*** The Committee of the TYNESIDE NATURALISTS' FIELD CLUB beg to state that the Authors alone are responsible for the facts and opinions contained in their respective Papers.

TYNESIDE
NATURALISTS' FIELD CLUB.

At a meeting held in the rooms of the Natural History Society of Northumberland, Durham, and Newcastle upon Tyne, the 25th April, 1846,

(The Reverend the Vicar of Newcastle in the Chair)

On the motion of Ralph Carr, Esq., seconded by Joseph H. Fryer, Esq.,

It was unanimously resolved,

I. That a Society be formed, under the name of the Tyneside Naturalists' Field Club, for the practical study of Natural History in all its branches, and that the Antiquarians of the district be invited to unite with the Club for the promotion of their pursuits through its meetings.

II. That the Officers of the Club be a President, Vice-President, a Committee, and a Secretary, all to be chosen for the year at a general meeting of the Club, to be held in Newcastle on the Thursday of the Epiphany Quarter Sessions.

III. That the members of the Club shall hold five field meetings during the year, in the most interesting localities for investigating the Natural History and Antiquities of the district.—That the places of meeting be selected by the committee; and that timely notice of each be communicated to members by a circular card from the secretary.

IV. That those members to whom it may be convenient shall partake of breakfast together, at the nearest country inn, at ten o'clock, after which the researches of the day shall commence.

V. That the hour for a frugal dinner be appointed by the

chairman, during which any papers which he may have received from members of the Club shall be read from the chair.

VI. That as members must incur some trifling expense in reaching the place of the field meetings, no subscription to any general fund be required, beyond the amount of five shillings yearly, to be laid out in defraying the cost of printing such papers as may be selected for that purpose, and to meet any expenses which may be incurred for stationery, postage, or other unavoidable outlay. That the cost of any lithographic or other illustrations be defrayed by the author of the paper for which they may be required.

VII. That the papers of the Club be printed in a cheap octavo form, and distributed gratuitously to the members.

VIII. That a class of honorary members be admissible, in which shall be included any ladies distinguished by their attainments in the study of Natural History, or local Antiquities, or to whom the Club may be indebted for the communication of papers or specimens.

IX. That at the close of each year the president be requested to favour the Club with an address, containing a written summary of its proceedings at the several field meetings, together with such observations from himself as he may deem conducive to the welfare of the Club and the promotion of its objects.

X. That all candidates for membership shall be proposed and seconded by existing members, either verbally or in writing, at any meeting of the Club.

XI. That the Club shall endeavour to discourage the practice of removing rare plants from those localities of which they may be characteristic, and of risking the extermination of rare or interesting birds by wanton persecution.

XII. That on the other hand, members be requested to use their influence with landowners and others for the protection of the characteristic birds of the country, and to dispel the prejudices that are leading to their destruction.

XIII. That consequently the rarer botanical specimens collected at field meetings, be chiefly such as can be gathered without disturbing the roots of the plants; and, that notes on the habits

of birds be accumulated instead of specimens, by which our closet collections would be enriched only at the expense of nature's great museum out of doors.

XIV. That in like manner the Club shall endeavour to cultivate a fuller knowledge of local antiquities, historical, popular and idiomatic, and to promote a taste for carefully preserving the monuments of the past from wanton injury.

The meeting then proceeded to elect the officers for the first year, and the following were appointed

PRESIDENT.

RALPH CARR, Esq., Dunston Hill.

VICE-PRESIDENT.

THE REV. JOHN F. BIGGE, Ovingham.

SECRETARY.

MR. JOHN THORNHILL.

COMMITTEE.

JOSEPH H. FRYER, Esq.
JOSHUA ALDER, Esq.
W. K. LOFTUS, Esq.

It was also resolved, that such parties as may signify to the secretary, at the Library of the Literary and Philosophical Society, their wish to become members, shall be admitted without being formally proposed, until the first general meeting of the Club, after which period the tenth rule shall take effect.

The thanks of the meeting were then voted to the Vicar, as chairman, and to Mr. Carr, for having suggested, and for his exertions in the formation of the Club.

(Signed) R. C. COXE, M. A.,
Vicar of Newcastle, Chairman.

At a general meeting of the Club, held on Monday the 11th May, 1846,

RALPH CARR, Esq., President, in the Chair.

On the motion of the secretary, seconded by J. H. FRYER, Esq.,

It was unanimously resolved,

I. That the Tyneside Naturalists' Field Club undertake the

formation and publication of correct lists of the various natural productions of the counties of Northumberland and Durham, with such observations as their respective authors may deem necessary. Also that a succinct account of the Geology of the district be prepared.

