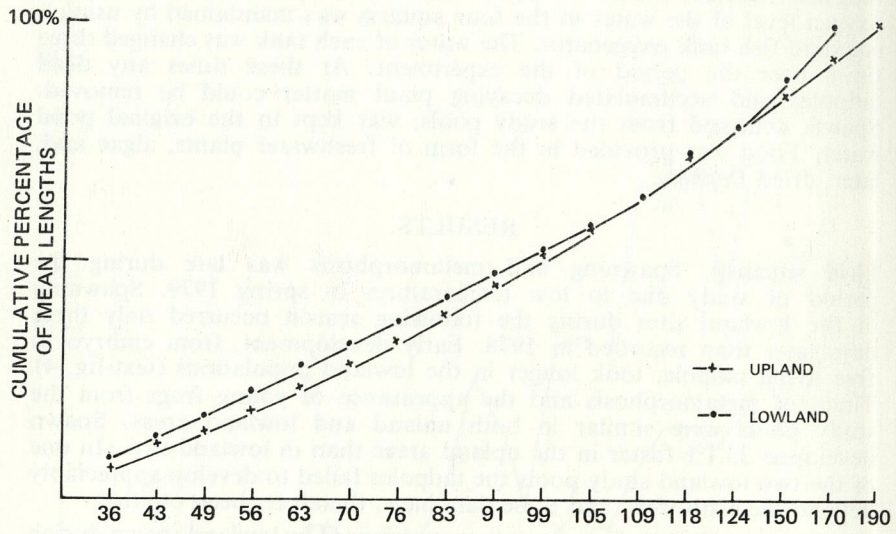

Fig. 5 Growth rates of *Rana* tadpoles in laboratory aquaria (lowland and upland)

During early spawn development minimum air temperatures were considerably lower in the upland areas. In the first ten days after fertilization two frosts occurred of greater severity than –5°C. In both 1978 and 1979 serious frosting caused a very high mortality among young embryos in both upland sites.

Ambient air temperatures were 1.3°C higher in the lowland areas and pool water temperatures 0.44°C warmer. Temperature recordings were taken from first emergence and, therefore, begin earlier in the lowland sites, at a time when the upland pools were still covered by ice. Both air and pond temperatures were similar in the two upland pools where the water surfaces were unsheltered and exposed to the sun.

Most upland *Rana* emerged during the second week of April when the ground temperature (5cm depth) weekly mean had increased to 0.9°C, a rise of 0.72°C on the previous three months average of 0.18°C. The earliest frogs emerging from hibernation in these upland sites suffered high mortality by becoming trapped in areas of melting snow.

Laboratory. Under laboratory conditions the growth rates of upland and lowland tadpoles were very similar (text-fig. 5) although development to metamorphosis was much longer than under field conditions. In the control experiment lowland embryos took 43.6% longer to develop than under field conditions.

Most of the dead spawn found in the highland pools, much of which had been earlier frosted, was covered with a grey translucent fungus. (This was possibly *Saprolegnia ferax,* identified by Fryer, 1973.) No fungus was found on spawn in the lowland districts.

DISCUSSION

Many animals which inhabit a range of altitudes, with their associated climates, have specialized adaptations allowing the completion of the life cycle under different temperature regimes. The meadow pipit *Anthus pratensis* L. is adapted to breeding at unusually high altitudes in the northern Pennines (Coulson, 1956) as is the cranefly *Tipula subnodicornis* Zett. (Coulson, 1962).

Overwintering of the *R. temporaria* tadpole is not uncommon in mountain districts, due partly to the late spawning, but also to the inhibiting effect of cold upon growth and development (Smith, 1973). Second year tadpoles were caught on the Pennines study pools in late spring. They were always large and distinctly dark in colour, sometimes bearing rudimentary hind leg buds. These tadpoles are the first to metamorphose and may account for the very early sightings of newly emerged frogs in upland areas.

The cold, wet moorland areas seem unfavourable environments for common frogs, causing late spawning, high egg mortality and a delay in the emergence of juveniles. The high annual rainfall at those upland ponds (1903.5mm/year) means, however, that there are many breeding ponds which seldom, if ever, dry out. Common frogs normally lay their eggs in the shallower water at the edge of a pond, the most vulnerable area during drought conditions. In the wetter uplands it is unlikely that spawn will suffer greatly from desiccation except during exceptionally dry springs.

Mean developmental temperatures compared in upland and lowland *Rana* populations were very similar because upland common frogs spawn later, and there is a tendency to compensate for the lower temperatures found at higher altitudes. Development of lowland spawn begins a month earlier at relatively low temperatures, when upland pools are still frozen. Very small, comparatively shallow pools close to the main upland study sites were found to have higher water temperatures than the main ponds. In one such pool emergent *R. temporaria* were recorded two weeks earlier than in the main sites.

During spawn development in the upland areas, frosts occurred earlier and were more extreme than those found in the lowlands. In the lowland sites where the climate is more equitable and the pools have considerable shelter afforded by overhanging trees, frost was of little or no consequence. The first effect of frost is a rippling of the spawn albumen surface and a greying of the central vitellus. The structure of those embryos which have been frosted becomes weakened and even a small amount of handling causes rupturing. Often only the surface spawn is actually killed by a frost, but repeated freezing temperatures and the effects of a fungus frequently destroy the spawn mass.

Upland spawn is likely to be more resistant to extreme temperatures. Savage (1950) discovered that, due to the remarkable construction of the mucopolysaccharide capsule surrounding the egg mass and its response to solar radiation, the egg mass is maintained at a higher temperature than the surrounding water. A high ionic concentration, normally found in lowland pools, inhibits the swelling of the egg capsule. Beattie (1977)

found low pH impedes albumen swelling, but in the upland pools this is countered by the relatively low ionic concentration of the pools. Spawn examined in 1978 and 1979 had a larger volume in the upland ponds. The mucopolysaccharide capsules surrounding the eggs are much larger in low pH upland pools and act as insulating layers, keeping the embryos warmer on average than the surrounding water (Beattie, 1980). This may be an important factor in the development of upland spawn, which is so liable to early frosting.

The growth and metamorphosis of *R. temporaria* is accelerated in constant light, but retarded in complete darkness (Guyetant, 1964). A time switch in the laboratory kept a constant twelve hour photoperiod. This may have delayed development as those tadpoles in the field would experience possibly 30% more daylight for much of the summer.

When tadpoles are overcrowded some grow much larger and develop faster, the larger ones producing a substance which inhibits the growth of smaller ones (Richards, 1958). The highest density of tadpoles was found in one of the lowland pools, but there was little size variation to indicate uneven development. There was, however, between the stages of initial hind leg buds to fully formed fore limbs, more developmental variation in the lowland area than the upland sites. The highland tadpoles all developed at a similar rate and metamorphosed within a week. Lowland tadpoles took twice this time.

In the field *Rana* development was considerably faster in the upland areas. Under laboratory conditions, however, the growth curves are almost the same, indicating there is probably little innate difference between upland and lowland *Rana temporaria* tadpoles.

ACKNOWLEDGEMENTS

I am much indebted to Mrs P Burnham and Mr M Rawes for their help in the preparation of this paper. My special thanks go to Dr A L Panchen who gave me much valued advice and expert guidance on the final manuscript.

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597.094288

SHORT COMMUNICATIONS

RARE FISH CAUGHT OFF AMBLE

A deal-fish *Trachipterus arcticus* (Brünn.), measuring 1.83m in length, was caught in nets on 6 May 1982 by the fishing vessel *Rejoice,* fishing out of Amble. The skipper, J Gair, shot his nets 084° 6.4km Coquet, then towed for some three hours to a position 135° 11.3km Coquet, a tow which would keep the vessel approximately six to ten kilometres off the coast. The specimen was acquired by the Fisheries Inspectorate at North Shields, at whose office it was examined, photographed and dissected, the internal organs being removed and forwarded to the Fisheries Laboratory at Lowestoft for further investigation. The fragile nature of the fish, and its large size, prevented complete preservation, but a portion was removed and the skull and anterior body have been prepared for the Hancock Museum skeletal collections.

Only five other examples of the species have been recorded in the literature for the northeast coastline: a specimen measuring 1.65m was stranded at Newbiggin on 18 June 1844 with another (1.21m) at Spittal on 26 March 1879; one (.91m) was found near the mouth of the Tweed in February 1882, a male (1.83m) was stranded at Cambois on 3 July 1932 and a fifth (2.0m) was trawled by MV *Silver Spray* 30km off the Tyne on 4 March 1971 (Davis, in press). According to Wheeler (1969) the deal-fish is not uncommonly found on northern European coasts facing the open sea.

The species is spectacular not only for its size and ribbon-like body, but also for its bright silver body and orange-red dorsal fin and the peculiar fan-like tail. It is a mesopelagic fish, living in depths of between 100 and 500 fathoms, where it feeds on smaller fish, squids and crustaceans.

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598.42

UNUSUAL RECOVERIES OF ARCTIC TERNS *STERNA PARADISAEA*

On 31 May 1982 a tern carrying a ring Zoo Pretoria 2-56238 was found dead in the colony in Pinnacles Haven, Brownsman, Farne Islands, Northumberland (55°37′N 1°37′W). It was subsequently discovered to have been ringed as a first year bird at Cape Recife, Algoa Bay, Cape Province, R.S.A. (34°2′S 25°42′E) and was the first South African marked arctic tern recovered in the British Isles; it had covered a minimum of 10302km.

Even more remarkable was the recovery of CE 77.150, marked as a pullus on Brownsman on 25 June 1982. It was picked up by Mr G Sykes in the grounds of the Division of Atmosphere Physics, Aspendale, Melbourne, Victoria, Australia (38°02′S 145°06′E) on 18 October 1982; it had apparently been attacked by plovers (according to the finder presumably the spur-winged plover *Hoplopterus spinosus)* and later died in captivity. It had travelled at least 17509km on a great circle course in what must have been a maximum of 100 days and was probably considerably less.

Grace Hickling and Peter Hawkey
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TRANSACTIONS

OF THE

NATURAL HISTORY SOCIETY

OF

NORTHUMBRIA

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Fig. 1 The great bustard. This drawing appeared on the covers of the original issue of John Gould's *The birds of Great Britain*

925.7

SOME CORRESPONDENCE BETWEEN JOHN GOULD AND THE NATURAL HISTORY SOCIETY OF NORTHUMBRIA

by

P S DAVIS

The Hancock Museum, Newcastle upon Tyne NE2 4PT

'All ornithologists are not artists. Many artists are not successful at business. But the Englishman John Gould was an ornithologist, artist and successful businessman.' This introductory remark in Gordon Sauer's recently published (1982) book is followed by a most informative account of the genealogy, chronology and published works of John Gould (1804–1881). Although well known for producing lavish works on the avifauna and mammals of various parts of the world (for example *The birds of Great Britain* (1862–1873)) or monographs on families of birds such as *A monograph of the Trochilidae, or family of hummingbirds* (1849–1861), Gould was also a traveller and collector, taxidermist and naturalist. His abilities and experiences are outlined by Sauer, whose book has recently been purchased for the Society's library. It was an exciting coincidence that a few days after browsing through this volume I came across a series of letters between Gould and the then secretaries of the Society in its first letter book, which covers the years 1829–1831. The correspondence refers to the purchase of mounted birds, and there are additional reports on the specimens by the 'ornithological curators'. The year is 1830. The Natural History Society is but an infant organisation, yet growing rapidly, gathering in collections from its members, many of whom are influential men, wealthy, well connected, much travelled and some of whom are to achieve lasting fame as scientists.

It is tempting to believe, when reading through the 'Lists of presents and purchases' for those early years, that there was little or no policy governing acquisitions. The correspondence which follows refutes this, and provides an insight into the professional manner in which the Society's affairs were managed at that time. It also says a little about Gould himself, supporting Sauer's comment on his skill in business affairs. There is social and economic comment, too – the passage of goods by sea, the effectiveness of postal services, the demand for services of taxidermists . . . but let the letters speak for themselves.

The first two letters are written by George Townshend Fox (1782–1848), a businessman whose family had been involved with shipping on the Tyne for many years. He is best remembered for negotiating the purchase of the Allan Museum for the Literary and Philosophical Society of Newcastle in 1822, and his book, published in 1827, describes its contents. Fox, a founder member of the Natural History Society and one of its first vice presidents, addressed his letters to Nathaniel John Winch (1768–1838), one of the first two honorary secretaries (the other being the geologist William Hutton (1797–1860)). Winch was a talented botanist, devoting his life to the study of the local flora and producing a number of important works, of which his *magnum opus* was *Flora of Northumberland and Durham.* Fox obviously had the needs of the Society's museum in mind on his business trips to London and the south of England. The original two missives are not present in the letter book, the entry reading 'Copy of parts of two letters from Mr Fox to Mr Winch':–

Hastings Feb. 20th 1830

Dear Sir,

You (or Mr Hutton) would receive a short note from me relative to the Nat.Hist.Society, which I wrote in London, I now address you solely to mention that in consequence of the directions I received from the Committee by a letter from Mr Hutton, I made an engagement with Mr Coxen, Birdstuffer, 12, Broad St. Golden Square for supplying the Society from time to time with such Birds as they might wish, and I left him a list of our Desiderata. I engaged for him to send instanter a few that he had on hand amongst which are an Egret, a Gardenian Heron, a Glossy Ibis, and some small British Birds, the particulars of which he will write an account of (with the prices) to the Society, addressed to Mr Thornhill. The Birds will come by a vessel, directed to my Agent, Mr. Robert Dawson of So Shields, and will be forwarded to Newcastle by him. With Coxen is connected the Birdstuffer of the Zoological Society, Mr Gould, who resides at the Society's house in Bruton Street, and who has undertaken to superintend our orders, and fill up the gaps, where necessary, and in addition to this trouble, has liberally volunteered to present the Society with 50 or 60 skins of foreign Birds (from his duplicates) to be set up by Mr Wingate. Agreeably to Mr Huttons directions, I requested the birds to be generally sent in skins, though I agreed, as being better, to have the small birds sent set up. They will be charged at about 3/6 each complete.

You will please inform the Society and Mr Thornhill of these particulars. Remittances can be made by the Society at Intervals of a few months.

N. J. Winch Esq

London March 6. 1830

My dear Sir,

Being here for a day or two, I write to say, that I have called at Mr Coxen the Birdstuffer, in Broad St. and find that he is about to forward to our Museum several specimens of British Birds, principally desiderata. There are 3 or 4 small Birds the same as we have, but being better skins, I did not object to their coming.

I have also seen at Mr. Gould's about 30 or 40 skins of foreign birds which he intends to forward at the same time as a present to our Society; the acceptance of which, will, I doubt not, be duly esteemed by the Committee as they are a delightful set.

They will have to be set up by Mr Wingate, as I did not chuse (*sic*) that any expense shd. be incurred here about them, agreeably to the directions of the Committee - though Mr Gould offered to get them done, and I believe they would be done here at a less expense than with us.

I expect the whole parcel will give great satisfaction, and we will shortly be enabled to exhibit to our countrymen almost all the British Birds, figured by Bewick, and several not figured.

N. J. Winch Esq

The first meeting of the Zoological Society of London was held on 29 April 1826, and John Gould, who had been a keen taxidermist from the age of fourteen, and was then aged twenty-three, was appointed as its 'Curator and Preserver' in July 1827. Fox's reference to his 'residing' in Bruton St. is of interest - it was more likely his place of work, as a Gould bill dated 1826 in the Windsor Castle archives (Sauer, 1982) gives 11 Broad Street, Golden Square as an address. John Gould married Elizabeth Coxen (1804-1841), the daughter of Nicholas Coxen (1765-1833) of London, in 1829, and

'Mr Coxen, Birdstuffer' must, therefore, be a close relation. Surprisingly, Sauer's genealogy of the Coxen family does not reveal a taxidermist, although members of the family who visited Australia with Gould on his collecting trip (1838-1840) would be strong candidates. 'Mr Wingate' is easier to identify as the Newcastle taxidermist Richard Wingate (d.1859), in whose workshop John Hancock developed his skills.

It is gratifying to see later in the correspondence that the Society did not have to pay by instalments, and interesting in the light of future events, to ponder Fox's comment that 'the whole parcel will give great satisfaction'. However, Gould, in a businesslike manner, despatched the specimens promptly and sent a covering letter (written from **12** Broad Street) to John Thornhill Jnr, Curator of the Literary and Philosophical Society's Museum:

12 Broad Street
Golden Square London

Dr Sir,

By the wish of Mr. Fox I have the pleasure of communicating to you that I have forwarded for the Newcastle Museum this day by sea 44 British Birds the whole of which Mr. Fox has seen and approved of. I hope they will arrive safe and meet your approbation. Some of the specimens are not so good as I could wish but at the request of Mr Fox I have sent them at a reduced price. Mr F has also left with me a list of the Birds you are in want to complete your collection also in many cases to have better specimens therefore as soon as our summer visitants arrive I hope to send you some better Birds . . . I have the finest opportunity for completing the whole of the British Fauna in all their various stages and ranges of Plumages, and any orders you can give me for your Museum or Private Collectors, I shall be obliged and feel great pleasure in paying every attention to your commands.

I have also taken the liberty of enclosing for your museum 30 skins of Foreign Birds from various parts of the World, which if they will prove at all exceptable (*sic*) I shall feel myself highly gratified, and some future occasion I may perhaps give you something better.

I have the pleasure of being
Dr Sir
Your Very Respectfully
John Gould

March 18th 1830

P S You will oblige me by . . . stating the arrival of the Birds.
The Box is addressed to Mr Robert Daw[son] . . . South Shields

Amongst the correspondence (which is not in datal order in the letter book) is an invoice and note from Gould to the Society, which may well have arrived in the packing crate with the specimens. It is dated 15 March 1830, lists the forty-four birds mentioned by Gould, and seems to have been written in haste – the handwriting, lack of punctuation and the afterthought of 'Spotted Flycatcher' supporting this view. Most of the bird names are recognisable today, only Velvet Duck (=Velvet scoter *Melanitta fusca*), Gardenian Heron (=Night heron *Nycticorax nycticorax),* Red-legged Crow (=Chough *Pyrrhocorax pyrrhocorax*), Alexandrine Plover (=Kentish plover *Charadrius alexandrinus*), Accentor alpinus (=Alpine accentor *Prunella collaris*), Titlark (=Meadow pipit *Anthus pratensis*), Tringa Temminkii (=Temminck's stint *Calidris temminckii*) and Rose ouzle (=Rose-coloured starling *Sturnus roseus*) are unfamiliar or puzzling.

List and note are as follows:

The Newcastle Museum
to John Gould

March 15th 1830

	£	s	d
Male Glaucous Gull	0-	18-	0
Glossy Ibis	2-	0-	0
Little Egret	1-	1-	0
Velvet Duck		15-	0
Grouse		7-	0
Gardenian Heron		18-	0
Young Red Necked Grebe		8-	0
Brown Owl		6-	0
Red-legged Crow		5-	0
2 Knot (summer & winter)		12-	0
Swift		4-	0
Wryneck		4-	0
Woodwren		4-	0
Pied Flicatcher (*sic*)		7-	0
Sanderling (winter)		5-	0
Sedge Warbler		4-	0
Stone Chat Female		4-	0
Alexandrine Plover		7-	6
Woochat (*sic*)		10-	6
Male & Female Cirl Bunting		15-	0
Accentor alpinus		10-	6
Dartford warbler		10-	0
Pleas (*sic*) to turn over		11-15-	6

	£	s	d
Brought forward	11-	15-	6
Grasshoper warbler (*sic*)	0-	6-	0
Common Whitethroat		4-	0
Lesser Do		4-	0
Greenfinch Female		4-	0
Long tailed Tit		4-	0
Blue Headed Do		4-	0
Wood lark		4-	0
Tit Do		4-	0
Swallow		4-	0
Lesser Redpole		4-	0
Twite		4-	0
Bulfinch (*sic*)		4-	0
Brambling		4-	0
Tree sparrow		4-	0
Red Backed Shrike		4-	0
Male & Female Spotted Sandpipers	1-	10-	0
Tringa Temminkii		8-	0
Rose ouzle Female		12-	0
29 Pedastles (*sic*) at 4d each		9-	8
Packing box Portage etc.		10-	0
Spotted Flycatcher		4-	
	18-	11-	2

Terms for passing Birds as below from the size of a [not decipherable] Bird to that of a Crane Museum Price is 3/6 each one with the other Pedastles not included if at any time the birds should be sent the greatest attention shall be paid and returned ready for the case if larger than a Crane the price will be in moderate proportion.