II. That as mistakes may occur in the proposed lists, and as it is of importance that an authentic collection should be accessible when any doubt may occur as to a name or species, that local collections be formed and placed, with the consent of the Natural History Society, in the Newcastle Museum. The collections to be the property of the Natural History Society. That the specimens be either kept separate or incorporated with the mass of the collections, as may be convenient to the managers of that institution, it being a condition, that the specimens be distinguished by some mark to shew that they refer to the lists.

III. That the proposed publications be printed in a cheap form, and sold at a low rate.

IV. That sub-committees be appointed from the general committee, and from the other members of the Club, to carry out the foregoing resolutions.

V. That the parties forming those sub-committees shall, along with the members of the general committee, form a committee for considering the extent and details of the proposed publication, and such other matters as may be necessary in connection with the scheme.

VI. That the following gentlemen be the sub-committees :—

MAMMALIA AND ORNITHOLOGY,
Messrs. John and Albany Hancock.

AMPHIBIA, ICTHYOLOGY, AND RADIATA,
Messrs. R. E. Bewick, John Hancock, and M. J. F. Sidney.

MOLLUSCA, CRUSTACEA, AND ZOOPHYTES,
Messrs. J. H. Fryer, Joshua Alder, Albany and John Hancock.

ENTOMOLOGY,
Messrs. James Hardy, J. T. Bold, John Hancock, and Thomas Pigg, Jun.

BOTANY.

Messrs. Thornhill, and Thompson, and the Rev. J. F. Bigge, and Mr. John Storey.

GEOLOGY,

Messrs. Hutton, Fryer, Sopwith, Loftus, and King.

VII. That, for fully carrying out the plan, the assistance and co-operation of parties pursuing Natural History in the north of England, whether members of the Club or not, be requested, in furtherance of the undertaking.

VIII. That the papers and lists collected and published by the Tyneside Naturalists' Field Club, be at the disposal of the Natural History Society, for printing in the Transactions of that institution, if its committee shall think fit, and that it be requested, that the Club may have the use of such of the papers already published in the Transactions of the said Society, as may be of service in preparing the proposed account of the Natural History of the district.

IX. That a copy of the foregoing resolutions be submitted to the committee of the Natural History Society, and that their attention be particularly drawn to the 2d and 8th resolutions*.

The thanks of the meeting were then given to Mr. Carr, for the able manner in which he had presided over the business of the meeting.

* The resolutions were handed accordingly to the committee of the Natural History Society, who resolved, "That the committee of the Natural History Society cordially agree and sanction the Rules and Regulations of the Tyneside Naturalists' Field Club, as far as the Natural History Society is concerned."

THE PRESIDENT'S ADDRESS

AT THE FIRST ANNIVERSARY MEETING OF THE SOCIETY.

GENTLEMEN,—When our Naturalists' Field Club was set on foot, in April last, we had felt ourselves stimulated, and were also happily directed, by the example of a body of gentlemen in Berwickshire, and on our side of the Tweed, who had been associated during several years for the purpose of searching into the natural productions of that district. Not only had their proceedings been successful in adding new plants to the phytology, and new animals to the fauna, of Berwickshire, and even of Great Britain itself, but they had struck out a mode of carrying forward their researches, which made the means as delightful as the end. The object being to cultivate, diffuse, and advance the knowledge of the works of the Creator within the limits of a certain tract of country easily accessible, the means chosen were long and pleasant rambles on foot during fine days in the summer half-year, and in society capable of affording mutual instruction. They did not indeed forget to eat a hearty breakfast, before leaving the village inn where they might happen to meet, nor to dine together at the end of the day; but being very hungry, and having often a good distance to go ere reaching home, they made short work of the repast. There was neither time nor inclination to permit their active and instructive meetings to degenerate into dinner-traps, after the too common custom of this good country of ours. By these means men were brought together from town and country, as many as were really interested in some branch of natural science or in the study of antiquities, and no others came. The Society has, consequently, split upon no rock, but has gone on and prospered. Long may it do so, for the materials to be examined and re-examined can never come to an end. One and the same locality needs not to be revisited for long at the same season, unless by design for the sake of comparing different years and different kinds of weather,

in their influence on plants and animals. It may be doubted whether any man can live long enough to understand nature too well in the fields, waters, and rocks, within a walk of his own house, much less within the country, or the whole basin of a considerable river. But the knowledge gained in our own district, and maturely considered, will arrange itself in the mind as a centre round which may be grouped facts and observations drawn from other regions, whether within our four seas, or far beyond them ; and I think we may feel sure that no men are more likely to make a good use of increased facilities of visiting other situations, on the wings of steam, than those gentlemen who have so steadily bestowed their attention on the Berwickshire hills, dales, and sea-beaten shores.