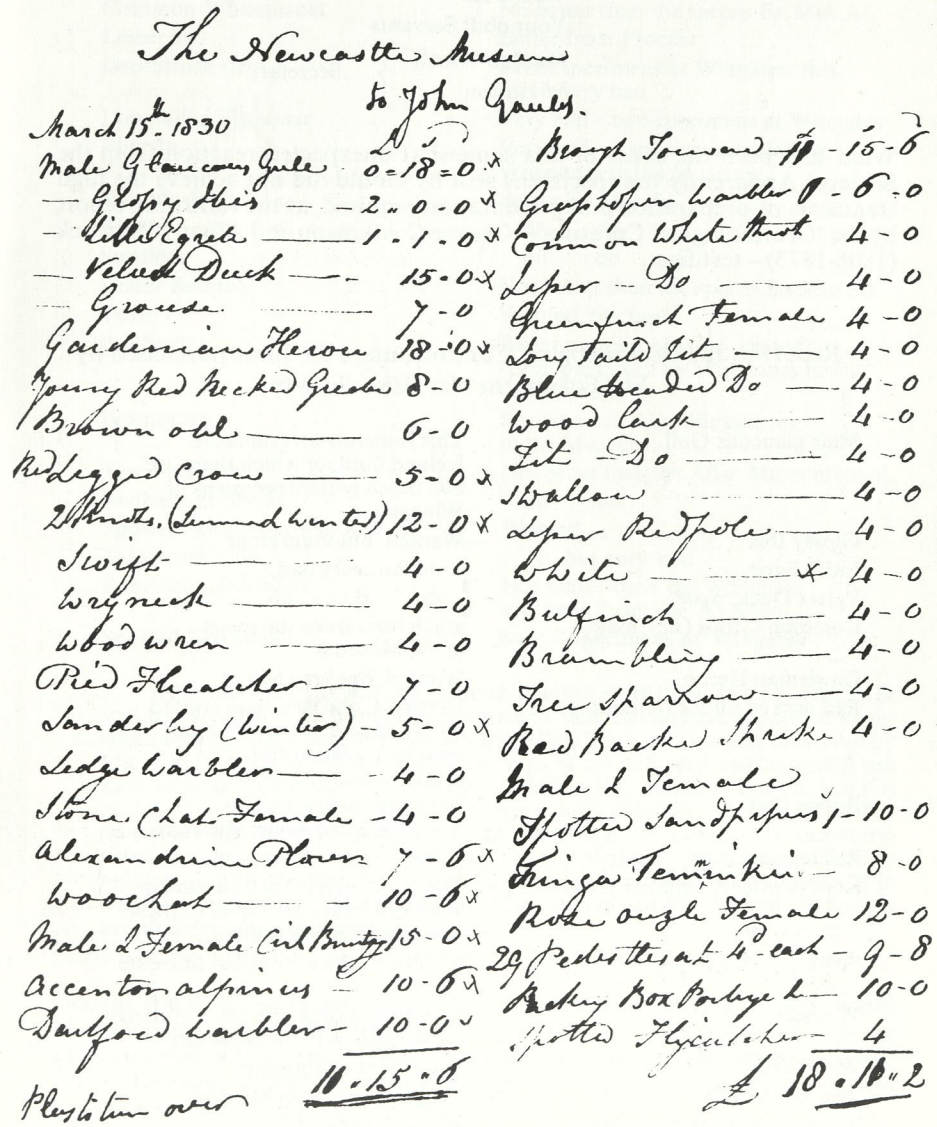
Be so good as to say in your letter whether the Birds arrived in good order otherwise I will adopt another mode of Package

The arrival of the specimens in Newcastle was not the resounding success that George Fox had expected. A copy of a terse letter from the honorary secretaries to Gould is preserved in the letter book, but, unfortunately, no copy was made of the letter (presumably of a similar curt nature) sent to Fox which is referred to:

Newcastle on Tyne
23rd April 1830

Sir,

We are directed by the committee of the Natural History Society of this Town to inform you of the arrival of a case containing a Collection of Birds – we have also directions to communicate with Mr. Fox upon the subject (who is not at present at home,) this will be done with as little delay as possible but in the mean


The Newcastle Museum
to John Gould.

March 15th. 1830

Male Glaucous Gull	0	18	0	Brought Forward	11 - 15 - 6
— Glossy Ibis	2	0	0	Grasshoper Warbler	0 - 6 - 0
— Little Egret	1	1	0	Common Whitethroat	4 - 0
— Velvet Duck		15	0	Lesser — Do	4 - 0
— Grouse		7	0	Greenfinch Female	4 - 0
Gardenian Heron		18	0	Long Tailed Tit	4 - 0
Young Red Necked Grebe		8	0	Blue Headed Do	4 - 0
Brown owl		6	0	Wood Lark	4 - 0
Red Legged Crow		5	0	Tit — Do	4 - 0
2 Knots. (Summer & Winter)		12	0	Swallow	4 - 0
Swift		4	0	Lesser Redpole	4 - 0
Wryneck		4	0	White	4 - 0
Woodwren		4	0	Bulfinch	4 - 0
Pied Flycatcher		7	0	Brambling	4 - 0
Sanderling (Winter)		5	0	Tree Sparrow	4 - 0
Sedge Warbler		4	0	Red Backed Shrike	4 - 0
Stone Chat Female		4	0	Male & Female	
Alexandrine Plover		7	6	Spotted Sandpipers	1 - 10 - 0
Woochat		10	6	Tringa Temminkii	8 - 0
Male & Female Cirl Bunting		15	0	Rose ouzle Female	12 - 0
Accentor alpinus		10	6	29 Pedestles at 4 each	9 - 8
Dartford Warbler		10	0	Packing Box Portage &c	10 - 0
				Spotted Flycatcher	4
Pleas to turn over	11	15	6	£	18 . 11 . 2

Fig. 2 Facsimile of the first page of John Gould's invoice to the Natural History Society (see page 4)

time we are desired to request that no more Birds may be sent until you have another communication from the Society.

We are Sir
Your obdt Servants
Nat Jno Winch
W Hutton } Secretary

What had been the cause of this somewhat unexpected reaction from the Society? Apparently the specimens sent by Gould did not achieve the high standards of preparation and presentation required, as the following report by the 'Ornithological Curators' – George C Atkinson and Albany Hancock (1806-1873) – testifies:

Report by the Ornithological Curators, upon the Birds purchased by Mr. Fox for the Nat. Hist. Society

Male glaucous Gull	This is merely an immature Iceland Gull, of which there are two much better specimens at Wingates.
Glossy Ibis	Wanted, but indifferent
Little Egret	do, but very bad,
Velvet Duck, male,	do do do
Common Grous (*sic*), male	much inferior to the specn in the Museum
Gardenian Heron	Wanted, but very bad
Red necked Grebe (immature)	Very bad, one specimen stuffed by Wingate is in the Museum, another is also in course of preservation.
Brown Owl	Very bad, inferior to the specn from the Allan Museum.
Red legged Crow	do do
Knot (winter & summer plum.)	Two specimen in the Museum in winter plumage are equal to these; summer plumage wanted.
Swift	Not better than the Allan Museum specn.
Wryneck	Very bad, a fresh specimen stuffed by Wingate is in the Museum.
Woodwren	Better in the Museum
Pied Flycatcher	Very bad, better in Museum.
Sanderling (Winter plumage)	Wanted, but bad
Sedge Warbler	Very bad, better in Museum
Stone Chat	bad, Two fresh specimens at Wingates.
Alexandrine Plover	Wanted but indifferent
Woodchat	do do
Cirl Bunting (male & fem.)	Female wanted, better male in the Museum
Alpine Warbler	Wanted, but bad

Dartford do	No better than the specn Ex.Mus.Al.
Grasshopper do	Better specimens from Proctor
Common Whitethroat	No better than the specns Ex.Mus.Al.
Lesser do	Better from Proctor
Greenfinch (fem.)	Fresh specimens at Wingates. this one is very bad.
Longtailed Titmouse	Very bad – two specimens at Wingates
Blue do	Very bad – a specimen stuffed by Wingate is in the Museum
Woodlark	Better Ex Mus.Al.
Tit do	do do
Swallow	do do
Lesser Redpole	Not better than the specns Ex Mus.Al.
Twite	Wanted, but bad
Bullfinch	Better even Ex Mus.Al. a good specn preserved by Wingate is in the Museum
Brambling	Specns stuffed by Wingate are in the Museum
Tree Sparrow	Not better than the Allan Museum specn.
Redbacked Shrike	do do
Spotted Sandpiper (M. & F.)	Wanted
Temminck's do	do, but very bad
Rose coloured ouzel	Not better than the wretched specimen from the A1.Mus.
Spotted Flycatcher	bad; – specimens at Wingates

By the above list, it will be perceived, that not more than 10 or 11 of the birds sent by Mr. Gould are wanted by the Society, and that we have as good or better specimens of all the rest, either from the Allan Museum, or lately preserved by Mr. Wingate. Those the Society are in want of are in a very bad state, and will have to be restuffed, as far as practicable, before they can be exhibited, and it is nothing but their rarity, that should insure the Society to purchase them. The others are for the most part our commonest birds, such as may be had everywhere in the immediate neighbourhood, and which it was the intention to replace only by the very best fresh killed specimens. The foreign skins, 28 in number, presented by Mr. Gould, may be worth about 4 or 5£, and the Society are already in possession of 8 of the species.

George Atkinson was unable to attend the committee meeting of the Natural History Society when the fate of the Gould specimens was discussed. Albany Hancock was not a member of the committee at that time, so it was important that Atkinson should state his case firmly by letter. He writes to the Committee of the Natural History Society:

Gentlemen,

I am prevented, by the sudden indisposition of my father, from attending the meeting of the committee of the Nat.Hist.Soc. this evening.

As one of the curators of Ornithology, it was desirable that I should have done so, to give my opinion on the specimens of birds, sent by Mr. Fox's direction from Gould of London. Many of them, – all in fact but 10, are birds which we already possess, or which we could procure with ease in the woods & fields about us: they are badly prepared, & in wretched condition as to plumage. There seems to be little doubt, that Mr. Fox, had put into Gould's hands a list of our

Desiderata (from which lists in future when sent to gentlemen at some distance, we had better scratch the names of birds which we can at any time procure) & that Mr Gould has in consequence sent us the common specimens I speak of – If we admit them to our Museum, we shall of course look forward to the earliest opportunity of replacing them, & I think it will be a dangerous precedent to establish, to admit any stuffed birds but those of our own artist, except in cases of great rarity.

Your other curator who is much more competent to it than I am, has made a report of the preparations sent; I have not revised it from the same circumstance which prevents my attendance tonight: but our opinion was perfect by coincident on the subject.

Gentlemen
Your Obt. H. Svt.
Geo: C: Atkinson.

Carr Hill
Tuesday 20th Apr. 1830

I would, therefore suggest that Gould be written to on the subject of taking back, the specimens we do not want, & that we return them to him even at the risk of a loss to the Society.

It is interesting to see Albany Hancock regarded as a talented ornithologist. He is remembered as marine biologist and palaeontologist and his younger brother John has assumed the mantle of 'bird-man'. However, Albany always exhibited great care and attention to detail in all his scientific work and there can be little doubt that his report was accurate. What must the meeting of the committee have been like and how did they approach the problem? The Society was obviously not satisfied by the specimens, yet would not want to upset their vice president, Mr Fox, who had been such a benefactor to it. Similarly, the committee must have been aware of Gould's abilities and reputation and the possibility of obtaining some of their 'desiderata' in the future. A compromise had to be found and the secretaries were given the unenviable task of writing to Gould. The minutes of the meeting, at which were present Mr Gibsone (in the chair), Rev W Turner, Mr Adamson, Mr Wailes, Mr Alder and the secretaries, simply record:

'On the Report of Messrs. Atkinson & Hancock on the collection of stuffed birds sent by Mr Gould of London being read,

Resolved: That Mr. Gould be written to by the Secrys desiring him to ship no more birds and that a communication be made to Mr. Fox on the subject of those already sent'.

The matter was referred to at a further meeting held on 26 April 1830, when Messrs Bigge (chairman), Gibsone, Alder, Burnett, Wailes, Atkinson and the secretaries further resolved:

'That Mr. Gould be remitted for the specimens of Birds, which the Curators, Messrs. Atkinson & Hancock, approve of & his present of skins of foreign Birds be declined, & returned with the birds rejected.'

The letter to Gould is preceded in the letter book by a page of arithmetic establishing the total cost of specimens bought. The first two sets of jottings are in Winch's characteristic hand, the lower column in one yet to be identified. The final sum forwarded to Gould according to the secretaries' letter is £9.13.0 for fourteen mounted birds and Winch's figures are shown thus

Mem – 14 Birds (Desiderata)		£9.13
Skins Presented		5
		14.13
Invoice	£18.11	
Ded.	14.13	
	£3.18	

Newcastle 4th May 1830

Sir,

We are directed by the Committee of the Natural History Society to remit the sum of £9-13-0 being the amount you have charged for 14 Birds according to the annexed list – the remainder of the specimens sent, being birds we already possess in the Collection, and therefore of no use to the Society, we shall be glad to have your orders for returning them as soon as possible; the Committee having directed us to pay all expenses upon them – We regret that there are so many specimens, we do not want, & hope our future transactions may be more satisfactory.

The Society are much obliged by the offer of a present of skins of foreign birds but as they would not feel justified in making a purchase of the whole collection sent, they conceive themselves bound to offer to return these, if you will give them leave to do so

Mr John Gould
12 Broad Street
Golden Square
London

Gould's prompt reply, in haste, addressed to 'Messrs Winch & Hutton, Museum, Newcastle upon Tyne', indicates fair business practice and no small degree of generosity. Obviously Fox's negotiations had been carried out in all good faith and a desire to further the cause of the Society's museum, yet his ornithological inexperience and failure to exercise discretion on the quality of specimens had resulted in an embarrassing situation for both parties.

Gould makes plain Fox's involvement and his own reservations:

12 Broad Street Golden Square London

Gentn,

I beg to acknowledge to receipt of your letter being dated May 4th containing an order on Curtis & Co the amount of 9£-17-8.

With respect to the Birds sent they were all ordered and seen by Mr. Fox and by his directions sent to your Institution. I was rather doubtful whether many of the specimens would be considered good enough for your Museum. But I found Mr Fox's object was to obtain as many specimens as possible contained in your desiderata. I at the same time informed him that any that you may have collected in the interim or any that you may disapprove of – I would take back. You will therefore oblige me by returning the specimens by the best way you may think proper at your earliest convenience and if you will be so good as to favour me with a list you are truly in want of I shall feel great pleasure in collecting them for you, if I would not have them in my collections. The Foreign Birds pray keep if you think them worthy of your acceptance.

I rem. Gm
Your Very Obedient
John Gould

May 10th 1830
(Haste)

Which specimens did the Society purchase and why is there a discrepancy between the £9-13-0 which the secretaries indicate they are forwarding and the £9-17-8 John Gould states he received? Albany Hancock's report indicates which specimens are most desirable and a further clue is given in the Gould invoice, where a tick (√) or a crossed tick (✗) has been placed against the birds which it is intended to purchase. The birds marked ✗ are glaucous gull, glossy ibis, little egret, velvet duck, Gardenian heron, red-legged crow, knot, sanderling, Alexandrine plover, woodchat, cirlbunting, alpine accentor, Dartford warbler and twite (total cost £8-11-6); those marked √ are spotted sandpiper and 'tringa temminckii'. This gives a grand total of £10-9-6 and a list of eighteen birds neither of which tallies with the secretaries' letter. The problem can fortunately be solved by reference to page 12 of the 'List of Presents and Purchases' (Anon, 1831) where the Gould specimens can be recognised. Winch and Hutton's final calculation, which would explain that the arithmetical discrepancy was due to the cost of the stands or 'pedastles' (see page 4), must have looked as follows:

Species	No of specimens	Price
Velvet duck	1	15-0
Sanderling (winter)	1	5-0
Woodchat	1	10-6
Spotted sandpiper	2	1-10-0
Twite	1	4-0
Knot (summer)	1	6-0
Cirl bunting (female)	1	7-6
Little egret	1	1- 1-0
Gardenian heron	1	18-0
Glossy ibis	1	2- 0-0
Alexandrine plover	1	7-6
Temmincks sandpiper	1	8-0
Alpine warbler	1	10-6
	14	9- 3-0
	Packing/Portage	10-0
		9-13-0
	14 'Pedastles' at 4d	4-8
		9-17-8

On page 5 of the same 'List of Presents and Purchases' the donation of bird skins is recorded:

Twenty-eight Skins of Foreign Birds, viz.:-

1 Coracias.	Psittacus haematodus	Mr. Gould Golden
Gracula religiosa.	Corvus cristatus	Square, London.
1 Loxia.	1 Lamprotornis	
2 Oriolus.	Sturnus Louisianus.	
1 Lanius.	Oriolus Baltimore.	
1 Totanus.	1 Hirundo.	
3 Picus.	1 Charadrius.	
Merops apiaster.	1 Bombycivora.	
Euristomus orientalis.	Seven undetermined.	

What was the fate of these foreign skins and the fourteen mounted specimens? From Albany Hancock's original description of the latter it could be imagined that these birds would be replaced if better specimens were made available to the Society. Only four years would pass before the move to the museum adjoining the Literary and Philosophical Society, to be followed fifty-four years later by another move to the new museum at Barras Bridge, when the bird displays would again be 'modernised', refurbished and extensively supplemented by John Hancock's specimens. It is not surprising, therefore, that it is now impossible to know if any of the Coxen/Gould mounts survive. Recent work at the museum enables a rapid check of the skin collections *via* the computer file on the bird skins, which to date (1983) stands at over 10000 specimens. Although there are several old specimens of the required genus, or species, without data it is impossible to say conclusively if any were collected or prepared by Gould. Had the specimens been labelled as 'Ex-Gould' on receipt, then detection would have been possible.

There is a postscript to this Gould story. George Fox must have received a reprimand – or at least a caution – from the Society about purchasing specimens it did not require. Yet, on 3 October 1830 he wrote to the secretaries from his Durham home about a further visit to Gould. Much of the letter concerns payment of subscriptions to the Society, omitted here, and the relevant portion reads:

> Before I left London I called at Mr. Gould's (the Z.S.'s Birdstuffer) who informed me that he had been duly paid his account by our Society. I returned to order two or three more specimens, which I considered to be desirable acquisitions, and likely to give an effect to the Collection, and I have to request the favour of your mentioning it to the Committee, and obtaining their approbation. The Birds are an adult purple Heron, a **British killed** specimen!, and the Impeyan Pheasant, which is showing now as the *rara avis* of most Museums. These will cost about (£6) six pounds, a higher price than we can generally give, but they are not dear.
>
> I expect to be in Newcastle on Tuesday Evening, & if you are at the Museum about ½ past 7, I shall hope to see you.
>
> Believe me, Very Truly Yours
>
> Geo. T. Fox

The minutes of the committee meeting for 18 October 1830 record the Society's response to Fox's unsolicited action. Messrs Turner, Fryer, Robertson, Hancock, Atkinson, Alder, Burnett, Gibsone and Hutton resolved that 'no member of the Society shall conclude a purchase for any specimen on behalf of the Society without the previous sanction of a meeting of the committee. Resolved that Mr Fox's purchase of two birds from Mr. Gould be confirmed provided they be fine specimens.' The *rara avis*, it seems, never made the trip from London and there is no further correspondence surviving relating to this transaction. The purchase of the purple heron is duly recorded in the list of purchases for 1830-1831 (Anon(1831)) as 'Purple Heron (*Ardea purpurea*), with one of its Eggs. The male and female Birds, with the Nest and Eggs, were procured in Lincolnshire.'

Considering this rather awkward start to the relationship between the Society and John Gould, it is surprising that the story does not end here. However, travelling on business, Gould on several occasions visited the north of England – for example, to Twizel in August 1831 to meet P J Selby. This link with individual members of the Society would have made him

aware of the museum's needs, as would his close contact with other distinguished naturalists who had received copies of the Society's lists of 'desiderata'. This is borne out by a much later letter from Gould to the Society in April 1841, a copy of which is preserved in the correspondence for that year:

London, 20 Broad Street
Golden Square
April 13, 1841

My dear Sir,

Some time ago, if I recollect rightly, I saw at Mr Yarrell's a scientific list of the Ornithological desiderata, to the Natural History Society of Newcastle and which I believe had been drawn up by you. During my late visit to Australia, I made it a point to collect all I could in every department of Zoology, and in Birds my own collection is particularly rich. I have of course many duplicates, and these I have determined to present to such public institutions as subscribe to my work. The Nat. Hist. Soc of Newcastle is I believe forming a library and when there I was told they would probably be disposed to take my publication: I have not however, as yet made any application but if you think it likely and would propose it, giving such an opinion respecting it, as you may deem it merits I shall feel extremely obliged; as I am especially anxious that at least one copy should be in Newcastle and particularly in the library of an institution like the Natural History Society. In the event of their subscribing, I shall feel great pleasure in presenting their Museum with one hundred species of Australian Birds, and would take care to select such forms and species as would be most interesting. At Penzance whither I have just sent a collection, several of the members of the Nat. Hist. So there have subscribed to a separate fund for the purchase of my works and I believe the same plan will be adopted at Worcester. Perhaps you will be kind enough to favour me with a line and your opinion on the subject.

I beg to remain
My dear Sir
Yours etc
(Signed) John Gould

Gould's small bribe had the desired effect, although the Society must have convinced the Literary and Philosophical Society that it should take Gould's works rather than purchase them directly. Over a year later, in a letter to John Adamson, the secretary, Gould keeps his promise about the specimens:

London, 20 Broad Street,
Golden Square
May 17. 1842

My dear Sir,

I owe you many many apologies for having so long neglected to acknowledge the receipt of your obliging note which duly reached me at Jardine Hall. Pray pardon an inattention induced by my numerous engagements and accept my warmest thanks for your kindness in obtaining the support of the Newcastle Literary and Philosophical Society to my Birds of Australia.

I have this day forwarded by Steam a Box containing the 100 Australian Birds I promised to the Museum and which I hope will be acceptable. Should there be duplicates to those you already possess please to let me know and I will do my best to replace them with others as it will always be a point with me to render the

collection of Natural History in a Town having so many claims to the attention of all devoted to that Science, as the birth place of Bewick besides numerous other associations, as complete as lies in my power.

Believe me to remain,
My dear Sir,
Yours truly obliged
John Gould

P S. In the Box you will also find Parts 2, 3, 5 & 6 of my work which renders the copy complete as far as published. Perhaps you will oblige me with a line acknowledging the receipt of the of the (*sic*) Box.