It has been one of the rules of that northern club that, at the end of his year of honour, the President should read, at a general meeting, an address, giving some account of what had been done, and of the observations of natural objects made at the several field meetings; together with any further remarks that he might deem adapted to the occasion. A desire having been conveyed in one of the resolutions passed on the formation of our Tyneside Club, that a like address should be read by its President before vacating his place, I will now do my best to obey the injunction. First, however, let me observe how much I regret the unseemly prolongation of my tenure of the chair, beyond the week of the Epiphany Sessions, when it ought to have terminated. The occasion of the delay in this matter, however, will, I am sure, suffice to excuse it on my part, since it was no other than a serious illness of our esteemed and excellent Secretary, Mr. Thornhill, without whose aid and presence it was felt we could not proceed but at great disadvantage. The present meeting may be congratulated that our Secretary is now able to be amongst us, and I trust when I have read the minutes kept by him of the proceedings of each field-meeting, it will be admitted by all that, though of some length, they are not spun out by any useless or irrelevant matter, and that there is no part of them that could be properly curtailed by another hand. Indeed, in justice to the researches of those gentlemen who exerted themselves in the

cause of natural history, and of the Club, at each field-meeting, I, for one, cannot see how a more succinct record than Mr. Thornhill's could be either satisfactory in the present year, or useful for after-reference and comparison, when to look back to it may be both pleasing and instructive. I, therefore, beg leave now to read the minutes taken by the Secretary ; and at the end of some of the days, by way of showing that this course is not followed out of sheer idleness, I will subjoin some remarks on what appears to have been always a neglected branch of local antiquities—namely, on the older and purer forms, and the original meaning, of some of the names of localities visited in that excursion.

FIRST FIELD MEETING.

20th May, 1846.

A party of sixteen of the members assembled to breakfast at Ovingham, at 10 o'clock.

After breakfast they proceeded up Whittle Dene, some having first visited the old church at Ovingham, the tomb of Bewick, &c.; others the garden of the Rev. Mr. Bigge, the Rector, where they were shewn many of the rarer British plants under successful cultivation.

The party spent a very pleasant day in the Dene and neighbouring fields, the only interruption being a rather heavy thunder-storm, which passed over the Dene in the afternoon.

The following is a list of the rarer objects of Natural History, collected or observed :—

The nests of the Grasshopper Warbler *(Sylvia Locustella)*, and of the Long-tailed Titmouse *(Parus caudatus)*, were found by Mr. John Hancock, the former being very seldom met with. The Golden Crested Wren *(Regulus auricapillus)* was also observed.

Twenty-three species of Shells were collected.

The Dene and neighbourhood are rather rich in the number of the plants growing there; not many of them, however, very rare.

Those most worthy of notice are,—in the Dene, *Ranunculus auricomus, Trollius Europœus, Euonymus Europœus,* large hairy variety of *Fragaria vesca, Carduus heterophyllus, Myosotis sylvatica, Orchis Morio, Listera Nidus-avis,* the last-named plant was found by the Rev. Mr. Bigge, and brought by him to his garden at Ovingham. *Convallaria majalis,* one of the very few really wild northern localities of this plant. *Paris quadrifolia, Polypodium Dryopteris.* In the neighbourhood, communicated or pointed out by the Rev. J. F. Bigge,—*Sisymbrium Sophia, Arenaria verna,* by the side of the river a little below Ovingham, *Nepeta Cataria, Verbena officinalis, Botrychium Lunaria,* and *Ophioglossum vulgatum.*

THE PRESIDENT'S NOTES ON THE SECRETARY'S REPORT OF THE FIRST FIELD-MEETING.

The party proceeded as far as the township and farm-stead of Spital. It has been said that here had been situated an hospital, or religious house of some kind, but on what evidence I could not learn. If this origin of the name should not be substantiated, the features of the situation will easily suggest another, for there is hard by a somewhat remarkable "spout" or waterfall, where the burn tumbles over a ledge into a deep circular basin. I do but mention the circumstance because this feature may soon be lost by the diversion of the burn itself to feed the new reservoirs for supplying Newcastle with water.

There is at Spital a clear mineral well, impregnated with iron and sulphur; and around it the moss or bog is abundantly sprinkled with that most elegant floweret, the Primula farinosa.

The long woodland dene, in which our day had been so pleasantly spent, takes its name from the township of Whittell, Whittall, or Whitt-hall. In the earliest list of the townships of Northumberland it will be seen to have as good a claim to the name of White-hall, as the more splendid structure in Westminster itself. Hall is the Old English and Anglo-Saxon name for the better sort of houses, such as were inhabited by small landowners, or in other words, by yeomen, (aed-man, a man possessing property.) No spelling can be worse than that of the modern

"*Whittles*" and "*Thropples*," in which this good old ending has reached the last shape of corruption, and the whole word has been utterly debased.

The name of Ovingham, itself, belongs to a very interesting class of names, indicating the homes or abodes of particular Anglo-Saxon families;—in this case, it is the home of the Offings, or sons and daughters of Offa, whosoever that patriarch may have been. The Anglo-Saxon word would be Offinga-ham; literally, "of the Offings the home." There is an excellent early English spelling of this name, among others of like structure, in the old records called the Pipe-roll and the Ecclesiastical Inquests, which well represents our pronounciation of the soft g in such cases, although in most other parts of England that letter would be hard. When written Ovingeham, as we may find it in the old national documents, etymology and actual pronunciation are at once conciliated.

Before endings in *ton* like Ovington, though the meaning of the first part of the word is the same, a different analogy prevails and the common spelling is as correct, as in Ovingham for Ovingeham it is inaccurate. Just over the water is Eltringeham, the well-chosen abode of the Eldrings or offspring of some patriarchal settler called Eldric or Eldred, who no doubt had an eye to fish and fowl as well as to the picturesque.

I trust that the meeting will forgive this passing digression, which has been made partly in the hope of inducing some antiquarian brothers to come and wander over the country with us next summer.

SECOND FIELD MEETING.

3rd May, 1846.

The second field meeting was held at the pleasant village of Shotley Bridge. The party breakfasted at that place, and then proceeded up the Derwent to the Snape, visiting the Silver-tongue lead mine in their way. On an eminence over-

looking the Snape, and commanding an extensive and beautiful view both up and down the Derwent, a marquee, amply stored with refreshments, by the kindness and attention of Mr. Hutton and Mr. Nicholas Burnett, had been erected, and the good things it contained were duly appreciated by the party as they came straggling up. Some having been seeking plants, others insects or shells, some fossils, whilst others had joined that they might enjoy a pleasant day's ramble amongst the beautful scenery of the neighbourhood. After their luncheon, the party proceeded to Hownsgill, and thence back again to Shotley Bridge, where they dined. The day was remarkably fine, and every one was evidently pleased and desirous to please, so that the excursion passed off as pleasantly as might be. Many interesting plants and other objects of Natural History were observed, amongst others the Maiden Pink, *(Dianthus deltoides,)* which was new to the district of the excursion. Some papers were read, and lists of discoveries handed in. A paper was read by the President, Ralph Carr, Esq., from Mr. Hardy, of Gateshead, mentioning several insects which he had found, and which had not before been noticed in the neighbourhood of Newcastle, adding several interesting notices of their habits. Mr. Bold also described the habits of a species of Death-watch, new to the Newcastle district; of which he exhibited specimens in the various stages from the caterpillar to the perfect insect. Mr. King, the Curator of the Newcastle Museum, gave an account of the results of a dredging expedition off the coasts of Northumberland and Durham, in which he had the good fortune to capture several shells, and other marine animals, new to those coasts. He also mentioned several other sea shells which he had lately obtained, and which were new to the district. He exhibited, besides the specimens already alluded to, numerous examples of other shells, which although not new, were remarkable for their size and beauty, and for the way in which they illustrated the history of the different species. He also exhibited some small, but very beautiful specimens of coral. —The following is a list of the species new to the coasts of Northumberland and Durham :—CRABS—A new species of the Genus *Ægа*. ECHINODERMS—*Psolus squamatus*. SHELLS—