The arrival of '100 specimens of birds from Australia' from John Gould is recorded in the Accessions Register on 23 May 1842. By this time Gould was an established and much respected figure and his donation to a Society he admired was to be recognised by the greatest honour it could bestow. At a General Meeting of the Society held on 23 May 1842, it was:

Proposed John Gould Esq., 20 Broad Str. Golden Sqr. London, as an Hony. Member of the Socy

J.Adamson.
W Hutton
R. M. Glover.

and the motion was duly agreed. Considering the inauspicious start of this relationship, it is pleasing to see it reach such a conclusion! Gould acknowledged the honour in a letter addressed to the secretaries:

London, 20 Broad Street
Golden Square
Aug. 11, 1842

Gentlemen,

I have the pleasure to acknowledge the receipt of your Letter of 22nd Ult., informing me that I have been elected an Honorary Member of the Northumberland, Durham and Newcastle Natural History Society and enclosing my Diploma; in reply I have to request that you will do me the favor to present my best thanks to the Society for the honor they have conferred upon me and to assure them that it will afford me sincere gratification to advance the Interests of the Institution by every means in my power.

I beg to remain
Gentlemen,
Your obedient & obgd Servt
John Gould

According to Goddard (1929) Gould offered to name and arrange in scientific order the whole of the bird collection – it is not known if the offer was ever taken up. He did, however, continue to add to the collections, donating on 20 March 1843 'A collection of quadrupeds from New South Wales, including 7 Skins of marsupials, 3 of rodents and a specimen of *Ornithorhynchus paradoxus.*' A letter to John Adamson from him gives more detail:

London
20 Broad St
Golden Square
15 March 43

My Dear Sir,

When I had the pleasure of visiting Newcastle last year the curator of the Philosophical institution expressed a desire to obtain for the Museum some of

the Australian Quadrupeds particularly Marsupials and being ever anxious to contribute as far as lies in my power to the various provincial collections I have this day selected from my own eleven species of Quadrupeds which are at this moment being packed up to be forwarded by the first conveyance;

W'de you Sir do me the favour to inform the directors that they are offered as a donation from myself with the hope that they may prove of interest and that on a future occasion trust I shall be able to forward them some others of more value

I beg to remain
My Dear Sir
Yours most truly
John Gould

John Adamson Esq

The parcel is sent by steam addressed to the curators of the institution and contains the following species

Marsupials
- Halmaturus dorsalis
- ualabatus
- Petrogale lateralis
- Phalangista vulpina
- Petaurista leucogaster
- Phascogale penicillata
- Dasyurus Geoffroyi
- Ornithorhynchus paradoxus

not Marsupials
- Hapolotis albipes
- Hydromys chrysogaster
- Mus leutreolus

P S. The skins although not looking in the best condition will all mount well if put into careful hands.

Gould was, understandably, confused by the relationship between the Literary and Philosophical Society and the Natural History Society, the latter by this time (1843) occupying newly-built premises adjacent to the former. At the date of the earlier correspondence (1830), the Natural History Museum was to be found in rooms in the Literary and Philosophical Society's building.

The correct scientific and common names for the mammal species listed by Gould are:

Halmaturus dorsalis (= Black-striped wallaby *Macropus dorsalis* (Gray, 1837))

Halmaturus ualabatus (= Black-tailed or swamp wallaby *Wallabia bicolor* (Desmarest, 1804))

Petrogale lateralis (= Brush-tailed rock wallaby) *Petrogale penicillata* (Griffith, Smith & Pidgeon))

Phalangista vulpina (= Brush-tailed possum *Trichosurus vulpecula* (Kerr, 1792))

Petaurista leucogaster (= Greater glider *Schoinobates volans* (Kerr, 1792))

Phascogale penicillata (= Brush-tailed phascogale *Phascogale tapoatata* (Meyer, 1793))

Dasyurus Geoffroyi (= Western native cat *Dasyurus geoffroii* (Gould, 1841))

Ornithorhynchus paradoxus (= Platypus *Ornithorhynchus anatinus* (Shaw, 1799))

Hapolotis albipes(= White-footed tree-rat or rabbit-rat *Conilurus albipes* (Lichtenstein, 1829))

Hydromys chrysogaster (= Water rat *Hydromys chrysogaster* (Geoffroy, 1804))

Mus leutreolus (= Swamp rat *Rattus lutreolus* (Gray, 1841))

In what condition were these much travelled skins? Gould's postscript suggests that he may well have donated specimens which were less than perfect, but, unfortunately, in this instance there is no report on them to consult. What was the fate of these mammal skins? Were they ever made up into mounts for display or did they remain as skins? Again, for precisely the same reasons stated earlier, it is impossible to know if any of the 'quadrupeds' listed, or the Australian birds, are still in the Hancock Museum collections. It must, however, be highly probable that some of Gould's Australian bird skins survive, albeit unrecognised as such, in the study skin collection.

It is, perhaps, a little disconcerting to realise that, despite this contact with Gould and the consequent committee debates and careful consideration of the issues posed, together with the drafting of tactful letters and the trouble involved in the carriage and shipment of items, the Society has, at the end of the day, been left with no identifiable legacy of all these efforts. Viewed with a dispassionate eye, one must consider that Gould had really come well out of the encounter. He had disposed of a number of items of questionable quality, obtained subscribers for his illustrated works, and had even received the ultimate accolade of honorary membership of the Natural History Society. But did the Society actually come so badly out of the affair? It is difficult to assess what impact his specimens, when displayed, might have had on the museum's visitors – the curious Australian specimens may well have attracted a good deal of interest. Did the fact that Gould accepted honorary membership and donated collections raise the status of the Society? Were others encouraged to join the Society or put collections in its care as a result? Did Gould fire the enthusiasm of local ornithologists – including John Hancock – on his visits to Newcastle? It is impossible to know. Perhaps the Society's real Gould heritage is encompassed in the letters themselves, which provide a glimpse of a very different world, and an insight into the abilities and industry of a remarkable man.

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069.5

SHORT COMMUNICATIONS

THE SITE OF THE HANCOCK MUSEUM

Before 1884, when the Hancock Museum was built, its site and gardens were part of the property of the Hospital of St Mary Magdalene known as Sickman's Close. On it was a house called St James' Place, built about 1795, and in 1830 held under lease from the hospital by Mr Thomas Carr. Before this house was built, the area was occupied by the remnants of the mediaeval Chapel of St James the Apostle, which had long been disused. Brand (1789) states that the west end had been converted into a cow-house, and the east end into a dwellinghouse, although numerous remains still existed. These were destroyed when St James' Place was built.

St James' Chapel was evidently connected with the Hospital of St Mary Magdalene, although the precise nature of the connection is not clear; Charleton (1892) states that there was a separate Hospital of St James, but this seems to be a misinterpretation. Neither Bourne (1736), nor Brand, mention any separate Hospital of St James, but Brand quotes details of a lease of 1542 by Edward Burrell, described as 'Master of the Hospital of St Mary Magdalene and Previsour of the Chapell of St James and the lazar house nigh to the said Hospital'. This document seems to show that there was only one Hospital, namely that of St Mary Magdalene, but does not account for the connection between the Hospital (which had its own chapel near where the Church of St Thomas now stands) and St James' Chapel.

The Hospital of St Mary Magdalene had been founded by Henry I for the relief of lepers and continued later as a hospital for the sick and poor: St James' Chapel is first mentioned in 1349 when John Cragg of Newcastle left five marks to its chaplain. The 'lazar house nigh to the said hospital' may have been the same as Sick Man's House which evidently stood somewhere near St James' Chapel – Mackenzie (1827) equates this with St James' Place, but can hardly be correct here as Sickman's House is referred to as a boundary mark of the Town Moor in 1620, long before St James' Place was built.

Sick Man's Close (or part of it) appears also to have been known as the Magdalen Barrows, whence the name Barras Bridge is derived, being the burial ground of the St Mary Magdalene Hospital. Large quantities of human bones were found here when the foundations of St James' Place were dug and wells sunk. In front of St James' Chapel (probably near the present memorial to the first Lord Armstrong) there stood before the 'great rebellion' a large stone cross, pulled down by John Pigg, the eccentric Town Surveyor. Another ancient landmark, the Thornbush, mentioned in a description of the Town Moor boundaries in 1357, was nearby. It seems probable that, at some distant time, the Sickman's Close must have been part of the Town Moor, but the date when it became part of the property of the St Mary Magdalene Hospital is a matter of conjecture – it may possibly even have been before the Town Moor was granted to the burgesses by King John.

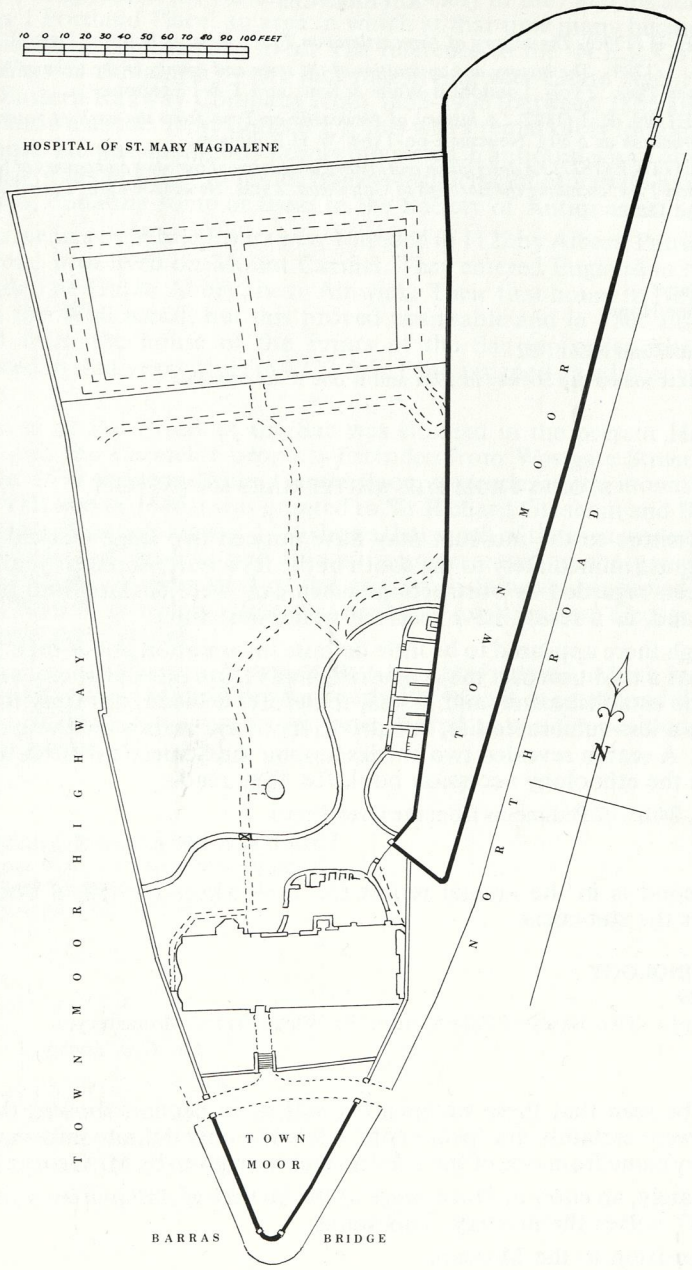

Fig. 3 St James' Place – the house and gardens. Colonel John Joicey purchased St James' Place and presented it to the Society and the original of this plan accompanied the relevant assignment, dated 12 May 1877. The areas shown as 'Town Moor' were conveyed from the Corporation of Newcastle upon Tyne to the trustees of the Society on 2 June 1880

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069.5

STONES FROM THE WHITEFRIARS MONASTERY

Many visitors to the museum may have noticed two large worked stones on the grass immediately to the south of the forecourt; in recent years these have been regarded as obstructions when cars were backing into parking spaces and, as a result, have received numerous chips.

Although there appeared to be little definite information about their origin, there was a tradition that they came originally from one of the city's former monastic establishments and it was, therefore, decided, not only to move them to a less vulnerable site, but also to try to ascertain something of their history. A search revealed two entries among the Society's records and the first, in the ethnology accession book for 1889 reads:

> Ap. 24th. 2 Pediments from the Grey Friars.
> Geo. Irving Esq.

The second is in the annual report for 1889 where the list of donations includes the statement

> ETHNOLOGY
> 1889
> April. Two Bases of Pillars, from the White Friars' Monastery.
> *Mr. Geo. Irving*

It will be seen that these statements conflict; inspection showed that the stones were certainly not 'pediments' while the only definite information is that they came from one of the Friaries and were given by Mr George Irving.

Fortunately, an entry in *Proceedings of the Society of Antiquaries,* volume 4, for 1887, solves the mystery. This states:

> Donation to the Museum
>
> The following were announced and thanks voted to the donors.
>
> From the N.E.R.Co (per Mr. Irving)
> The capital of a column from the Whitefriars
>
> [Mr. Irving said that the other two capitals discovered were to be sent to the grounds of the Natural History Society]

George Irving joined the Natural History Society in 1887 and his address is given as 1 Portland Place, an area in which at that time many business and professional men must have lived. The reference to the 'N.E.R.Co' in the *Proceedings* is explained by the fact that Irving was Estate Agent of the North Eastern Railway Company from 1855-1906 (between 1855 and 1871 he was known as the 'Rent Collector'); this was a remarkably long spell in a single post. He was apparently keenly interested in antiquities and obviously made use of his position to rescue objects which might otherwise have been destroyed, donating some of them to the Society of Antiquaries.

The Carmelites or White Friars were founded in 1122 by Albert, Patriarch of Jerusalem, who lived on Mount Carmel. They entered England in *ca.* 1240 and settled at Hulne Abbey, near Alnwick. Their first house in Newcastle was on the Wall Knoll, but this proved unsuitable and in 1307 Edward I granted them the house of the Friars of the Sac (an order which was surpressed in that year) while in 1337 Ada Page assigned an adjacent garden to them.

The house of the Friars of the Sac was situated in the present Hanover Square and the Carmelite property extended from Westgate Street to the Tyne. In 1539 the then Prior, Gerald Spor, surrendered the monastery to Henry VIII and in 1546 it was granted to Sir Richard Gresham and Richard Billingford. Bourne's map of 1736 shows that much of the area was occupied by orchards and gardens and this is commemorated in the present day Orchard Street. A great deal of the ground is, however, occupied by the Central Station complex, a fact that probably explains how George Irving discovered these stones.

Finally, it is satisfactory to report that the third capital, which has been stored in the chapel of the Keep for nearly 100 years is in good condition and that the Society stones have now been moved to a safer position in the museum garden.

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GREY SEALS
AT THE FARNE ISLANDS
1981 AND 1982

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THE GREY SEAL *HALICHOERUS GRYPUS* (FABR.) AT THE FARNE ISLANDS: 1981 AND 1982

by

GRACE HICKLING AND PETER HAWKEY

Farne Islands Committee of the National Trust
and Natural History Society of Northumbria

The main purpose of this report is to cover the 1981 and 1982 breeding seasons, but it also deals briefly with the research carried out by the Sea Mammals Research Unit (SMRU) on the islands during 1981 and 1982.

P Hawkey was again responsible for organising the field work in which, as usual, he himself played a major part. His principal helpers were the wardens J Walton and K Miller (1981 and 1982), G Wren and M Kirby (1981) and J McAllister and G Crook (1982). J Prime of the SMRU gave considerable help while three National Trust officers - R E Meyrick, Regional Director for Northumberland, T W Wright, Conservation Adviser, and M J Rogers, Chief Agent - and Mrs G Hickling also visited the colony.

In order to prevent a repetition of the 1979 situation when, because of bad weather, the numbers of seals present on Staple Island built up undisturbed, it had been decided that the Brownsman cottage should be occupied from early October. Accordingly, in both years two wardens moved from Inner Farne (where they had been living) on 12 October, a few days before the first calves were born. They were later joined by the rest of the party and, as table 2 shows, regular counts of births were made between 23 October and the beginning of December. In 1981, weather and sea remained reasonable until 20 November when force 10 westerly winds brought the first real storm of winter and four days later, with a three to four metre swell from the northnorthwest, conditions were even worse. Waves swept completely over the Crumstone, while a subsequent visit to North Wamses showed that virtually all calves had disappeared from the northwest, north and northeast sides of the island.

As a result it was 27 November before the breeding islands could again be visited; a final count was carried out and three days later the party returned to the mainland.

Bad weather came early in 1982 and, although all the nurseries were visited on 30-31 October, by 5 November, when another count was planned, the wind was southerly, occasionally reaching gale force 8 and there was a heavy swell. These conditions persisted until 11 November when despite a forecast of strengthening winds, P Hawkey decided that counting could not any longer be postponed and all the outer islands (with the exception of the Crumstone) were checked. At the same time it was realised that every effort must be made to reach the Wideopens and deal with any animals that might be breeding there and P Hawkey, J Walton and K Miller made preparations for a short stay on Inner Farne. The move took place on 12 November, in extremely rough conditions, and on 16 November they managed to land on West Wideopens where they shot nineteen adults and made a rough count of calves: a corrected figure was obtained on the following day when all the young were dyed.

They remained on Inner Farne until 23 November when they joined the others on Brownsman: throughout most of the period the weather was very stormy and this meant that it was difficult to undertake any work on West Wideopens or, indeed, even to land on this island.

Table 2 shows that there were three further counts before the party returned to the mainland on 2 December. The majority of calves have been born by December and it is, therefore, no longer necessary to keep wardens on Brownsman. P Hawkey had, however, planned to make at least one more trip from his base at Seahouses, but, unfortunately, in both 1981 and 1982 weather made this impossible.

Time of breeding. Dates of the probable first births on the different islands are given in table 1 and, in both years, the first confirmed breeding was on the Wamses.

Table 1
Estimated date of first births

	1981	1982
North Wamses	21–22 October	15 October
South Wamses	22 October	15 October
Big Harcar	30–31 October	18–19 October
Northern Hares	30–31 October	14–15 October
West Wideopens	before 26 October	before 30 October
Crumstone	21–22 October	20–21 October
Megstone	22–23 October	25–31 October

No calves were found on 20 October 1981 while a heavy swell on 21-22 October prevented landing. However, on 22 October, observations through a telescope showed three youngsters on South Wamses and, next day, two more, less than 48 hours old, were discovered on the north island. In 1982, the wardens on Brownsman noticed a calf on the South Wamses shingle beach in the late afternoon of 15 October and on rowing across to investigate they found another new born calf on the North Wamses. All other dates in the table are based on estimates of the age of the oldest animal present on an island at the time of the first visit.

Calf population and mortality rate. In both 1981 and 1982 the numbers of calves known to have been born by early December was 992 (table 2) and this compares with totals of 1302 and 1118 in 1979 and 1980 respectively. Hickling and Hawkey (1981) suggested that among the reasons for the fall noted in 1980 was that many calves (including some that had not yet been counted) were washed off the nurseries, while the final count, on 11 December, had been made almost a fortnight earlier than in 1979. It seems improbable, however, that either of these reasons can explain the further decline in 1981 and 1982 for, although the final counts were made even earlier, it is unlikely that the numbers uncounted would have exceeded fifty. There seems little doubt that the real explanation is that a large group of grey seals is now breeding on the Isle of May. Prime (1981) described the growth and establishment of this colony where he calculated that there were at least 499 births in 1980; he concluded that the recent marked increase 'could be related to the decrease in pup production at the Farne Islands'. In 1982, he stated that there were 505 births on the Isle of May in 1981 adding that,

Table 2
Calf population and mortality rate 1981 and 1982
Number of calves (alive and dead) born between counts

Date of count	*North Wamses*	*South Wamses*	*Northern Hares*	*Longstone End*	*Longstone main rock*	*Big Harcar*	*Little Harcar*	*West Wideopens*	*Scarcars*	*Crumstone*	*Megstone*	**Total**
23–24.10.81	3	4	–	–	–	–	–	–	–	2	2	11
28.10.81	31	2	–	–	–	–	–	1	–	1	4	39
1.11.81	134	11	3	–	–	1	–	1	–	10	–	160
5–8.11.81	180	10	20	–	–	1	–	14	2	14	–	241
11–14.11.81	193	13	23	–	1	–	–	41	–	–	*	271
16–17.11.81	91	16	28	–	1	1	–	14	–	*	4	155
27.11.81	41	15	8	1	3	1	1	*	*	*	*	70
1–3.12.81	10	7	7	–	–	2	–	15	–	*	*	41
15.10.82	1	1	–	–	–	–	–	–	–	–	–	2
21–23.10.82	6	–	3	–	–	4	–	–	–	6	–	19
27.10.82	38	6	1	–	–	–	–	–	–	*	*	45
30–31.10.82	105	2	12	–	–	1	–	1	–	12	3	136
11–14.11.82	295	55	92	–	–	–	–	*	*	1	*	443
17–18.11.82	*	*	*	*	*	*	*	142	–	*	*	142
23.11.82	92	20	57	–	2	4	–	*	*	*	*	175
26–27.11.82	6	2	6	–	–	1	–	*	*	1	2	18
1.12.82	–	3	4	–	–	–	–	–	–	1	1	9
Nos born												
(1) 1981	**683**	**78**	**89**	**1**	**5**	**6**	**1**	**86**	**2**	**27**	**10**	**992**
(2) 1982	**543**	**89**	**175**	**–**	**2**	**10**	**–**	**143**	**–**	**21**	**6**	**992**
Nos found dead on islands												
(1) 1981	**115**	**18**	**15**	**1**	**1**	**1**	**1**	**9**	**–**	**–**	**1**	**162**
(2) 1982	**127**	**13**	**32**	**–**	**1**	**3**	**–**	**8**	**–**	**3**	**2**	**189**

NOTES (1) An * indicates that no landing was made
(2) No calves were born on Brownsman, Staple Island, Nameless Rock and East Wideopens
(3) Animals (born elsewhere) were washed up as follows: 1981 – 4 (Brownsman), 1982 – 3 (Brownsman 2, Staple Island 1) and are included in totals

although emigration to this island would account for part of the apparent decrease on the Farnes, this was not a complete explanation. He suggested therefore, that some females from the Farnes might 'have gone even further afield – possibly to Orkney or even Norway', but there is as yet no evidence to support this suggestion.