Panopœa Bivonœa, Pecten Landsburghii, Fusus Norvegicus, F. Turtoni, Fusus, a new species allied to *F. corneus, Trochus millegranus, Natica Grœnlandica, Hypothyris (Terebratula) psittacea, Axinus (Cryptodon) flexuosus.* CORALS—*Retepora Beaniana.* SPONGES—A new species of *Halichondria.* Besides the above-named species, Mr. King stated that he had obtained from time to time several dead shells, which he supposed to have been washed up from a tertiary shell bank situated twenty miles from the northern part of the coast of Northumberland, viz. :—*Astarte Gairensis,* not found living on the east coast of England, but found fossil at Bridlington, and living on the west coast of Scotland ; *Saxicava sulcata,* a species nearly allied to *S. rugosa,* but much larger, only found fossil on this side of the island, but living in Baffin's Bay. A species of *Mya,* allied to *M. truncata,* received living from Greenland, by Mr. A. Hancock, and named by that gentleman *M. Grœnlandica ;* it is found in a fossil state in Sweden, on the shores of the Gulf of St. Lawrence, and in the Isle of Bute.

The secretary mentioned that he had noticed in a ditch at Marsden, Durham, *Callitriche platycarpa,* which had not been before announced as a plant of this district.

He also announced that, in company with Mr. John Storey and Mr. John Thompson, he had noticed new habitats for one or two of the rarer Northumberland plants, viz. : *Pyrola minor, Carduus heterophyllus,* and *Rubus saxatilis,* in Cockton wood, near Chesterholme.

The insects mentioned by Mr. Hardy in his paper, as worthy of particular notice, are *Ophonus pubescens,* by the Wear, in Southwick Marsh, a little above Sunderland; *Cateretes bipustulatus,* at the same place. He had found the same insect by the Derwent, near Winlaton Mill. On the bog below Hilton Castle he found *Ephistemus gyrinoides, Tachyerges Saliceti, Crioceris tenella.* In old grass fields in the same vicinity he found *Gymnaetron tricolor* (first found in this vicinity by Mr. T. J. Bold). Of Dipterous insects he noticed *Ptychoptera paludosa ; Beris clavipes ; Chrysomyia polita* and *Chrysogaster viduata,* and (by far the rarest) *Nemotelus nigrinus.* On the Derwent, near Gib-

side, he had found *Brachyopa bicolor*, *Chrysostoxum bicinctum*, and *C. arcuatum*, *Cheiloxa ruficornis*, and *Atherix Ibis*.

Mr. Bold described the habits of *Anobium molle* a species of death watch, which he had found in considerable numbers near Newcastle. This paper will be found in its place in the Transactions.

The rarer insects noticed during the excursion by Mr. Bold, were *Gymnaetron niger*, *Apion subulatum*, *A. Spencii* and *A. striatum*. In addition to these Mr. B. caught upwards of sixty species of beetles, the names of which will appear in the classified list now preparing by Mr. Bold and Mr. Hardy.

In addition to the Maiden Pink mentioned, the only plants worthy of particular notice are *Aquilegia vulgaris*, near Allansford; *Parietaria officinalis*, on the bridge at the same place; *Orobanche major*, abundant; and *Fedia dentata*, in the cornfields; also, *Echium vulgare*, in great abundance by the Derwent, above Allansford.

The Geological features of the district travelled over are, in the words of Mr. Hutton, "interesting, though simple. It is well known that in the North of England the carboniferous formation naturally separates itself into three divisions, the upper one characterised by an abundance of coal, the under one by a large development of limestone—these being usually designated the "coal measures," and "the mountain limestone formation;" between these a thick series of beds of coarse grit and slate are interposed, called the "millstone grit." It was upon this intermediate group almost entirely that the excursion was made. In descending the hill from Medomsley, or Conside, towards the Derwent, the outcrop of all the lower members of the coal formation is passed over, the lowest workable bed of coal, the 'Brockwell Seam,' cropping out in the hill side, very little above the hotel at Shotley Bridge. Following the Derwent, as the party did, upwards from Shotley Bridge, the whole thickness of the 'millstone grit' (brought up by the rise of the strata) was passed over by the time the party had arrived at the Silver-tongue lead mine, where, in the bed of the Derwent, the first stratum of mountain limestone, called the "Fell Top Limestone," makes its appearance. The millstone grit possesses few characters of interest

sufficient to comment upon, except as having afforded rough millstones, perhaps, for ages, the name of the formation being derived from its use in the very district traversed by the Club. Metalliferous veins are almost exclusively confined to the lower divisions of the mountain limestone ; but sometimes veins of lead do occur in the middle series, and at Healyfield have been worked for many years in the millstone grit."

THE PRESIDENT'S NOTES ON THE SECOND FIELD-MEETING.