As will be seen from table 2, measures taken to prevent pregnant cows coming ashore on Staple Island and Brownsman were completely successful and no calves were born on these islands; this meant that as in 1979 and 1980 most of the births were concentrated on the Wamses (in particular the north island) and the Northern Hares. There was a further drop in the numbers using the Big Harcar, but by contrast there was a marked increase on West Wideopens.

The overall mortality rates were 16.3% (1981) and 19.1% (1982) while, as usual, the highest mortality rate for individual islands coincided with the largest population. This was clearly shown in 1982 when the North Wamses rate reached 23.4% while that for the remaining islands was only 14.0%.

Colony management. From time to time the National Trust is criticised by people who believe that the seal colony should remain inviolate and that nothing should be done to limit it size. It is, therefore, appropriate to remind these people not only of the circumstances under which the Farne Islands became Trust property, but also of the responsibility for management that this ownership entails.

For hundreds of years the islands have been the summer home of thousands of breeding seabirds and, indeed, during the 7th century they were the scene of one of the first recorded attempts at nature conservation when St Cuthbert laid down rules to ensure the safety of the nesting eider ducks. Subsequently, there was very considerable exploitation of the wildlife, first by the Monastic House of Farne and, later, by tenants of the then owners, the Dean and Chapter of Durham. This was followed by a short period of private ownership, but in 1923 a public appeal was launched in order that 'one of the most interesting places where birds foregather...will remain for all time inviolate and the feathered inhabitants continue to breed.' As a result of this appeal the islands were handed over to the Trust in 1925 and in the relevant conveyance it is stated that they shall be 'vested in the National Trust for the preservation, so far as is practical, of their natural aspect and features and of the animal, bird and plant life thereon.' At that time birds formed the bulk of the wildlife; the seal colony was very small and there is no reference to it in contemporary correspondence. In fact, no accurate counts of seal numbers were made until the 1950s although records left by naturalists who made occasional winter visits in the 1920s indicate that there were probably not more than 200-300 individuals. By 1938, when salmon fishermen, in particular those based on the Tweed, were complaining strongly about the damage done by seals, the size of the colony was variously estimated as 150 or 200 although it now seems probable that the true figure was nearer 600. However, the Seahouses fishermen made no complaints and this, together with the start of the 1939 war, meant that no action was taken.

During the next ten years nothing was known about seal numbers, but observations made in 1950 suggested that there were probably 1800-2000 animals. In 1951, members of the Natural History Society started investigations which, during the next thirty years, have yielded invaluable information about the life history of grey seals. They carried out the first ever marking of these seals with numbered tags and had a spectacular success

when seal no. 1 turned up a fortnight later in Norway having travelled some 640kms. Since then tagging has provided important evidence about seals' movements while the presence of tagged animals in fishing nets has supported the fishermen's claim of the damage they cause. Indeed, the Ministry of Agriculture used this latter fact to justify killing female calves on the islands in 1958 and again, and on a much larger scale, in 1963, 1964 and 1965, when the object was to reduce the colony by twenty-five percent.

The Trust agreed, albeit reluctantly, to these culls, but after further consideration it decided to withdraw permission for additional killing in 1966 and 1967. At the same time, research continued and it became obvious that numbers were increasing by about nine per cent per annum – an alarming figure which meant that if this trend remained unchecked the colony might double every ten years. In other words, the number of births might well have risen from *ca.* 1019(1960), through 1956(1970) to some 4000 in 1980! These figures have more impact when it is realised that the size of an undisturbed seal population can be related to the number of young born annually and that the relevant colony sizes would be 3500-4000(1960), 7000-8000(1970) and 14000-16000(1980).

For various reasons, chief among them the adverse effect that a large concentration of breeding seals would inevitably have on the vegetation and fragile soil cover of islands such as Staple Island, Brownsman and the Wideopens, this prognostication was quite unacceptable. It was recognised that these concentrations would seriously damage the nesting sites of many thousands of seabirds, in particular puffins, terns and eider ducks and, accordingly, it was decided that the only way to preserve the general ecosystem of the islands was to reduce the colony to a level which, in the past, had proved satisfactory both from the point of view of the habitat and of the health and well being of the seals themselves. It was felt that the figure for 1960, when there were 1000 breeding females, fulfilled these criteria and this became the target. Killing of calves had not proved an effective method of reduction and it was, therefore, planned to take adults, mainly breeding females, and this operation was carried out in two stages (in 1972 and 1975) when 1089 females and 290 males were removed.

Unfortunately, the results were to some extent disappointing: 1343 calves were born in 1976 and, even more disturbing, the culls had done nothing to limit the numbers of animals using Staple Island soil cap for there were 753 births on this island as well as 309 on Brownsman.

The Trust has continued to give very careful consideration to the management of the colony and today its policy has two objectives, namely to stabilize the colony size at approximately 1000 breeding females and to prevent the vegetated islands being used as seal nurseries with the consequent risk of damage to the fragile soil cap. In order to achieve this, wardens live on the outer islands throughout the breeding season and regularly patrol both Staple Island and Brownsman so preventing females from coming ashore. These patrols are reinforced by 'scarers', *i.e.* gas-guns operated by propane gas which fire warning shots at intervals. Adults are only killed if these measures prove ineffective and, as will be seen by table 3, no such action was needed in either 1981 or 1982. Starving and ailing calves are, of course, despatched on all the nurseries.

Because of distance and difficult weather conditions it is impossible to employ similar measures on West Wideopens and a group of females usually

becomes established here; it is then necessary to remove some of them in order to prevent damage to the vegetation.

Finally, killing carried out on other islands is designed to prevent an increase in colony size which might threaten the target of 1000 breeding females.

Table 3
Numbers of animals (including ailing and starveling calves) shot 1981 and 1982; 1980 figures are included, for comparison, in brackets.

	Staple Island	*Brownsman*	*North Wamses*	*West Wideopens*	*Other islands*	**Total**
Adult males						
(1980)	(1)	(1)	–	–	–	(2)
1981	–	–	–	–	–	–
1982	–	–	1	3	–	4
Adult females						
(1980)	(14)	–	–	(19)	(2)	(35)
1981	–	–	–	2	–	2
1982	–	–	28	21	–	49
Calves						
(1980)	(13)	–	–	(20)	(2)	(35)
1981	3*	15*	7	39	–	64
1982	2*	8*	40	70	14	134

*Not born on these islands

SMRU research. During 1981 the SMRU investigated the reproduction, biology and diet variation of the Farne Island seals. The objects of their programme were (1) to examine stomach contents, especially any fish remains present, (2) to collect rectal faeces and also faecal samples from the hauling-out rocks and (3) to carry out general observations, including a search for dead seals and for any tagged or marked animals. In addition, specimens were to be removed for laboratory examination.

Members of the unit visited the area on thirteen occasions between 30 November 1980 and 11 December 1981, and sampling was carried out on Big Scarcar, South Wamses, Big and Little Harcar, Blue Caps, Clove Car, Northern Hares, Longstone End, Crumstone, Knivestone and Megstone. Forty-six males and ninety-seven females were taken, a figure which must be kept in mind when considering the number of calves born in 1981.

Full details of the conclusions drawn from this sampling have not yet been published, but preliminary results indicate that more than 90% of the females were pregnant and that this percentage had not varied throughout the year. Furthermore, there had been a similar fertility rate in 1980.

No faecal samples (see (1) and (2) above) were collected in 1982 and the unit's main aim, and one which required the direct cooperation of the Trust's staff, was to study the local movements of the seals. In particular, it was hoped to determine how much time individual animals spent hauled out on rocks, and at sea, and over what distances they travelled to feed.

The unit has successfully developed a technique for fitting VHF radio tags to adult seals. The animal is temporarily immobilized by means of a tranquilizing dart and the instrument is fixed to the back of its neck in a position which will not only cause the minimum of discomfort, but also have a reasonable chance of remaining in place until it falls off at the next moult. Incidentally, both the tag and the method of attachment have been approved by the Home Office.

The resultant signals can be heard over a distance of eight kilometres and it is then possible to plot the animal's movements. It was hoped that four such transmitters could be fitted to Farne seals and that the necessary monitoring equipment (an automatic multi-channel receiver and chart recorder) could be installed in the Brownsman cottage and operate during the summer of 1982. However, because of various difficulties, it was 20-21 July before the first three seals (two males and one female) were equipped with their tags; the animals were recorded regularly for the first eight days, but the chart recorder then broke down and, despite repairs, there were few subsequent recordings. No radio tagged seals were detected in an aerial survey of the east coast carried out in August, but since then there have been at least three sightings of animals marked in this way. In addition, a female radio-tagged on the Isle of May was identified less than two weeks later on Big Harcar (see table 4).

Marking seals. No seals were tagged or marked with plastic streamers during the period and details of several of the animals recovered in the early months of 1981 have already been published (Hickling and Hawkey, 1981). Additional recoveries are given in table 4, among them A 2772 which at nine years forty-four weeks is the oldest seal found with its jumbo tags still in place. It had also been freeze branded, but there was no sign of the brand – a letter 'F'. However, what was possibly a still older tagged seal was found on 10 August 1981 when a female was shot on the Knivestone; examination showed that there were holes in the tail and hind flipper and these suggested that the animal had probably been tagged in 1970, *i.e.* it was aged approximately ten years and thirty-seven weeks.

Two successful freeze brands, both 'X', were seen in autumn 1981 and in one case the branding iron had apparently been applied for a considerable time for the result resembled a hot-iron, rather than a freeze brand mark. Two further branded animals – an 'X' and an 'S' – were observed on 8 November 1982 (see table 4(b)).

Two streamer-marked animals identified at the islands in 1981 were aliens – they had been marked on Orkney and North Rona during the previous autumn.

As usual, in both years occasional colour-dyed calves were found on the Northumberland coast from mid-November to December, but none was at a great distance from the islands.

Other marine mammals. A party of killer whales *Orcinus orca* was seen off the outer group on 19 August 1981: it consisted of a male, female and calf. The male's dorsal fin was about 1.5m high and it was estimated that the animal measured 9m in length. On 18 July 1982 two animals, one of which was definitely a male, were seen moving past North Wamses in a northerly direction.

On 16 May 1981 a dead white-beaked dolphin *Lagenorhynchus albirostris* was found washed up on Knoxes Reef. In 1982, six were off Inner Farne on 30 July. They were first seen passing Quarry Hole and continued under the lighthouse

cliffs, some nine metres out, before turning and swimming westward towards the mainland. On 8 April 1982, dorsal fins of dolphins were noticed, but it was impossible to identify the species.

Three common porpoises *Phocoena phocoena* were observed travelling north on 21 April 1982, two moved south on 17 May, two west on 6 July and two southeast on 8 July; in addition, at least six individuals were noted feeding in the area throughout 7 August.

Table 4
Recoveries and sightings of marked seals

(a) Tagged on the Farne Islands

No	*Date marked*	*Recovery details*	*Date recovered*
5136	26.11.79	Nr Ameland, West Frisian Islands, The Netherlands. Caught in net	28.10.81
5150	,,	Isle of May. Seen on rocks	20.6.81
A 2772	28.11.71	Big Scarcar. Female shot (9 years 44 weeks)	8.9.81
A 2782	,,	Warkworth, Northd. Tag only found on beach	9.2.83
*22877	5.12.79	Isle of May. Seen nursing very young calf	21.11.81
22910	29.11.79	Isle of May. Seen on rocks	21.5.80
22916	,,	Harlingen, Friesland, The Netherlands. Found dead on beach	15.6.81
25206	27.11.79	Westpolder, Groningen, The Netherlands. Found dead, perforated ulcer	15.6.81
25268	28.11.79	Henne Strand, Jylland, Denmark. Found dead on beach	12.3.83
25456	27.11.80	Bamburgh, Northd. Tag only found, but decomposing seal seen 100m away	24.6.82
Tail and flipper tag holes only	Nov 1970	Knivestone. Female shot (*ca* 10 years 38 weeks)	10.8.81
Double rototag	Nov/Dec 1979	Crumstone. Seen	9.3.81
,,	,,	Longstone End. Seen	30.3.81
,,	,,	Megstone. Seen	31.3.81
Rototag and allflex	,,	Megstone. Seen	11.3.81
,,	,,	Clove Car. Seen	(1) 27.4.81 (2) 29.4.81
*Orange allflex	,,	Crumstone. Seen	1.3.83

(b) Branded on the Farne Islands

Date branded	*Type of brand*	*Sighting details*	*Date recovered*
1969	freeze 'X'	Big Harcar. Male seen (11 years 48 weeks)	14.10.81
,,	,, ,,	Isle of May. Male seen (12 years)	(1) 21.11.81 (2) 22.11.81
,,	,, ,,	,, ,, Seen (13 years)	8.11.82
1970	,, 'S'	,, ,, Seen (12 years)	,,

(c) Tagged on the Isle of May

No	*Date marked*	*Recovery details*	*Date recovered*
24917	8.11.82	Brownsman. Tag only found	13.7.83
24926	16.11.82	Northern Hares. Tag (with attached red streamer) only found	21.7.83

(d) Streamer marked

Date and place marked	*Colour*	*Sighting details*	*Date recovered*
Oct 1980 North Rona	Orange	In sea off Knivestone	18.5.81
,, Orkney	Yellow	Crumstone. Seen	,,

(e) Radio-tagged

No	*Date and place marked*	*Recovery details*	*Date recovered*
*?	20–21.7.82 Farne Islands	Longstone. Seen	late August 1982
*?	,, ,,	Farne Islands. Seen (at least one)	November 1982
*?	,, ,,	Megstone. Seen	1.12.82
*24934 (female)	24.11.81 Isle of May	Big Harcar. Detected by receiver in light aircraft flying overhead	6.12.82

NOTE: All animals with the exception of those marked * were tagged as calves

Acknowledgements. We should like to thank members of the SMRU for their help in reporting marked seals.

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All statements and expressions of opinion in the papers in this volume are the sole responsibility of the authors and must in no way be taken to represent the opinions of the Natural History Society.

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VEGETATION SURVEY OF CHILLINGHAM PARK, NORTHUMBERLAND

by

S J G HALL[1] and R G H BUNCE[2]

SUMMARY

Indicator species analysis was used to classify the vegetation of Chillingham Park. The park comprises 134 hectares of species-rich grassland and open woodland. 138 plant species were found in an initial survey and a key was developed whereby any quadrat subsequently sampled could be classified into one of sixteen vegetation classes.

A synoptic vegetation map is presented. The vegetation classes are discussed in terms of topography, soil type and acidity, species complement and cover abundances. Some implications for management and for ecological and behavioural studies on the white cattle which inhabit the park are discussed.

INTRODUCTION

Chillingham Park was probably enclosed during the 13th century (Bilton, 1957). Circumstantial evidence suggests that a herd of cattle was then in the area and that these animals were the forebears of the present Chillingham herd of white cattle (Tankerville, 1956; Bilton, 1957). The park is one of the few areas of permanent grassland in Northumberland to have escaped extensive improvement during the 18th and 19th centuries because the owners wished to preserve, as unchanged as possible, the habitat of the cattle (Bennet, 1979); some wet areas were drained, however, and small bridges built. The boundaries of the park have been extensively altered over the years and the area reduced, and these changes have yet to be described.

The present study was intended to complement work on the history, ecology and behaviour of the white cattle (S J G H, in preparation).

GENERAL DESCRIPTION

Chillingham Park is situated about sixty kilometres northwest of Newcastle upon Tyne at 55° 31′N, 2° 54′W, grid reference NU 0625, and consists of about 134 hectares of a west-facing slope, ranging in altitude from 98m to 235m above sea level. The solid geology is sandstone of the Carboniferous Fell Sandstone Group.

Ash *Fraxinus excelsior* and alder *Alnus glutinosa* grow along the water-courses and in the wettest areas, and mature plantations of beech *Fagus sylvatica* occur on the upper slopes. These species are found with oak *Quercus* sp., silver birch *Betula pendula*, and sweet chestnut *Castanea sativa* in a wood called Robin Hood's Bog. There are several small 19th century plantations mainly of exotic conifers, oak and sycamore *Acer pseudoplatanus*. There is at present no growth of trees past the seedling stage, apparently owing to grazing pressure. Studies of lichens have shown that ancient woodland has not survived within the park (Gilbert, 1972). There are no

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lakes or ponds and a sheepfold is the only fenced enclosure. A stone building called the 'deer hemmel' is the only man-made shelter.

A deer-proof fence divides the park from Chillingham Home Farm and from the wooded grounds of Chillingham Castle. A stock-proof fence forms the boundary with recently afforested land and a hayfield to the north. To the east, the park is separated by a stock-proof fence from afforested land and by a steep bank from a slope covered with heather *Calluna vulgaris* and bracken *Pteridium aquilinum.* Although this slope is accessible to the cattle, they do not go there (S J G H, unpublished observations) and it has been excluded from the present study. Its area is not included in the figure of 134 hectares given above as the area of the park.

Management policy during the 20th century has been to alter the park as little as possible. Wartime overstocking (1939-1945) with sheep apparently resulted in acidification from pH 5.3 to pH 4.8 (Bennet, 1979) and necessitated slagging and liming; some of the old land drains were repaired and small additional areas were drained. A bracken clearance experiment was conducted on about four hectares at the south of the park, some plots of land being rotavated and reseeded, during the early 1950s. Mechanical cutting of bracken has been undertaken elsewhere in the park on other occasions and the most heavily grazed areas were limed during the period 1980-1982.

The park is owned by the Sir James Knott Charitable Trust and the right to depasture sheep (to a maximum of 300 ewes, plus their followers) is currently let to the owner of Chillingham Home Farm. The rights to graze cattle is leased to the Chillingham Wild Cattle Association, who own the herd. Fallow deer *Dama dama* are frequently seen in the park.

CHOICE OF METHODS

The main objective of this study was to classify the vegetation into types which could be used to elucidate aspects of the biology of the white cattle. Chillingham Park is also of botanical interest in its own right and worthy of a numerical classification. Techniques which depend for their accuracy upon recognition of vegetation types, using personal experience, were not considered. A classification of areas according to the density of bracken cover was considered, but rejected as an over-simplification. Indicator species analysis (Hill *et al.*, 1975) is an appropriate multivariate technique; an hierarchical key is used to assign quadrats to the appropriate vegetation class. The use of this method has been illustrated by Bunce and Shaw (1973).

It was decided to add to the scope of the survey by estimating cover abundances of plant species, using point quadrats.

METHODS

A one centimetre grid was drawn on the Ordnance Survey maps (scale 1/2500) dividing the park into 2140 squares, each 25m x 25m on the ground. Squares were designated by their row-column co-ordinates.

Plant species growing on a sample of 101 squares were listed by S J G H in June and July 1979, using the quadrat (200m^2 in area) described by Bunce and Shaw (1973). Cover abundances of the species were estimated using a rod 3.3mm in diameter. The tip of the rod was lowered to the ground at fifty points within the quadrat and the species touched by it were recorded. The slope of the ground was measured with an inclinometer and soil pH was

measured. Some specimens were only classified to genus level, e.g. most *Carex* species. Indicator species analysis is a robust technique in that plants which are inconsistently recorded do not accumulate correlations and do not, therefore, appear as indicators in the key.

The hierarchical key was developed from the species lists made for each of the 101 quadrats using the first axis of reciprocal averaging; such 'first-axis scores' can be used (Hill *et al.*, 1975) to highlight ecological gradients. In an indicator species analysis the decision to take the left or right hand path at each division of the key is taken as follows. The quadrat is searched for the seven indicator species listed immediately above the division. Those on the left hand side of the path are called negative indicators, those on the right, positive indicators. The number of negative indicators is subtracted from the number of positive indicators. If the result is equal to or less than the threshold value, the left-hand path is taken. Using the key, each of the 101 quadrats was assigned to a vegetation class.

A further 140 squares, distributed more or less evenly among the 101 original squares, were visited during the period 12 September to 9 October 1979. The quadrat was searched for all of the sixty-five species which featured in the hierarchical key, their presence recorded and the hierarchical key applied to the list later. This procedure supplied information which, though redundant for the purpose of assigning squares to vegetation classes, was useful for further studies of the occurrence of the sixty-five key species.

Between October 1979 and January 1980, the remaining 2039 squares were visited and classified using the hierarchical key. Soil pits were dug on fifteen of the 101 quadrats surveyed initially and the soil was described.

The abundance of each species in the park as a whole was calculated. In the case of key species, this was done using the species lists for the 101 quadrats surveyed initially and for the 140 surveyed later. Non-key species were assessed using the lists for the first 101 quadrats only. The procedure was as follows. The species lists for quadrats defined as vegetation class 1 were taken. The proportion of these in which a given species (species 'a') featured was calculated. This fraction was multiplied by the number of squares in the park as a whole which were vegetation class 1. This process was repeated for the other fifteen vegetation classes, giving sixteen numbers, whose sum was the total number of squares where species 'a' would be expected. Division by 2140 gave the percentage occurrence of species 'a'.

RESULTS

One hundred and thirty-eight species were recorded during the initial survey (table 1). The hierarchical key is presented in text-fig. 1. A synoptic map (text-fig. 2) was drawn in which, for clarity, the sixteen classes were reduced to six. The data on soil pH, soil types and slope are presented in table 2, with the total area covered by each vegetation class. A first-axis score was calculated for each of the 101 squares initially surveyed and a mean first-axis score calculated for each vegetation class (table 2).

General descriptions are given of each vegetation class (table 2). These descriptions take into account the indicator species, the cover abundance of species and the soil pH and slope data. Some vegetation classes were particularly prone to infestation by bracken and by the thistle *Cirsium arvense* and the mean cover abundances of these species are given for the classes where they were frequently found.

Table 1

Species list, with percentage occurrences (see text)

Species	%	Species	%
Deschampsia cespitosa	96	*Primula* sp.	9
Agrostis tenuis	91	*Endymion non-scriptus*	9
Rumex acetosa	91	*Digitalis purpurea*	8
Holcus lanatus	90	*Stellaria holostea*	8
Anthoxanthum odoratum	87	*Epilobium* sp.	7
Potentilla erecta	84	*Trifolium pratense*	7
Festuca rubra	83	*Fagus sylvatica*	7
Galium saxatile	69	*Carex remota*	7
Poa pratensis	68	*Deschampsia flexuosa*	7
Pteridium aquilinum	68	*Lathyrus montanus*	7
Viola riviniana	67	*Mnium undulatum*	6
Rhytidiadelphus sp.	66	*Stellaria media*	6
Veronica chamaedrys	64	*Crataegus monogyna*	5
Festuca ovina	64	*Blechnum spicant*	5
Juncus effusus	63	*Euphrasia* sp.	4
Oxalis acetosella	63	*Polygonum aviculare*	4
Agrostis stolonifera	60	*Lathyrus pratensis*	4
Poa annua	58	*Fraxinus excelsior*	4
Trifolium repens	56	*Veronica montana*	
Cerastium vulgatum	56	*var. tenuifolius*	4
Ranunculus repens	48	*Thelypteris oreopteris*	4
Brachythecium rutabulum	48	*Galium aparine*	4
Poa trivialis	47	*Calluna vulgaris*	4
Luzula multiflora	47	*Filipendula ulmaria*	4
Cirsium arvense	46	*Ranunculus flammula*	4
Cynosurus cristatus	45	*Plantago major*	4
Plagiothecium undulatum	44	*Ajuga reptans*	3
Veronica officinalis	43	*Equisetum arvense*	3
Luzula sp.	43	*Polytrichum commune*	3
Conopodium majus	41	*Pinus sylvestris*	3
Agrostis canina	38	*Dryopteris filis-mas*	3
Carex sp.	38	*Rumex conglomeratus*	2
Holcus mollis	38	*Carex pulicaris*	2
Ranunculus acris	37	*Sarothamnus scoparius*	2
Sieglingia decumbens	35	*Castanea sativa*	2
Nardus stricta	34	*Sphagnum* sp.	2
Urtica dioica	33	*Acer pseudoplatanus*	2
Stellaria graminea	32	*Galium palustre*	1
Veronica sp.	31	*Geranium robertianum*	1
Plantago lanceolata	31	*Lysimachia nemorum*	1
Taraxacum officinale	30	*Valeriana dioica*	1
Cirsium palustre	29	*Aegopodium podagraria*	1
Juncus articulatus	28	*Brachypodium sylvaticum*	1
Cardamine pratensis	28	*Crepis paludosa*	1
Polygala serpyllifolia	27	*Lophoidea bidentata*	1
Dactylis glomerata	27	*Phalaris arundinacea*	1
Lotus corniculatus	24	*Stellaria alsine*	1
Luzula pilosa	22	*Veronica beccabunga*	1
Acrocladium cuspidatum	21	*Arrhenatherum elatius*	1
Lolium perenne	21	*Achillea ptarmica*	1
Quercus sp.	19	*Briza media*	1
Mnium hornum	18	*Bellis perennis*	1
Cirsium vulgare	18	*Pedicularis sylvaticus*	1
Carex panicea	18	*Leontodon autumnalis*	1
Potentilla sterilis	18	*Scrophularia aquatica*	1
Dicranum sp.	17	*Carex caryophyllea*	1
Alopecurus pratensis	16	*Juncus bufonius*	1
Trisetum flavescens	15	*Campanula rotundifolia*	1
Prunella vulgaris	15	*Carex binervis*	1
Carex flacca	15	*Carex pallescens*	1
Vaccinium myrtillus	14	*Hieracium pilosella*	1
Alnus glutinosa	13	*Senecia jacobaea*	1
Vicia sepium	13	*Glyceria maxima*	1
Veronica serpyllifolia	12	*Calamagrostis* sp.	0.3
Achillea millefolium	11	*Galium verum*	0.3
Carex ovalis	11	*Juncus subuliflorus*	0.3
Betula pendula	9	*Potentilla reptans*	0.3
Ophioglossum vulgatum	9	*Sagina procumbens*	0.3
Juncus squarrosus	9	*Festuca pratensis*	0.2
Dryopteris dilatata	9	*Hypnum* sp.	0.2
		Circaea lutetiana	0.2

Fig 1 Hierarchical key

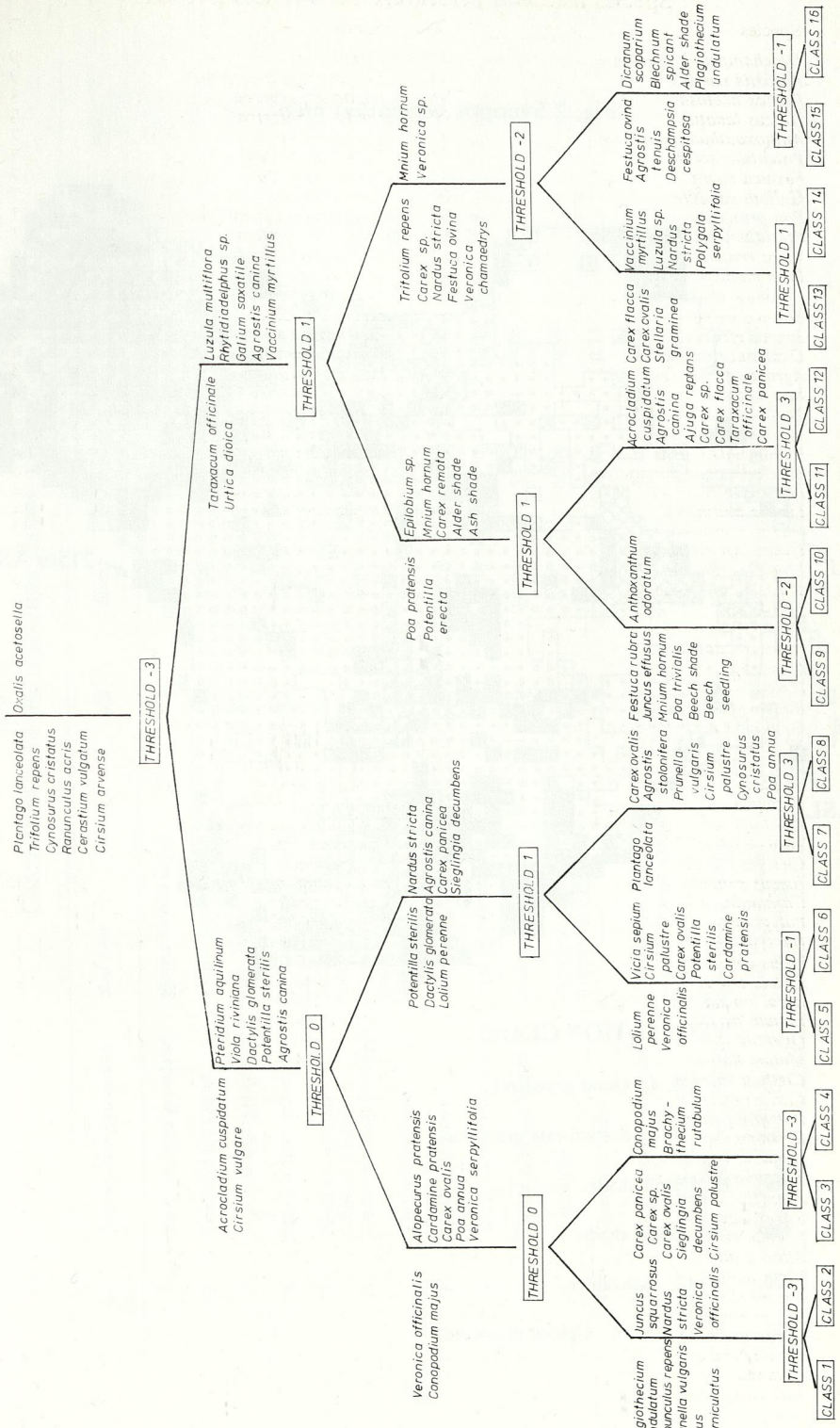

Fig. 2 Synoptic vegetation map

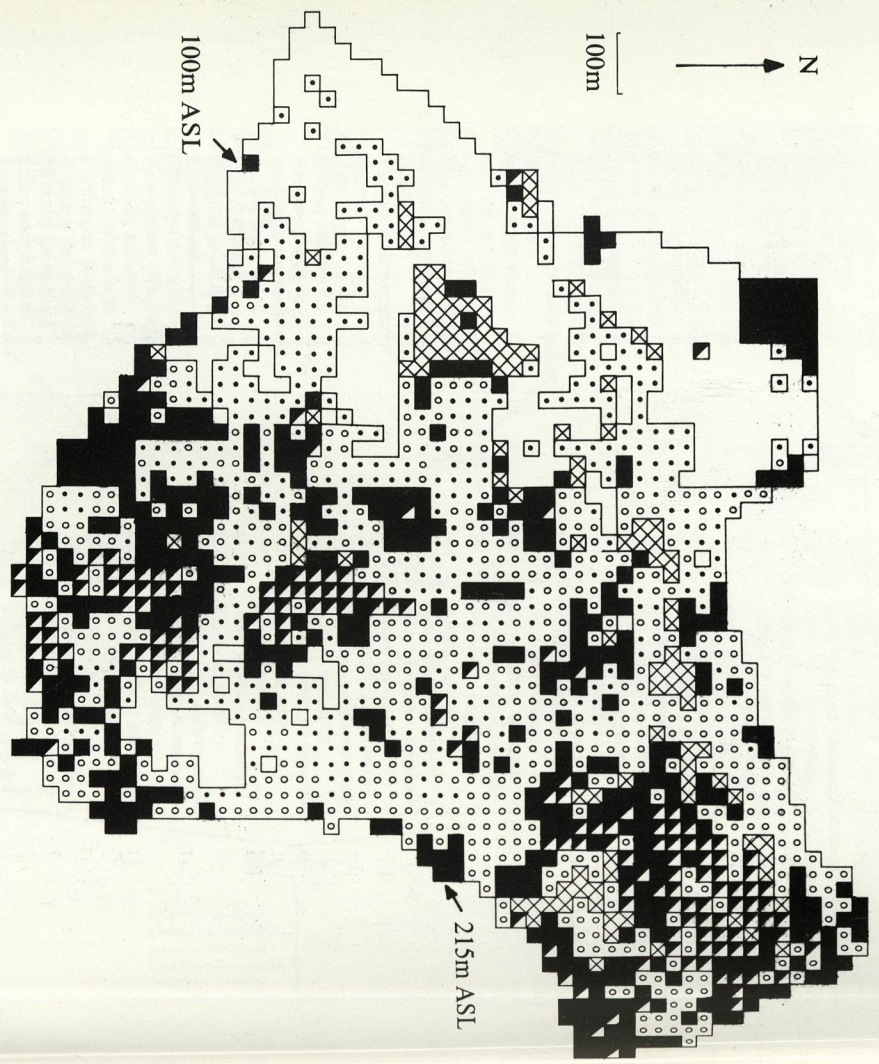

Table 2
Characteristics of the vegetation classes

Veg. class	*Generalised description*	*Soil type*	*pH*	*Slope*	*Mean first axis score*	*Area in park (ha)*	*Mean % bracken*	*Mean % thistle*
1	Rich lowland grassland	gleyed brown earth	5.5	4°16′	3.73	2.50	—	14.9
2	Lowland grassland	gleyed brown earth	5.3	5°20′	12.00	14.00	—	16.0
3	Wet lowland grassland	gley	5.6	5°13′	6.89	3.94	—	10.3
4	Dry lowland grassland	(i) acid brown earth (ii) gley	5.2	3°9′	7.50	7.81	—	13.0
5	Bracken invaded lowland grassland	acid brown earth (with gleying)	5.0	8°4′	22.56	11.56	52.3	7.5
6	Damp bracken invaded	acid brown earth	5.7	8°27′	24.43	2.13	65.0	4.3
7	Flushed lowland grassland	lowland grassland gley	4.8	6°37′	20.43	10.00	48.0	0.7
8	Flushed lowland grassland	gley	5.0	8°23′	25.75	2.63	46.0	4.3
9	Damp shade (beech)	acid brown earth	4.5	8°38′	65.75	10.06	85.4	—
10	Dense bracken shade	acid brown earth	4.9	10°21′	54.13	27.50	86.6	—
11	Ash/alder	enriched, highly organic earth	4.4	6°5′	66.00	6.94	—	—
12	Open ash/alder	—	4.9	24°50′	52.00	0.13	—	—
13	Dry upland grassland	(i) peaty gley	4.9	10°16′	42.14	6.25	62.7	—
14	Poor damp upland grassland	(ii) acid brown earth peaty gley	5.1	10°30′	39.75	9.75	52.7	—
15	Dry upland grassland	acid brown earth	4.8	12°51′	65.75	11.13	—	—
16	Shaded upland grassland	acid brown earth (with gleying)	3.8	7°27′	75.00	7.45	72.7	—

DISCUSSION

Species list. Almost all the species recorded (table 1) are widespread in upland Britain and the general features of their ecology are well known. The species most widely occurring in the park, *Deschampsia cespitosa,* is particularly characteristic of soils with impeded drainage. *Anthoxanthum odoratum, P. aquilinum, Festuca ovina* and *Agrostis tenuis* are characteristic of acidic mineral soils with a low base status, but not of poor peat soils. *Achillea millefolium* and *Prunella vulgaris* are characteristic of species-rich permanent grassland that has remained unploughed, as are the noteworthy small fern *Ophioglossum vulgatum* and the grass *Trisetum flavescens.* Some other plants are typical of a variety of upland habitats but there are no really montane species. The number of species is very much higher than might be expected in reseeded pasture.

Hierarchical key. The first division in the key (text-fig. 1) separates a group of eight vegetation classes (indicated by species characteristic of lowland pasture of adequate phosphorus and nitrogen status) from eight classes found on the more acidic upland areas and including *Oxalis acetosella.* Within the lowland group, the first division separates areas of an upland nature (classes 5–8). The further divisions among classes 1–8 imply a complex separation within a relatively uniform habitat. For example, class 3 is distinguished from class 4 by the presence in the former of species characteristic of damp ground, such as *Cirsium palustre.* Despite their generally lowland nature classes 7 and 8 possess an upland element in the form of *Nardus stricta* and *Sieglingia decumbens.*

Within the upland group, the first division is analogous to that in the lowland group in that the lowland element (classes 9–12) is distinguished from the upland element by the former's possession of *Urtica dioica* and *Taraxacum officinale*. Shade is an important feature of these classes, whether provided by *F. sylvatica* (class 9), *P. aquilinum* (class 10), or *A. glutinosa* and *F. excelsior* (classes 11 and 12).

A striking feature of the key is the part played by *P. aquilinum* in defining classes 5–8 in the lowland group and class 10 in the upland group. A vegetation classification based simply upon cover abundance of bracken would have been misleading as vegetation class 10 has little in common with classes 5–8 apart from the presence of bracken. This species is evidently able to compete successfully in a wide range of vegetation and soil types.

Vegetation map. The synoptic vegetation map (text-fig. 2) shows how large blocks of classes 1–4, the most lowland in character, are also found on part of the higher area in the southeast of the park. Classes 5–8 are more scattered with pronounced linear distribution in some areas, suggesting association with localised enrichment from streams. The shaded types (classes 9–12) are scattered, being related to the presence of trees and bracken along watercourses and in or near the plantations. The upland types (classes 13–16) occur in large blocks, and also in small blocks which reflect localised acidic conditions. The distribution patterns show, in general, a high degree of geographical integrity, with most classes occurring in blocks which presumably reflect environmental uniformity.

Soil pH, soil types, slope. The soil types and pH values (table 2) conform to those which might be inferred from the species composition of the vegetation, though the presence of acid brown earths under classes 4 (dry lowland grassland), 5 (bracken invaded lowland grassland), 6 (damp bracken

invaded lowland grassland), 10 (dense bracken) and 15 (dry upland grassland) indicate how bracken may dominate land which could support grasses of high grazing value.

An indication of the relative importance of slope and soil pH in determining vegetational patterns can be obtained by calculating the correlation coefficients between the mean first-axis score for each class and the mean slope and mean soil pH for each class, respectively. Class 12 was excluded from this analysis as there were only two squares of this type. In the case of soil pH, correlation is highly significant ($r = -0.817$, 14 d.f., $p < 0.001$), suggesting that soil fertility is of particular importance in determining vegetation. Slope is positively correlated with the mean first-axis score ($r = 0.468$, 14 d.f.), though significance is not attained. However the slope of the ground does appear to influence the movements of the cattle (S J G H, unpublished observations) and may therefore need separate consideration in subsequent analyses. The high frequency and dense cover (table 2) of bracken on vegetation classes 5–8 as compared with classes 1–4 may be due to the cattle preferring to graze on flatter ground. Such a preference would permit bracken growth on slopes to proceed only partly hindered by trampling. Vegetation classes 5–8 are most likely to be invaded by bracken.

Implications for ecological and behavioural studies. Indicator species analysis has considerable potential value for zoologists as it is an objective method for dividing the habitat into different vegetation classes. Expertise in phytosociology is not required.

A full account of the relationships between vegetation classes and the ecology and behaviour of the wild cattle will be presented in due course. Preliminary analysis shows that vegetation classes 1–5 and class 11 are generally preferred for grazing. Classes 9, 10 and 16 are discriminated against, and classes 6, 7, 8, 13 and 14 are utilised in approximate proportion to their occurrence in the park (S J G H, in preparation). No data have been collected on the preferences of the sheep or the deer.

Further analysis will take account of differences in the behaviour of the sexes, in that mature bulls live in small groups each occupying a home range, while the other animals move around the park in a group or groups which vary in size and composition over the year (Hall, 1979).

Implications for management. It is evident from table 2 that vegetation classes 1–4 provide the best grazing in the park. Areas with vegetation of these classes (i.e. 21% of the area of the park) would probably best repay treatment with lime; they are not infested with bracken but would benefit from clearance of thistles. Vegetation classes 5–8 (i.e. 20% of the area of the park) are more seriously affected by bracken and bracken clearance would be best directed towards these areas, rather than towards areas of class 10 where the underlying sward is upland in character and deficient in species of high grazing value.

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THE FOOD AND FEEDING HABITS OF GULLS ON COQUET ISLAND, NORTHUMBERLAND

by

TREVOR D CHARLTON*

INTRODUCTION

Coquet Island is a small island 5.3 hectares in extent and situated 1.9 kilometres off the mouth of the river Coquet and opposite the little port of Amble. Part of the island is under the control of Trinity House and since 1970 the remaining area has been leased by the Trustees of the ninth Duke of Northumberland to the Royal Society for the Protection of Birds; it is maintained as a nature reserve and during the summer a full time warden is in residence.

Some five to six thousand pairs of seabirds and waders nest annually, the figures for 1980 (with those for 1979 shown in brackets) being as follows: eider *Somateria mollissima* 480(414), oystercatcher *Haematopus ostralegus* 25(25), black-headed gull *Larus ridibundus* 1715(1254), lesser black-backed and herring gulls *L.fuscus* and *L.argentatus* 27(40), Sandwich tern *Sterna sandvicensis* 1065(797), roseate tern *S.dougallii* 20(3), common tern *S.hirundo* 1096(1038), arctic tern *S.paradisaea* 512(667), puffin *Fratercula arctica* 975(750).

In order to determine if the gulls were having an adverse effect on other breeding birds, an investigation into their foods was carried out in the course of wardening duties during the seasons 1979 and 1980.

METHODS

Pellets from the large gulls, *i.e.* the lesser black-backed and herring gulls, could not be distinguished and so were lumped together. Twenty fresh pellets from these large gulls, and twenty from black-headed gulls, were collected weekly from mid-May 1979, and mid-April 1980, to early August of each year; they were then soaked in methanol, dissected and the contents examined with a x10 hand lens. In all, 540 large gull and 560 black-headed gull pellets were studied.

Observations were carried out on feeding gulls; in 1979 they spanned thirty-six hours and in 1980 one hundred and ten hours. They were made every five days, in approximately five hour periods and at different times of day, and the results are given below.

RESULTS

Black-headed gulls. These gulls were chiefly taking terrestrial foods supplemented by some marine foods and many fed on the island, particularly in the lighthouse gardens.

Similar items were recorded in both 1979 and 1980 and the combined results are given in table 1. Gramineae, mainly stems, earthworms (Oligochaeta) and carabid ground beetles (in particular *Feronia*) were the most common items. Cereal grains, largely oats *Avena sativa* and some barley *Hordeum*

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Table 1

% frequency of occurrence of chief foods in pellets

Food	*B-headed gulls (560 pellets)*	*Large gulls (540 pellets)*
Marine organisms		
molluscs	13	20
crustaceans	8	—
vertebrates	—	15
Bird remains		
eider offal	—	4
eggshells	2	9
Earthworms	86	—
Carabid beetles	62	9
Earwigs	3	—
Gramineae	95	90
Cereal grains	6	5
Lichens	—	13
Rabbits	5	24
Offal	9	37
Inorganic material	—	36

vulgaris, occurred most frequently from late May to early July. Marine crustaceans, especially the crab *Hyas aranens*, were found early and late in the season, and the mussel *Mytilus edulis* and dogwhelk *Nassa* sp. appeared throughout. Marine algae, namely *Laminaria* sp., one green algae and sea thong *Himantualia elongata*, were recorded in 1980. House mouse *Mus musculus* remains were identified in four pellets, all found on the same day. Towards the end of the season considerable amounts of material such as glass, paper and plastic were present while eggshells were conspicuous, probably the result of foraging in the terneries. Food regurgitated by some twenty chicks contained earthworms and sandeels *Ammodytes* sp.

Cleptoparasitism upon terns and puffins was noted on several occasions, but no predation was actually seen although attacks on arctic tern nests were suspected.

Lesser black-backed and herring gulls. Here pellets fell into two types – marine which were soft and fragile, sometimes having a pinkish tinge and often containing translucent bones, and farmland which were firmer and usually pale brown and grassy, and up to 50mm in length. The principal food items are shown in table 1. In 1980, there were few pellets with cereal grains early in the season, Dermaptera sp. were absent and marine crustacea and vertebrates were also reduced in numbers. Items occurring more frequently in 1980 than in 1979 were inorganic materials and cattle offal in the form of black or white hairs, some up to 50mm in length. Grass, some of which may have been swallowed during grass pulling displays, formed the bulk of the pellets. Insects were uncommon, while the remains of a small passerine were found in a pellet in early June. Rabbit *Oryctolagus curiculus* fur was obvious in many pellets along with occasional vertebrae. Legs, feet and claws of eider ducklings were common, but, surprisingly, no bill remains were found. (Large gulls were seen swallowing whole eider ducklings.) Eiders formed the bulk of eggshell fragments. Much glass and plastic was found together with several other oddments such as polythene

bags, rubber bands and, very commonly, silver foil. No tern chick remains were identified in any pellet and it may, therefore, be assumed that chicks were fully digested.

There is no doubt that the large gulls were marine, island and mainland feeders and took more marine matter, and relied more upon island foods, than black-headed gulls.

Observed predation. Fifty-two examples of predation by large gulls were recorded in 1979 compared with thirty in 1980, a rate of 1.75 per hour of recorded observations (table 2). Most common terns were lost from a colony on the short grass where the nests were easily visible from both the ground and air; colonies among nettles suffered less.

Table 2

Number of individual predations and prey items taken

Prey	*Herring gull*	*Lbb gull*	*Gbb gull**	**Total**
Common tern				
eggs	11	12	—	23
pulli	9	10	—	19
juvenile	—	1	—	1
Roseate tern				
pullus	1	—	—	1
B-headed gull				
egg	—	—	1	1
pulli	2	2	—	4
juveniles	—	2	—	2
Eider				
eggs	2	8	—	10
pulli	1	2	2	5
Puffin				
juvenile	—	1	—	1
Oystercatcher				
egg	—	—	1	1
Rabbit	—	—	1	1
Unknown	2	11	—	13
	28	49	5	82

*This was an injured first year bird, responsible for all five predations

DISCUSSION

The general feeding pattern was fairly clear. Black-headed gulls were essentially grassland or arable farmland feeders; many left the island in early morning and, again, many returned as dusk approached. Their main flight lines appeared to be west southwest and between south and southwest.

Major movements of large gulls were east and west and most of those travelling westward had probably just been roosting on the island. Groups of these gulls, numbering more than two hundred, can often be seen in Amble harbour, particularly at low tide, though only a small proportion would have been Coquet breeding birds. These latter may join the non-breeding birds and feed alongside the fishing vessels that regularly pass near the island on their way in and out of Amble. In addition, seasonal foods, such as young rabbits, eider eggs and gull and tern chicks were regularly taken.

Many tern chicks were lost to the large gulls. Chicks are generally available from 8 June to 8 August (sixty days) and there are about 1.75 predations per hour (say 0.75 to 1.0 tern chicks per hour) while gulls fed for about fourteen hours a day. Accordingly, given 3000 pairs of terns, each hatching two young (*i.e.* a total of approximately 6000 chicks), the predation is, therefore, in the region of 10–15% of this total.

The predatory feeding habits of these large gulls is probably having only a small effect on the breeding success of the terns although this may be heightened to some extent by the island's small size and restricted breeding space.

The frequency of foods taken generally coincided to some extent with its availability. Eggs were taken in early June, ducklings in mid-June, marine molluscs in early to mid-June, cattle offal from April to mid-June (when a sudden decrease was noticeable) while inorganic materials became much less frequent towards the end of the season.

ACKNOWLEDGEMENTS

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THE RAVEN *CORVUS CORAX* IN NORTHUMBERLAND

by

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INTRODUCTION

For several years I have been interested in the history, distribution and numbers of the raven in what, prior to the local government boundary changes of 1974, was known as the county of Northumberland, and this paper includes my own observations as well as those made by other local ornithologists. Among these are the late G Bolam and the late T R Goddard, both of whom left a series of unpublished bird diaries, Mr J Almond, Dr H M S Blair and Mr R Cook. I have also consulted the relevant reports of the British Trust for Ornithology nest record scheme as well as all available published literature, including the annual ornithological reports. A full list of works dealing with Northumberland's birds is given in pages 179-181 of Galloway and Meek (1978-83) and, accordingly, I have only included in the references (page 23) those authors whose names (1) do not appear in this list or (2) are referred to specifically in the text.

DISCUSSION

Breeding summary. The raven is a resident, but there is some local movement, mainly of young and non-breeding adults, and there are occasional sightings of one or two birds, sometimes as far away as Lindisfarne NNR or the Farne Islands. Although Bolam (1912) mentions that communal roosting was once common, Galloway and Meek (1978-83) state that flocking is now rare; they give three examples of parties varying in numbers from eight to twenty-four while H M S Blair knew of a further record of seventeen on the moors in the Warksburn area during the winter of 1937.

It starts to repair or rebuild its nest in early February; eggs are laid at one or two day intervals and the female is incubating a full clutch (in Northumberland from two to seven eggs) by the middle of March. Following incubation and fledging periods of about twenty and forty days respectively, the young are flying towards the end of May; after hatching, they may be cared for by their parents for five and a half to six months (Goodwin, 1976).

Nesting sites. A nesting site is defined as a building, tree, crag or sea cliff which has been occupied at least once by a breeding pair of ravens. In 1915, Bolam (unpublished notes) listed nine sites on the borders which were used either regularly, or fairly regularly, but there is little detailed information for the period 1920-1950. Recording improved during the next twenty years and three, four and five sites are regularly mentioned with a peak of eleven to thirteen sites in the northwest of the county in 1967 and a resident population of forty birds in 1968. Since 1970, there has been a drop in numbers and in some years breeding has not been proved while in others there have been only one or two pairs.

Forty-three sites have been identified (see text-fig 1); they comprise two on buildings, six in trees and the remainder on crags. Excluding the first two sites, the remaining forty-one range in altitude from 160 to 600m above sea level with fourteen sites at 150-250m, fifteen at 251-350m, nine at 351-450m,

two at 451-550m and one at 550-600m. The average altitude is 315m. Despite the fact that sea cliff sites have been used in the adjacent counties of Berwickshire and Durham, none has been reported in Northumberland.

Nests on buildings included one which, towards the end of the eighteenth century, was built annually in the steeple of St Nicholas Church (now the Cathedral) in Newcastle upon Tyne (Hancock, 1874); it is the earliest known record. Another nest was discovered on a derelict farm cottage in the west of the county in about 1957 (H M S Blair, personal communication).

Among nests built in trees was one in an alder in the Cheviots in 1956; unfortunately, one of the adults had apparently been shot, but it is interesting to find that there is an earlier record (in 1889) for this area. In 1959, a pair nested in a tree on the side of a ravine close to a house in upper Coquetdale; the nest was examined in 1960 and again later, but there was no further attempt at nesting (R Cook, personal communication). Sometime before 1937, there was a nest in a Scots pine *Pinus sylvestris* in a garden at Ilderton (Bolam, 1912), while in *ca* 1927 a pair nested in a tall Scots pine in the Warksburn area, although for some reason they deserted. They made a second attempt a few miles away and in a similar tree; the hen laid a clutch, but was trapped before the eggs hatched and her mate disappeared and the locality has not been used again (H M S Blair, personal communication). The final record is in the north Cheviots where, at a date unknown, a pair reared two young. In addition, Temperley (1953) refers to a new site in a tree where four young fledged successfully in 1952 and also to an old nest found in a tree; unfortunately, nothing is known of the locations of these sites.

Some crag sites have been used only once, but others may be termed 'traditional' *i.e.* they are used year after year. Text-fig. 1 shows that there are no records for the area south of the Tyne gap; there is certainly land of the appropriate height (160-600m above sea level), but there may be a shortage of suitable crags. Moreover, in the past observers may not have visited the district, favouring instead the more traditional sites. There is, however, one site near Midgeholme in Cumbria which is only one kilometre from the Northumberland border.

A few sites may contain as many as five old nests, often protected by a rock overhang. Examples of this include a crag in the North Tyne valley with five nests, and another in the middle of the county where Goddard (unpublished notes) recorded four nests in the 1930s. Bolam (unpublished notes) described how two pairs nested on the same crag in upper Coquetdale in 1897 while Tyer (1954) mentions that in that year a pair built a nest in the Darden valley, less than one kilometre from an established pair.

In some cases the raven may have to compete with the peregrine *Falco peregrinus* and ten sites are known to have been used by peregrines. The raven is usually the loser in these conflicts and, although in other parts of the British Isles the two species have nested alongside each other on the same crag, this has not been recorded in Northumberland. On at least one occasion, however, the raven is known to have been the victor for according to Dixon (1903) 'around 1851 a pair of peregrines came every spring and tried to establish an eyrie in White Raven's Crag..., but were invariably driven away by the ravens.'

There was an unusual incident at a site near Whittingham. In 1960, a raven was found dead, shot, on the ground below the nest; when this latter was

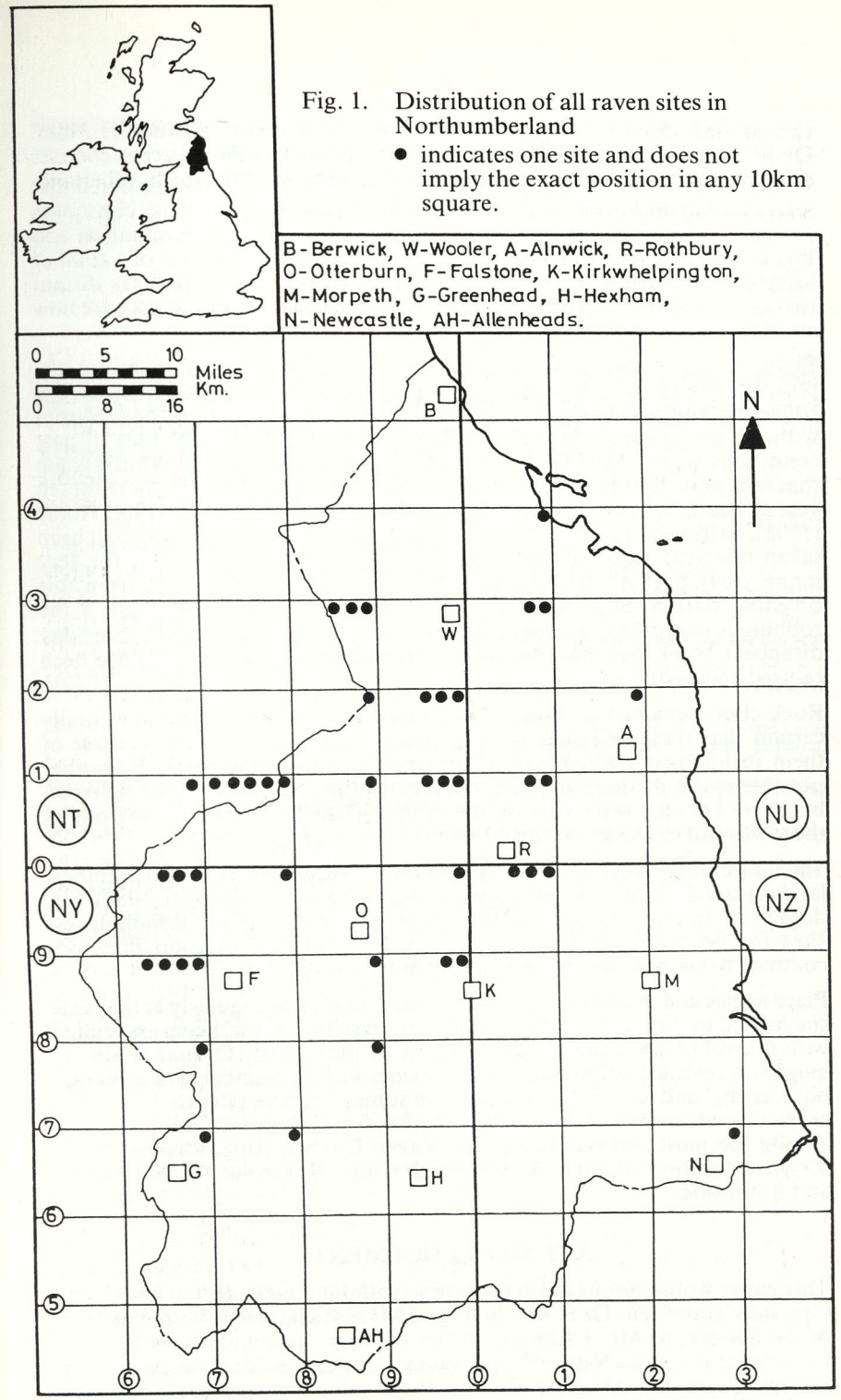

Fig. 1. Distribution of all raven sites in Northumberland
● indicates one site and does not imply the exact position in any 10km square.

examined a female merlin *F.columbarius* was flushed out and a single merlin's egg discovered (R Cook, personal communication).

Reasons for decline. Marquiss, Newton and Ratcliffe (1978) considered that increased afforestation and better sheep husbandry, with the consquent decrease in carrion, was largely responsible for the present situation and this is certainly true in Northumberland where thirty-five out of a total of forty-one sites (those in Newcastle and Ilderton are excluded) are distant two kilometres or less from plantations. Indeed, sixteen of the sites are now enveloped by forests.

Eight sites are adjacent to grouse moors, a fact which increases the possibility of birds being killed in one way or another by man. However, egg collecting and persecution of the adults has been carried on for centuries without any apparent significant decrease in numbers. Some idea of past conditions is given by Hardy (1889) who wrote of a site near Whittingham that it 'is now deserted by the ravens, which have not been seen there for ten years. The keepers shot the last of them'. Nine years later Milne Home (1898), writing of a nest in Redesdale, commented that 'the young had been taken this year as usual, and it is a deeply regrettable fact that for very many years past no young ones have been allowed to escape from this breeding station. Still the site is occupied year after year, though, if the robbing is continued, we may suppose that these poor birds will some day disappear from their ancient home.' Happily, these sites have since been re-used successfully.

Rock climbing and fell walking take place near ten sites and it is virtually certain that these activities were responsible for the desertion of three of them, including one which is on a Forestry Commission nature trail. Another possible cause of desertion is proximity to the Otterburn Training Area, but there are only three sites on the range, all on the periphery, and one of these was still in use in the early 1970s.

The future. It is hoped that the raven may continue to nest in Northumberland in small numbers (there were probably three pairs in 1982) for, despite increasing competition from the peregrine, there are still enough nest sites for both species to survive provided that afforestation does not continue to encroach on the remaining breeding stations.

Place names and the raven. The raven's habit of nesting regularly at the same site has led to the name 'raven', 'corby' or, possibly, 'crow' being associated with several of these places and a search of the 1:10000 Ordnance Survey maps has revealed twenty-eight such names in Northumberland although both 'corby' and 'crow' may probably in some instances refer to the carrion crow *Corvus corone.* Three of these places are simply farmhouses, but among the most obvious names are Raven Currick Rigg, Ravenscleugh, Ravenscrag, Ravenshaugh, Ravensheugh Crags, Ravenshill, Ravensknowe and Ravenside.

ACKNOWLEDGEMENTS

This paper would not have been possible without a great deal of help. I am especially grateful to Dr H M S Blair and Mr H Richardson, both members of the Society, to Mr. J Almond of the Alnwick Natural History Society, Dr D Ratcliffe of the Nature Conservancy Council and Mr R Morgan of the British Trust for Ornithology for their informative correspondence. Mrs G Hickling gave helpful advice and she and Mr A M Tynan allowed me to consult the Society's books and records. Finally I must express my special thanks to Mr R Cook, a former member of the Society, whose knowledge of the raven from 1945 onward provided me with the inspiration to begin my own studies.

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HARMOTOME FROM NORTHUMBERLAND

by

B YOUNG[1] and T F BRIDGES[2]

INTRODUCTION

The rare barium zeolite harmotome was first found in Northumberland by Sir Arthur Russell at Settlingstones and Stonecroft Mines [NY 843 683 and NY 855 689], near Hexham (Dunham, 1948). Although the discovery was reported at a meeting of the Mineralogical Society in 1933 no description of the mineral or its mode of occurrence here was published. Settlingstones Mine continued to yield specimens of harmotome until its closure in 1969. Examples are still obtainable from the Settlingstones dumps as well as from those at the neighbouring Stonecroft Mine. The present authors have examined Russell's specimens, now in the British Museum (Natural History), together with many more recently collected specimens from both localities. In addition, we have recently identified harmotome from two further Northumberland localities: Maughan's Shaft at Greyside Mine [NY 8646 6870] and Wellhope Shaft at Nentsberry Mine [NY 7786 4660]. In this note brief descriptions of the mineral and its associates are given for each of these localities.

OCCURRENCES IN NORTHUMBERLAND

Settlingstones Mine [NY 843 683]. Russell's manuscript notes, now held by the British Museum (Natural History) contain the following description of harmotome at this mine:

'...In 1931 I found crystals of harmotome in some cavities at the 90 fathom level west of Frederick's shaft, the witherite here having the whin sill (dolerite) on both walls...The harmotome occurs as minute, up to 1½mm colourless, often doubly terminated cruciform twinned crystals (100) (010) (001)...These crystals are encrusted with very minute secondary crystals of barytes giving them a snow-white appearance, and form a crust on flat rhombohedral crystals of calcite with here and there a minute crystal of pyrite. It also occurs as minute perfectly colourless crystals partly investing long prismatic crystals of calcite and as crusts of slightly smoky crystals on massive witherite. The spot mentioned is the only place in this extensive mine in which I have noticed the mineral...'

Many of the more recently collected specimens from here show harmotome crystals up to 3mm long, with the characteristic cruciform 'cross-stone' morphology, described by Russell encrusting white to pale cream-coloured pseudo-hexagonal pyramids of witherite, which line vugs in the witherite vein. Harmotome appears to be the last mineral to have formed in these vugs. Specimens collected recently from the dumps display harmotome crystals up to 3mm in length encrusting 'nail-head' calcite in cavities in kaolinised dolerite ('white trap'). Other specimens consist of a loose intergrowth of small (up to 0.5mm) doubly-terminated harmotome crystals with pyrite and colourless 'nail-head' calcite forming grey porous masses up to 10cm across. Scattered small crystals of secondary baryte are also present locally.

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Stonecroft Mine [NY 855 689]. Russell notes that at Stonecroft *or* Greyside Mine the harmotome crystals '...are exactly similar to those from the adjoining Settlingstones Mine, though in some cases they are rather larger, up to 2½mm, and show medial line and herring-bone striae on (010) very distinctly. They occur with small bipyramidal crystals of quartz forming a crust on grey altered whin (dolerite) and also with minute crystals of pyrite, on calcite and barytes...'

Small specimens of harmotome may still be collected from the Stonecroft dumps though since Russell's collecting much of the spoil has been treated for the recovery of sphalerite (F W Smith, personal communication). The majority of specimens obtainable here today show harmotome in colourless 'cross-stone' twinned crystals up to 2mm, and exceptionally up to 5mm in length, which are occasionally doubly terminated. They usually occur as scattered isolated crystals in vugs encrusting crystals of calcite, pyrite and witherite. A few specimens show harmotome encrusting etched crystals of dark brown sphalerite and witherite. More rarely the mineral occurs as crusts of crystals locally with a crudely radial arrangement, lining vugs in mineralized dolerite breccia. In most of the specimens seen harmotome appears to have been the last mineral to have crystallized. A few specimens show secondary baryte encrusting harmotome.

Greyside Mine [NY 8646 6868]. Early in 1983 we collected several specimens of harmotome from the dumps at Maughan's Shaft [NY 8646 6868], the easternmost working of the Greyside Mines. The mineral occurs here as crystals up to 1.5mm which closely resemble those from the Settlingstones and Stonecroft workings. One specimen was obtained in which harmotome and barytocalcite crystals up to 2mm line vugs in a calcite-barytocalcite veinstone. The relationship of the harmotome to the barytocalcite is not clear, but the harmotome appears to be the later mineral. This is the first record known to the writers of both minerals from this locality.

Wellhope Shaft, Nentsberry Mine [NY 7786 4660]. One small specimen of harmotome has recently been found on the dumps from this shaft. The harmotome occurs as very small (up to 1mm) colourless cruciform twins which together with honey-coloured barytocalcite crystals encrust colourless witherite lining a small vug. The single small specimen obtained here gives no indication of the relationship of harmotome to barytocalcite: both are clearly late stage minerals in the crystallization sequence. This is the first record of harmotome from this locality.

DISCUSSION

In all of the localities at which harmotome has been identified the mineral occurs in very small quantities as a very late-stage mineral in open vugs. At Settlingstones, Stonecroft and Greyside Mines it occurs in veins dominated by, or with abundant witherite, where the whin sill forms the wall rock of the ore-bodies. Reaction between late-stage barium-bearing mineralizing fluids and the felspars of the dolerite or their earlier-formed alteration products, is a likely source of the Ba, Al, K and Si required to form harmotome. However, harmotome has not been identified in other barium-rich veins which cut the whin sill elsewhere in the north Pennine orefield. In such places, for example Cow Green [NY 810 305] and Close House [NY 850 227], the deposits consist almost entirely of baryte with witherite present in very minor amounts. We suggest that the late-stage carbonating fluids responsible for the deposition of witherite, in part by replacement of pre-

existing baryte, as outlined by Hancox (1934), may have provided a suitable chemical environment for the development of small quantities of harmotome.

The discovery of harmotome at Nentsberry Mine is intriguing, as the ore-bodies worked here occur mainly in the Great Limestone with no associated igneous rocks. In this case the necessary metal ions for zeolite formation may have been derived either from shales or felspathic sandstones.

ACKNOWLEDGEMENTS

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SCANNING ELECTRON MICROGRAPHS OF SOME COMMON HEAVY MINERALS FROM THE SANDSTONES OF THE NORTHUMBERLAND TROUGH

by

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SUMMARY

Some of the most characteristic surface features of heavy minerals from sandstones in the Northumberland trough, as they appear under the scanning electron microscope, are described. Micrographs of four common species - garnet, zircon, apatite and tourmaline - are included to illustrate the text.

INTRODUCTION

The Carboniferous of the Northumberland trough is dominated by repeated formations of shallow-water, deltaic, clastic sediments. Of these, the most important is that known as the Fell Sandstone Group. Other formations, especially the sandstones of the Lower Limestone Group, in the Otterburn-Bellingham area, are locally well-developed. There are also clastic sequences belonging to the Scremerston Coal Group, the Middle Limestone Group, the Upper Limestone Group, the Millstone Grit and the Coal Measures. The Cementstone Group, at the base of the Carboniferous succession, is characterised by alternating sandstones and shales, with some limestones; but it is as rare in the Cementstones as it is common in the succeeding groups, for a clastic formation to exceed a thickness of twenty metres. The Fell Sandstones, however, present an unbroken thickness of 300 metres in the Rothbury area (NZ 025975).

Over the years, heavy mineral assemblages have been examined from the clastic rocks of the Northumberland trough by a number of workers. In some cases the evidence has been published, but it has often remained enshrined in unpublished theses. The earliest recorded reference was that by Trevelyan (1835), but nearly 100 years were to elapse before Kellett (1927-28) produced his paper on the Coal Measures, followed by that of Hawkes and Smythe (1931) on the garnet-bearing sands of the shore. More recently, the heavy minerals from individual groups of the Northumberland Carboniferous succession have been examined in some detail, including those from the Cementstones and Fell Sandstones (Campbell, 1954; Robson, 1956; Orr, 1957; Bell, 1963), the Lower Limestone Group (Frost, 1969), the Middle Limestone Group (Hemingway and Tamar-Agha, 1975) and the Coal Measures together with the Upper Limestone Group and the Millstone Grit (Jones, 1955).

The development of the scanning electron microscope has greatly advanced the study of the surface features of detrital grains. Such features enable the investigator to assess the relative importance of abrasion and of chemical solution and chemical precipitation, as has been described by Krinsley and Doornkamp (1973). The response to these influences depends upon the species of heavy mineral, the mode of transport and the movement of intrastratal solutions. The following account is illustrated by reference to

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heavy mineral grains separated from the Cementstones, the Fell Sandstones and the Rothley Grits. However, in the writer's experience, they are typical of many of the heavy minerals obtained from clastic deposits of the Carboniferous throughout the trough.

In the more detailed work carried out on these clastic deposits since 1950, there is agreement that the common non-opaque heavy minerals, forming only an extremely minute fraction of any sample of sandstone, include garnet, zircon, apatite, tourmaline and rutile. Monazite has also been recorded from the Fell Sandstones and, more frequently, from the Coal Measures. Epidote and staurolite also occur rarely in the latter group.

MINERAL DESCRIPTIONS

The usual method of separating the light from the heavy fraction is one that has been well-tried (Robson, 1956). In the present investigation, after selection and examination of heavy grains in reflected light under the binocular microscope, further examination has been carried out under the scanning electron microscope. Some of these grains have been reproduced as micrographs (plates 1 and 2). All are from outcrop samples, except where specifically stated otherwise.

Garnet. An uncommon variety of garnet, occurring in the Rothley Grits, which are very coarse sandstones near the base of the Upper Limestones Group (NZ 040890), attracted, at an early date, the attention of Trevelyan (1835). The grains are large, dull pink to brown and they are generally highly corroded. It is common for deep solution cavities to occur within them (plate 1, fig. 1).

It is normal for grains of garnet to show evidence of the diagenetic process. Facetting, for example, is a common feature, as is seen in an almost colourless garnet from a borehole sample, at depth 37.79m (plate 1, fig. 2) from the Fell Sandstones at Longframlington, north of the Coquet valley (NU 100025). Corrosion, in the form of minute solution cavities, occurs in the pink, facetted garnets of the Cementstone Group (plate 1, fig. 3) of the Coquet valley (NT 950025), while Hemingway and Tamar-Agha (1975) have discussed the stages of etching in the garnets of the Middle Limestone Group.

Garnets gathered from the shore at Budle Bay, near Bamburgh (NU 150360), were identified and described by Hawkes and Smythe (1931). They concluded that these garnets were derived from the Carboniferous succession rather than from the whin sill. Typically, they show smooth, previously facetted surfaces, but rounded mechanically in their latest (beach) environment (plate 1, fig. 4). Corrosion cavities show a smoothness uncharacteristic of garnets examined from indurated sediments.

Zircon. Grains of zircon are invariably present in heavy mineral assemblages obtained from the sandstones of the Carboniferous of the Northumberland trough. They occur colourless or purple, occasionally brown. Unlike garnets they are, as is well known, much more resistant to chemical corrosion and, in their host sandstones, they generally retain such surface features as were imposed on them by abrasion prior to deposition.

Plate 1, fig. 5 illustrates an elongated purple zircon from the Fell Sandstones of the Coquet valley which was broken during transport, followed by a rounding of its crystal edges. Subsequently, after deposition, its smooth

crystal faces were subjected to limited corrosion and possibly some secondary growth. In detail (plate 1, fig. 6) a surface on the pyramid face, undoubtedly abraded during transport, is reminiscent of the effect produced on a quartz grain during violent shaking in water, in a laboratory experiment (Robson, 1978, plate 9, fig. 6). This, therefore, appears to be another example of an abrasive, scaling process, in this case on a zircon grain, which has begun to peel off secondary growth from an earlier sedimentary cycle.

Incidentally, outgrowths, such as those described by Butterfield (1936) and Smithson (1937) have not been recorded from the zircons of the Northumberland trough – which may bear out the observation of the latter author that such phenomena are more common among impoverished assemblages. Plate 2, fig. 1 illustrates a very mature grain of zircon, in this case from the Rothley Grits (NZ 040890). The original grain has been broken and abraded almost to a sphere, so that its crystal faces have been entirely obliterated. Its surface is smooth though detail (plate 2, fig. 2) reveals, in its post-depositional history, some corrosion and some secondary growth.

Apatite. Grains of apatite are generally colourless, with a slightly milky appearance and, as such, are easily distinguishable, under reflected light, from zircon crystals. Apatite is much more chemically vulnerable, and often clearly shows the effect of intrastratal solution. Plate 2, fig. 3 from the Cementstones of the Coquet Valley is an example of the hexagonal form, with rounded edges produced prior to deposition. The micrograph of a portion of the surface (plate 2, fig. 4) is of a solution cavity.

Tourmaline. Plate 2, fig. 5, from the Rothley Grits, illustrates a fragment of euhedral tourmaline. Unlike the examples described above, this grain is one of the products of an earlier experiment in which it was placed in a drum with about ten grams of quartz sand. The drum, filled with water, was gently rotated for 8000 hours and the tourmaline was then removed (Robson, 1978). As can be seen, the crystal edges, which were angular when the grain was extracted from the sediment, have become somewhat rounded, as has the broken surface normal to the c axis. But the prism faces appear smooth, unabraded and only slightly affected by chemical solution.

In contrast, plate 2, fig. 6, a grain from the Fell Sandstones of the Coquet valley, is a broken fragment which is well rounded and which has subsequently been subjected to corrosion, so that barely any part of its surface shows the smooth character of that in plate 2, fig. 5. In fact, these two examples are common contrasting types of tourmaline found in most of the heavy mineral assemblages of the clastics in the Northumberland trough.

Other non-opaque heavy grains. Rutiles, not illustrated in this paper, are common among the heavy mineral assemblages and occasionally they occur in needle-like form. But, generally, they are irregular in shape, and are much subject to corrosion. Monazites, also not among the micrographs, are rare, but when present are almost invariably near-spherical grains.

COMMENT

A detailed study of the heavy minerals of the Northumberland trough, of which the above is but a brief introduction, would include a comparison of the surface features of grains with those from possible source rocks –

PLATE 1

fig.1 Garnet from the Rothley Grits, Upper Limestone Group, Rothley Crags

fig.2 Garnet from the Fell Sandstone Group, Longframlington borehole

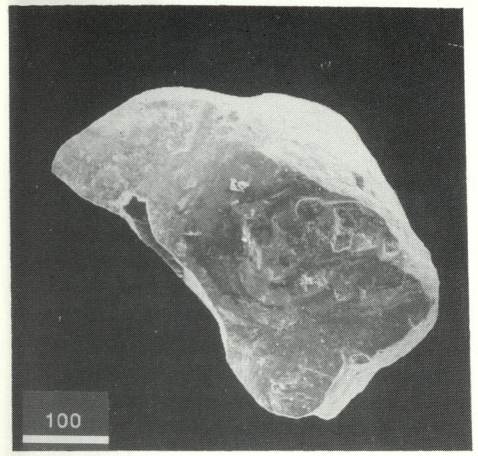
fig.3 Garnet from the Cementstone Group, Coquet valley

fig.4 Garnet from beach sand, Budle Bay

fig.5 Zircon from the Fell Sandstone Group, Coquet valley

fig.6 Zircon from the Fell Sandstone Group, Coquet valley (detail of fig. 5)

Scale in microns



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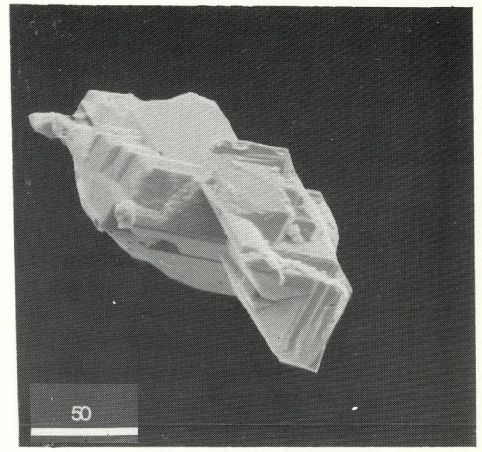

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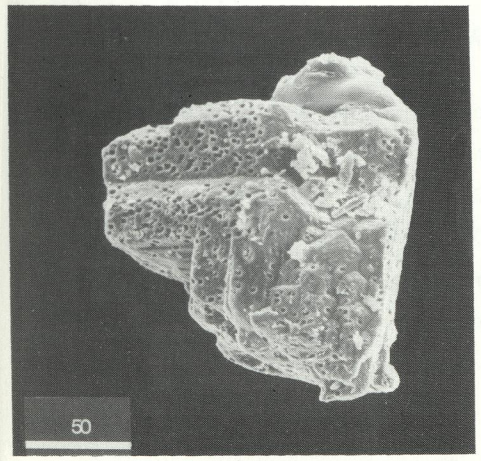

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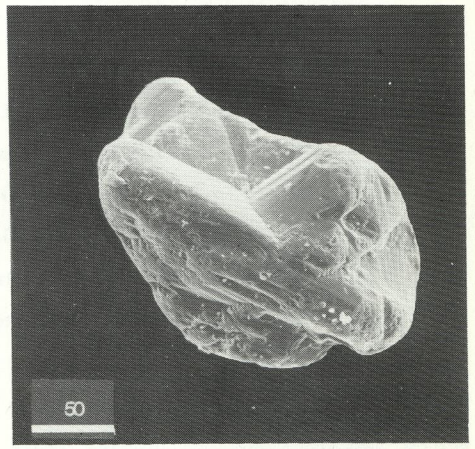

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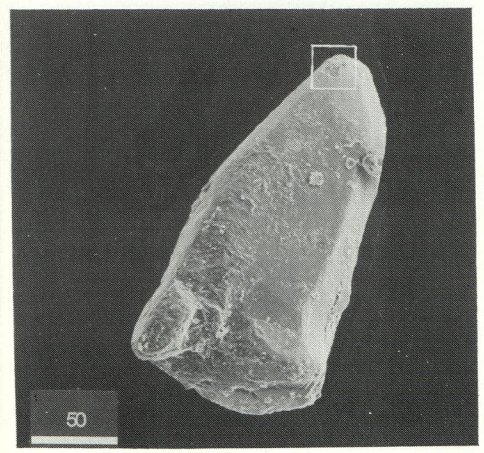

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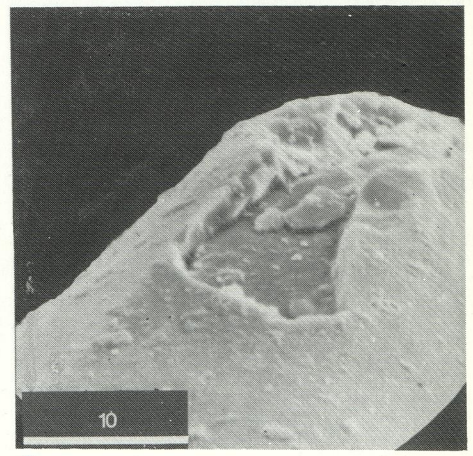

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PLATE 2

fig.1 Zircon from the Rothley Grits, Upper Limestone Group, Rothley Crags

fig.2 Zircon from the Rothley Grits, Upper Limestone Group Rothley Crags (detail of fig. 1)

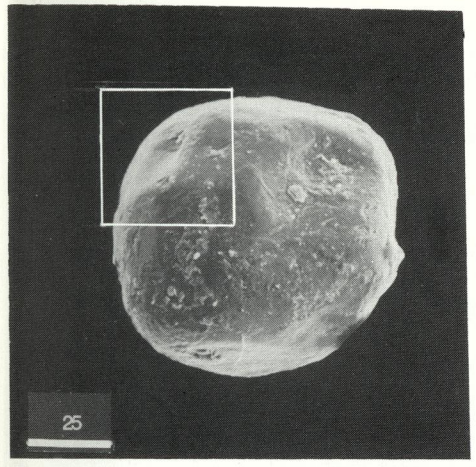
fig.3 Apatite from the Cementstone Group, Coquet valley

fig.4 Apatite from the Cementstone Group, Coquet valley (detail of fig. 3)

fig.5 Tourmaline from the Rothley Grits, Upper Limestone Group, Rothley Crags

fig.6 Tourmaline from the Fell Sandstone Group, Coquet valley

Scale in microns



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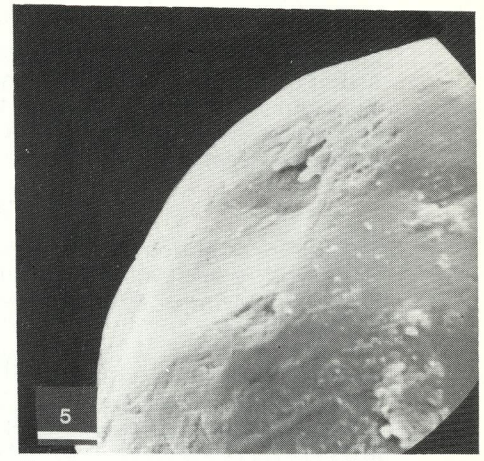

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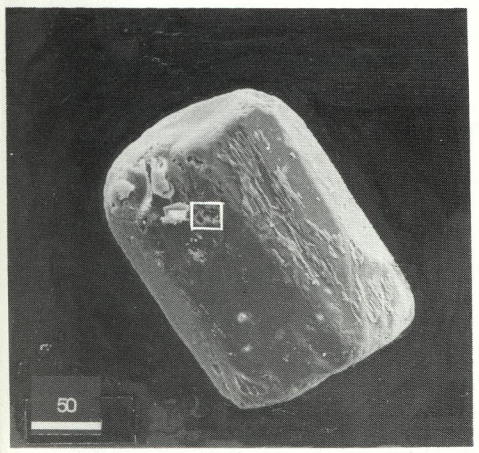

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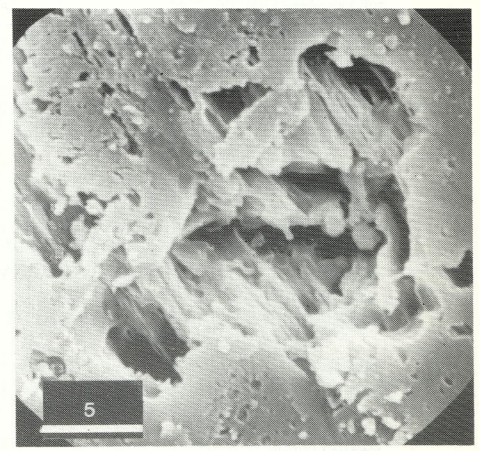

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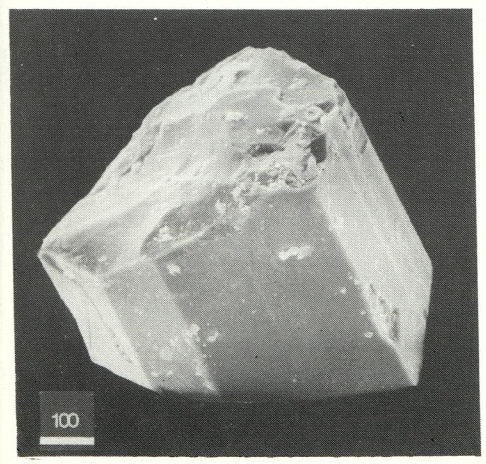

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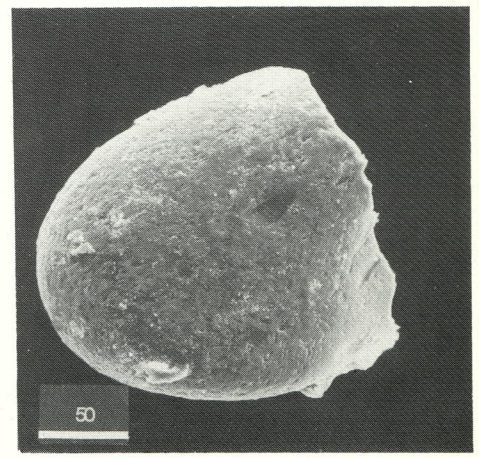

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igneous and sedimentary, the chemical composition of the grains themselves and of their secondary growth, their age determination and the influence of the sedimentary facies in which they occur. The available field material is extensive and the opportunities for research are wide over what, in this area, is almost virgin territory.

ACKNOWLEDGEMENTS

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SHORT COMMUNICATION

A NOTE ON THE OCCURRENCE OF A SWORDFISH *XIPHIAS GLADIUS* L. ON THE NORTHUMBERLAND COAST

The swordfish is considered to be a rare fish in the seas of northwestern Europe, although it occurs more commonly off the coasts of Spain and Portugal and in the Mediterranean (Wheeler, 1969), It is, however, worldwide in its distribution in tropical and warm temperate seas, and is the only member of the monospecific family Xiphidae (Perciformes). Only three records are known for the northeast coast of England namely a specimen stranded at Redcar in 1874, one brought into North Shields by trawler (pre-1890) and one seen leaping out of the water off Dunstanburgh on 18 August 1892 (Davis, 1983). The fourth record, and subject of this note, was caught alive in salmon drift nets east of Coquet Island, Northumberland, on 26 August 1983 by D Ferguson and C Warwick, who donated it to the Hancock Museum. The specimen was a male which weighed 20.4kg and other measurements were as follows: total length 170cm; standard length 149cm; greatest depth of body 25cm; length of head 77.5cm, length of snout 58.5cm; eye diameter 5cm; interorbital space 9.8cm; bony interorbital space 8.4cm; maxillary length 65cm; length of caudal peduncle 19.5cm; least depth of caudal peduncle 5cm.

Although a large fish, it is small compared to others caught in British waters, individuals with a total length of 330cm having been reported. The maximum length recorded is 490cm with a weight in excess of 454kg (Wheeler, 1969). Swordfish are active predators, mainly on shoaling fish, and the Coquet specimen had been feeding on herring, sprat and mackerel. Although too badly damaged to make a specimen for display, its skeleton has been preserved for the research collections.

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AT THE FARNE ISLANDS
1983-1985

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THE GREY SEAL *HALICHOERUS GRYPUS* (FABR.) AT THE FARNE ISLANDS: 1983-1985

by

GRACE HICKLING AND PETER HAWKEY

Farne Islands Committee of the National Trust
and Natural History Society of Northumbria

This report covers three breeding seasons, namely 1983, 1984 and 1985. As always, P Hawkey was responsible for organising the field work in which he himself played a major part, spending a great deal of each season out on the islands. His principal helpers were the wardens I Clowes (1985), G Crook (1983), N Gartshore (1983, 1984 and 1985), D Hadley (1984), J Haw (1984), G Hay (1985), N Holton (1984), K Miller (1983), K Rideout (1984 and 1985), D Sharrod (1984 and 1985), M Tyres (1985) and J Walton (1983, 1984 and 1985). Three officers, R E Meyrick, O Maurice and P Dickson from the National Trust regional headquarters at Scots' Gap, also visited the colony, while each year J Prime of the Sea Mammals Research Unit (SMRU) spent some time on the islands, collecting material for the Unit.

Two wardens took up residence in the Brownsman cottage on 8 October 1983 and on 24 October they were joined by two other wardens and, with the exception of a short period from 18 to 23 October, when two of them moved to Inner Farne, the whole team was based on Brownsman throughout the season.

Weather remained good during October and early November and regular counts of calves were made although a steadily increasing southwest wind prevented any landings on Megstone and Crumstone on 31 October. However, a heavy swell and strong winds – they reached force 7-8 from the north on 15 November – made it impossible to launch any boats between 13 and 17 November and it was 18 November before another count could be attempted and the wardens transferred to Inner Farne. Early next day, with only a light westerly wind, the count was completed when both Crumstone and Megstone were visited. Unfortunately, this proved to be only a brief calm spell although a drop in wind strength, and low water, enabled the wardens to land on the Wideopens on 22 and 23 November. Despite the fact that the weather continued unsettled for the remainder of the month, counts were made on 25 and 30 November and next day the wardens were brought back to the mainland.

In 1984, four wardens were stationed on the islands from 1 October, two on Inner Farne and two on Brownsman; on 27 October the Inner Farne contingent was increased to three while two additional wardens joined the Brownsman party.

The weather in mid-October was generally good with light winds and a considerable amount of sunshine. However, conditions changed on 18 October and during the next six days there was a heavy swell which made it impossible to launch a boat from Brownsman. Similar conditions occurred intermittently throughout much of November and there was no long calm spell. Despite this, regular counts were made on all islands except Crumstone, the longest interval between visits to the nurseries being nine days. Unfortunately, it proved impossible to get onto Crumstone although no calves were seen there; indeed had any been born on this island they would

have been swept off during the storms. P Hawkey commented that fewer seals than usual appeared to be present offshore on both the inner and outer groups of islands, perhaps because of the more obvious presence of wardens.

Regular counts were made during the second half of October 1985, but, with the exception of 7 November, weather during early November was extremely stormy. From 2 to 6 November the winds were westerly, force 4-8, and according to P Hawkey 'a most savage northerly swell continued unabated for five days with no hope of ever launching a boat'. On 7 November, with the swell dying down, the wardens crossed to South Wamses (where a count was made) and then walked across to the north island. Here the count had just been completed when one of the wardens fell and was grabbed by a cow seal. He was rescued by another warden, but he, too, was attacked, this time from behind, by another cow.

Counting was immediately abandoned and the injured men were taken ashore for medical treatment. Luckily their injuries were not serious although one had to have three stitches in a wound; this incident illustrates, very clearly, the hazards of working on difficult terrain among large and aggressive animals. Even calves are not the gentle, cuddly creatures so often portrayed by the media, but, from a very early age are capable of inflicting quite a nasty bite.

Another spell of westerly winds (force 6-10) followed from 8 to 12 November and on some days these were so violent that it was impossible even to stand, let alone work, outside the buildings. At the same time there was a very heavy swell from the north, bringing with it waves up to nine metres in height.

On 14 November all the islands except Crumstone were visited and the effect of the storms assessed. It was obvious that the Wamses had suffered badly and that many of the animals previously located round the shores had been driven up onto the tops of the islands – on North Wamses, for example, out of a total population of 267 calves, 195 were on the top. Equally startling was the effect on the north side of this island for, while 111 calves were present here on 31 October, only four remained on 14 November, and this despite the fact that it was the peak of the breeding season. Moreover, it was apparent that many previously dyed animals were missing.

The weather continued unsettled and on 27 November there were snow showers throughout the day while the freshwater pools had frozen solid – a most unusual state of affairs for the Farnes. Even the final return to the mainland on 6 December was not without adventure for although initially the sea was calm, by 1000 a heavy swell was rapidly developing and two hours later when *Glad Tidings III* reached Seahouses it was to discover the lifeboat waiting to escort all boats into harbour.

Human presence on the vulnerable islands is an essential factor in preventing damage to the fragile soil cap and during their stay on the islands the wardens carry out a considerable amount of conservation work as well as undertaking general repairs and maintenance. An important task is the replanting of bare areas and the increase in the number of wardens in 1984 and 1985 meant that replanting, too, could be very greatly increased. Seedlings of various grasses and of sea campion *Silene maritima* are grown in a 'nursery' in the upper garden on Brownsman and from here are transferred to other islands including the Wideopens, Staple Island and Brownsman itself. Inevitably the grassy paths on Inner Farne suffer from visitor pressure during the summer and the opportunity is taken to repair and, in some cases, returf the worst affected areas. In 1985, a major task was undertaken on Staple Island

when the wooden pathway was lifted, the laths drilled and then nailed down onto stringers. Maintenance work includes the regular checking of the gas-gun scarers – essential devices to deter seals from coming ashore at night when no wardens are visible. The wardens' quarters on both Brownsman and Inner Farne are redecorated regularly and each year routine repairs are made to the buildings and dry stone walls.

Time of breeding. Dates of the (probable) first births on the different islands are given in table 1. In 1983, although a white-coated and perhaps newborn calf was washed up on the mainland to the north of Seahouses on 15 October, the first calf actually on the islands was seen by W Shiel on 14 October as *Glad Tidings III* passed North Wamses; however, a heavy swell prevented the wardens launching a boat and it was not until 18 October that it was possible to visit the Wamses when seven young were counted on the north island. Two days later, on 20 October, a cow and calf were noticed on the South Wamses shingle beach.

Table 1
Date of first births

	1983	1984	1985
North Wamses	14 October	14 October	17 October
South Wamses	20 October	17 October	26 October
Big Harcar	24 October (E)	18-19 October (E)	20 October
Northern Hares	22 October (E)	25 October	2 November (E)
West Wideopens	21 October (E)	—	—
Crumstone	—	—	25 October (E)
Megstone	22 October	15-16 October	16-17 October

NOTE (E) indicates that this date is based on an estimate of the age of the oldest calf found on the first visit to this island

No calves had been born by 13 October 1984, but next day, when both groups of islands were checked, a stillborn female was found on North Wamses. A further search on 17 October revealed another dead female on South Wamses together with two live males on Megstone. In 1985, breeding started two to three days later than on the two previous years. On 17 October, a female, born only a short time before, was seen on North Wamses while on the same day a second calf, this time a male, was found dead on Megstone; it was thought to be about twenty-four hours old. Breeding on South Wamses, too, began considerably later than usual and it was not until 26 October that a calf (a female less than a day old) was discovered on the south shingle beach.

Calf population and mortality rate. There was considerable satisfaction in 1981 and 1982 when counts of calves born (992 in both years) indicated that the colony size appeared to have stabilised at the desired figure of 1000 breeding females. At the same time it was realised that this very considerable drop in numbers was mainly due to the establishment of a large breeding group of grey seals on the Isle of May and that, in future, these two colonies should be regarded as forming a single population.

Table 3 sets out the relevant births from 1980 to 1985 and it shows that there have been marked fluctuations in numbers, especially on the Isle of May; moreover, the drop in Farne births in 1983 and 1984 was not matched by a corresponding increase on the Isle of May. The 1984 Farne total of 778, which represented a decrease of 21.6% in only two years, gave rise to some

Table 2

Calf population and mortality rate 1983-85

Numbers of calves (alive and dead) born between counts

Date of count	*North Wamses*	*South Wamses*	*Northern Hares*	*Longstone End*	*Longstone main road*	*Big Harcar*	*West Wideopens*	*Scarcars*	*Crumstone*	*Megstone*	**Total**
14.10.83	1	–	–	–		–	–	–	–	–	1
18.10.83	6	–	–	–		–	–	–	–	–	6
22.10.83	18	4	3	–		–	1	–	*	2	28
24-26.10.83	47	7	–	–		1	*	1	–	*	56
29-31.10.83	172	14	6	–		–	28	–	*	*	221
2-4.11.83	71	16	5	–		2	22	4	–	8	128
8.11.83	87	14	29	1		1	27	1	*	*	160
18-19.11.83	76	33	69	–		–	43	–	–	8	229
25.11.83	20	20	8	1		–	4	–	*	–	54
30.11.83	2	4	9	–		–	1	–	*	–	16
17.10.84	1	1	–	–		–	–	–	–	2	4
21.10.84	12	2	–	–		2	–	–	*	*	16
24-25.10.84	35	–	1	–		–	–	–	*	–	36
29-30.10.84	99	4	7	–		–	–	–	*	1	112
2.11.84	117	6	20	–		–	–	–	*	2	145
7.11.84	95	44	37	–		–	–	–	*	*	176
11.11.84	60	18	56	–		–	–	–	*	1	138
20.11.84	45	13	57	–		3	–	–	*	–	117
25.11.84	7	2	7	–		1	–	–	*	*	16
1.12.84	6	3	4	–		–	–	–	*	*	13
5.12.84	1	1	–	–		–	–	–	*	–	2
17.10.85	1	–	–	–		–	–	–	–	1	2
20-23.10.85	34	–	–	–		1	–	–	–	*	36
27.10.85	86	2	–	–		1	–	2	6	2	99
31.10.85	153	13	–	–		–	–	–	*	*	166
7.11.85	174	*	*	*		*	*	*	*	*	174
14.11.85	72	112	10	–		12	–	–	*	*	206
18.11.85	32	13	13	1		5	–	–	2	*	66
28.11.85	35	7	29	–		2	–	–	–	*	74
2-5.12.85	7	2	9	–		–	–	–	–	4	22
Nos born											
(1) 1983	**500**	**112**	**129**	**2**		**4**	**126**	**6**	–	18	**901**
(2) 1984	**478**	**94**	**189**	–		**6**	–	–	–	6	**778**
(3) 1985	**594**	**149**	**61**	**1**		**21**	–	**2**	**8**	7	**858**
Nos found dead on islands											
(1) 1983	**109**	**27**	**23**	**1**		–	**24**	–	–	1	**187**
(2) 1984	**112**	**18**	**35**	–		**2**	–	–	–	1	**172**
(3) 1985	**74**	**25**	**9**	–		**5**	**1**	–	–	1	**121**

NOTES (1) An * indicates that no landing was made

(2) In addition, calves were born, or washed up as follows: 1983, Blue Caps (1), Brownsman (1), mainland (1); 1984, Roddam and Green (1), Brownsman (1), Staple Island (1); 1985, Brownsman (6), Wideopens (4), Inner Farne (1), mainland (2). These births and, where appropriate deaths, are included in the relevant annual totals

(3) Although weather conditions in 1984 made it impossible to land on Crumstone, there were sightings of calves on this island

Table 3
Annual number of calves born

Year	*Farne Islands*	*Isle of May*	*Total*
1980	1118	499-532	1617-1650
1981	992	505	1497
1982	992	600	1592
1983	901	341	1242
1984	778	506	1284
1985	858	804	1659

anxiety and there was corresponding relief when the 1985 results showed that, not only had the decline been halted, but that there had also been a modest increase. However, it is apparent that the situation is far from stable and that continuous monitoring of the colony's welfare, by means of calf population counts, is an essential part of management.

Details of the numbers of births and deaths on the various islands are given in table 2 and this shows that North Wamses remains the most popular nursery with second place going to the Northern Hares (in 1983 and 1984) and South Wamses (1985). These three islands attract the bulk of the breeding females and there are only a handful of births away from here.

The overall mortality rates were 20.7% (1983), 22.1% (1984) and 15.5% (1985); this last is a surprisingly low figure which takes no account of the fact that up to 138 calves apparently disappeared from the north and east shores of North Wamses between 31 October, when 150 young were counted, and 14 November when only five remained. It was thought that seven youngsters might have moved to the top of the island, but there was no other indication that the missing animals were still present on 14 November – indeed, there had obviously been serious losses from other parts of the shore.

Colony management. Hickling and Hawkey (1983) gave a brief account of the Farne seal colony, tracing its history from the middle ages, when the monks of the House of Farne exploited both adults and young, through the culls of the 1960s and 1970s, until the present day. They explained that the National Trust's management policy now has two objectives, namely to stabilize the colony size at approximately 1000 breeding females and to prevent the vegetated islands being used as seal nurseries with the consequent risk of damage to the fragile soil cap. They emphasised that although 1089 females and 290 males were removed during the 1972 and 1975 operations, adults are now killed only if other, non-lethal measures prove ineffective. The most important of these measures, which prevent females coming ashore on Brownsman and Staple Island, is the regular patrolling of these islands by wardens. These patrols are reinforced by 'scarers', *i.e.* gas-guns operated by propane gas which fire warning shots at intervals.

Up to 1983 all the wardens were based on Brownsman and from there it was comparatively easy to reach Staple Island. Unfortunately, it was much more difficult to employ similar measures on West Wideopens, another island with a fragile soil cap, for long spells of stormy weather often made it impossible to cross Staple Sound and so reach this island. Something of this nature occurred in 1982 for no visit could be made between 31 October (when one calf was found) and 17 November by which time the number of young had risen to 142.

In the 1983-85 seasons the Trust's policy again proved completely effective so far as Brownsman and Staple Island were concerned, but in 1983, 126 calves were born on West Wideopens and on 18 November 101 live youngsters were counted here. Fortunately, only four of the cows were on the vegetation and after these were removed, it proved unnecessary to kill any more adults. The Trust greatly regretted the need to take even this small number of healthy animals and in 1984 it was decided to extend the measures used on Staple Island and Brownsman to the inner group. With this in mind wardens are now resident on Inner Farne throughout the breeding season and, in consequence, there have been no births on the Wideopens. Despite the very considerable extra cost involved, the Trust feels that results have fully justified this decision.

Table 4
Numbers of animals (including ailing and starveling calves) shot 1983, 1984 and 1985; 1982 figures are included, for comparison, in brackets.

	Staple Island	*Brownsman*	*North Wamses*	*West Wideopens*	*Other islands*	**Total**
Adult males						
(1982)	–	–	(1)	(3)	–	(4)
1983	–	–	–	–	–	–
1984	–	–	–	–	–	–
1985	–	–	–	–	–	–
Adult females						
(1982)	–	–	(28)	(21)	–	(49)
1983	–	–	–	4	–	4
1984	–	–	–	–	–	–
1985	–	–	–	–	–	–
Calves						
(1982)	(2*)	(8*)	(40)	(70)	(14)	(134)
1983	3*	8*	9	5	–	25
1984	–	4*	17	–	16	37
1985	–	21*	9	3*	4*	37

*Not born on these islands

Table 4 shows the numbers of animals shot in the 1983-85 seasons. It must be emphasised that calves were killed only for humanitarian reasons; they included forty-three starveling youngsters (ten in 1983, five in 1984 and twenty-eight in 1985) which had been washed off their natal islands and, therefore, stood no chance of survival.

SMRU research. The tragic deaths of two members of the Unit, in a helicopter crash on 26 June 1983, meant a major curtailment in the programme planned for 1983. It was subsequently hoped to carry out this work in 1984 and 1985, but, in fact, comparatively little was actually done on the islands.

The aims and methods of the planned research were as follows:

(1) to provide, by means of aerial surveys, an assessment of the numbers of calves born and to photograph the distribution of the breeding animals

(2) to collect, as in 1981, faecal samples at frequent intervals. These would be examined, in the laboratory, to determine the species and size of fish eaten by the seals

(3) to study, as described in Hickling and Hawkey (1983), the local movements of the seals. In view of earlier, disappointing results, it was planned to modify both the type of tag and the receiving equipment. This work would be supplemented by regular aerial surveys of the east coast during which there would be a search for radio-tagged seals, while the numbers of seals in the various haulouts would also be counted

(4) to investigate new methods for estimating the size of the Farne Islands seal colony. In the past, the numbers of calves born annually formed a reliable guide to colony size, but since 1975 it has become increasingly difficult to convert these figures into accurate estimates. Accordingly, two possible new methods would be investigated: the first would use figures obtained from the haulout counts, while the second would be based on the variation in the natural markings of the seals and the identification of individuals by means of photographs

Members of the Unit visited the islands in March 1983, April 1984 and May 1985 when they collected faecal samples and made photographic records and general observations.

Other aspects of the research were carried out during the breeding seasons, mainly by J Prime, but with considerable help from the wardens. He collected numerous specimens from dead seals and also photographed certain individuals for inclusion in the proposed catalogue of recognisable animals. In 1985, a special effort was made to collect faecal samples and between 19 and 23 October, and again on 29 November, all the islands were surveyed.

Marking seals. Once again no seals were tagged or marked with plastic streamers during the period and only two animals were recovered although five tags were found, minus their owners (table 5).

Inevitably many tags become detached and these latest recoveries give no indication of how long the tags had remained in place. All that can be said with certainty is that the marked animals had left their natal islands and that one had travelled to Seahouses while another had reached Alnmouth.

Colour dyeing is an essential tool when counting calves and some of these colour-marked animals invariably turn up on the mainland. Their numbers and age – *i.e.* whether they are still in their first coat or have completed the moult – depend largely on recent weather conditions on the Farnes and this is clearly illustrated in table 5. Only comparatively few animals were recorded in 1983 and 1984, but at least fourteen were found in 1985, the most distant in the Seaton Delaval area near Blyth.

Cow seal entangled in fishing net. On 21 November 1985 an adult female seal, with a fishing net entwined over its neck and head, was seen in the North Cove of Brownsman. It was caught and, despite attempts to bite its rescuers, was eventually freed. Unfortunately, although at the time this was not noticed, it must have been injured, for on 28 November it was found dead on the North Wamses shingle beach. Its head appeared to have fallen off.

Seal attacking gull. On 28 November 1985 an immature great black-backed gull *Larus marinus* was mauled by a seal on North Wamses and, as a result, had to be destroyed. It carried a ring, Stavanger 344368, and had been marked as a pullus at Feøy, Karmøy, Rogaland, Norway, on 19 June 1985.

Unusual mortality among adult grey seals. Nine adult male grey seals were found dead in the period late December 1985 to early February 1986. One was discovered at the Long Nanny, near Beadnell, during the Christmas holidays, while between the end of January and early February 1986, there were two near the Beadnell limekilns, three on the coast from Seahouses to

Table 5
Recoveries of Farne marked seals

(a) Tagged animals

No	*Date marked*	*Recovery details*	*Date recovered*
6585	9.11.61	Longstone. Tag only found	May 1984
A0641	22.11.64	,, ,,	28.2.85
2435/6	1.11.71	Alnmouth, Northd. Tag only found	26.10.85
25090	23.11.79	South Wamses. Washed up dead, badly battered	*ca* 9.6.85
25117	,,	Lynmouth, Northd. Found dead on beach	24.6.83
25390	26.11.80	'Farnes'. Tag found when diving	29.7.84
25434	27.11.80	Seahouses. Tag only found	13.5.83

(b) Colour-marked animals

Recovery details		*Date recovered*
Roker, Tyne and Wear	(1) half moulted, green-dyed. Found on beach and taken into care	6.12.83
	(2) Died, probably from pneumonia	*ca* 20.12.83
Annstead, nr Beadnell, Northd.	first coater, green-dyed. Found dead	28.12.84
Seahouses, Northd.	,, ,, ,, ,, ,, ,,	28.1.85
,,	,, ,, red-dyed. Re-entered sea	6.11.85
,,	,, ,, purple-dyed. ,, ,,	8.11.85
Newton-by-the-Sea, Northd. (2 animals)	,, ,, ,, ,, . Found dead	12.11.85
Seahouses	,, ,, yellow-dyed. ,, ,,	17.11.85
,,	,, ,, green-dyed. ,, ,,	18.11.85
Bamburgh, Northd.	,, ,, yellow-dyed. Re-entered sea	,,
Embleton, Northd.	,, ,, purple-dyed. Found dead	20.11.85
Low Newton, Northd.	,, ,, green-dyed. ,, ,,	21.11.85
Seahouses	,, ,, ,, ,, . Re-entered sea	,,
,,	,, ,, yellow dyed. ,, ,,	,,
,,	,, ,, purple-dyed. Found dead	,,
nr. Boulmer, Northd.	(1) ,, ,, yellow-dyed. Seen on beach and attempt made to return it to sea	23.11.85
	(2) Found dead on same beach	14.12.85
nr Seaton Delaval, Northd.	second coater.* Re-entered sea	30.11.85
Beadnell Bay, Northd.	first coater, green-dyed. Found dead	mid-December 1985
Elwick, Lindisfarne NNR	,, ,, ,, ,, ,, ,,	,,
Budle Point, ,, ,,	,, ,, ,, ,, ,, ,,	,,
North Shields, Tyne and Wear	second coater.* Found apparently sick. Cared for by RSPCA and, next day, put back into sea	12.2.86

* No colour visible but must originally have been colour dyed

Budle Bay and a further three on Budle sand bar. In addition, D O'Connor, one of the wardens of Lindisfarne NNR, came across four to six dead adults at the north end of the reserve.

Common seal *Phoca vitulina.* Although common seals are still comparatively rare off the north Northumberland coast, one was seen regularly hauled out on Knoxes Reef during the summer of 1985, while an adult and calf were together at East Wideopens on 5 November 1985. These are interesting records which add weight to the hope that, in the not too distant future, these seals may once again breed in the Holy Island area.

Common Porpoise *Phocoena phocoena.* Porpoises were recorded each year between late spring and autumn, extreme dates being 7 April 1984 and 26 November 1983. Seventy-five sightings were made from Inner Farne, and eleven from Brownsman, and numbers involved varied from single individuals to occasional parties of five, six or seven and, once, nine. Most of the animals were travelling through the Inner Sound, between Inner Farne and the mainland, but others were in Staple Sound.

Dolphin sp. Dolphins occur much less frequently than porpoises. All the sightings were made from Inner Farne in 1983 – one in the Inner Sound on 12 July, two in Staple Sound on 16 July and one on 6 August, and two in the Inner Sound on 16 September, but in no case was the animal specifically identified. None was recorded in either 1984 or 1985.

Killer whale *Orcinus orca.* On 19 July 1984 'a medium sized whale' which was recorded moving south in Staple Sound may have been a killer whale, but the only definite record is of one, probably a female, swimming through Staple Sound on 27 July 1985.

Turtle sp. On 29 October 1985, Mr J Stevenson of the *John Wesley* noticed a turtle while fishing to the south of the Farne Islands. He described it as brown, with no obvious markings, and about 107 cm in length. He was unable to identify the species, but Dr Colin McCarthy of the British Museum (Natural History) has suggested that it was probably a leathery turtle *Dermatochelys coriacea* (L.). Dr McCarthy adds that at present this is the most common turtle occurring in British waters, where it follows jellyfish shoals, and that this is the sixth reported during 1985.

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