Our second excursion was a long and delightful one; the day, however, was intensely hot, whilst all nature was in full life and expansion under the burning sunshine. Fortunately there was a brisk air, and great part of the way was traversed under the canopy of the woods. The resting-place where we enjoyed the hospitable shelter of the tent, and partook of its refreshments, overlooks the course of the Derwent both downward, along in the direction we had come, and upward where its character is different, as it flows through an open moorland country. The point where we stood gave us the best possible idea of the geography of the river and great part of its basin. Just below us was a bold and richly-wooded elbow of the banks, forming a promontory on the northern side, and this point is called the Snape. We were told that this curious appellation was in allusion to the beak of a snipe. I fancied it might be a corruption of Snae-hope : but there was no "hope" or short valley there to countenance the supposition.

We must compare this name with a place called The Snipe, on the angle of land at the junction of Tarset Burn and Hunter's Burn, in the vale of North Tyne; and also with The Snipe, at the north-eastern point of Holy Island.

The Anglo-Saxon original, if such ever existed, has been lost ; but in the Old Norse, the language of the Danes, who so long held sway in these parts, we find the word *Snoppa, rostrum* a beak. Hence it is not unlikely that both *Snape*, as applied to a jutting promontory, or point of land, and the name of the bird may have a common origin, and that both are from the old Norse, Snoppa, a beak, or from a collateral Anglo-Saxon expression, which has disappeared.

On the southern side of Derwent are two "hopes," or short vales, Herdsel-hope and Hys-hope. Their names are now elegantly diversified into Horsop and Hysop. Why not at once, Her shop and His shop? As herdsel is in Old English a sheep-fold, the real name of the former little vale is of a pleasing pastoral character; that of the latter is not so easy to explain.

THIRD FIELD MEETING,

7th August, 1846.

The Club was to have assembled to breakfast at Bardon Mill, and to dinner at Haltwhistle, but, owing to the extreme wetness of the weather, the meeting was thin, and some of those who met at breakfast turned back before reaching Haltwhistle.

On account of the state of the weather, but little could be seen of a district highly interesting for its peculiar geological features, for its antiquities, and for the numerous interesting plants which its lochs, its rocky hill-sides, and its marshes produce. Its zoology does not appear to have been much investigated, but there seems little doubt that, especially in conchology and entomology, a careful examination would repay the naturalist.

The only rare plant gathered was *Ranunculus Lingua*, which the Rev. Mr. Cundill found in a small lake near Walltown.

The papers laid before the meeting were—

"Notices of some new species of Mollusca, &c., found at Ardrossan and in the Isle of Arran, in May and June last," by Mr. Joshua Alder.

"A list of new habitats of various of the rarer plants of Northumberland and Durham," by Mr. John Storey. These new habitats will duly appear in the catalogue of plants now in course of preparation.

The President exhibited viviparous heads of the Crested Dogstail Grass (*Cynosurus cristatus*).

A communication, through Mr. Hardy, was read from Dr.

Johnston, of Berwick upon Tweed, proposing that a joint meeting of the Berwickshire and Tyneside Naturalists' Field Clubs should take place at Alnwick, as soon as the Newcastle and Berwick Railway shall be opened, "for mutual encouragement and the promotion of friendly feelings."

THE PRESIDENT'S NOTE ON THE THIRD FIELD MEETING.

On this, the only occasion when the Club has been interrupted by bad weather, I happened to be absent on a visit to the banks of the Breamish. The day was there overcast and rather sultry, but no rain fell. Distant rolling peals of thunder were heard all day, beginning on the south-west and ending as if the storm had come round into Roxburgshire, behind Cheviot, on our north-western side.

FOURTH FIELD MEETING,

Friday, 11*th Sept.*, 1846.

The Club assembled in the first instance at the house of Mr. Abbs, of Cleadon, where they were shown through the interesting grounds belonging to that gentleman's residence, by the Rev. G. C. Abbs. They then proceeded to Whitburn, to breakfast. After which the party separated, some proceeding to seek for shells, &c.—others for insects or plants, as might be their particular pursuit. The principal circumstances which occurred, and which might be considered of more than common interest, were, 1st, that the party which kept on the banks saw a locust fly past them, which, however, they did not succeed in taking. This insect appears in this country at considerable intervals; it is about twenty years since any were seen in this district; at least if they have been seen, there is no record to that effect. This year, however, they have been seen and captured in considerable numbers, especially in the district in which the one alluded to above was observed. The second circumstance worthy of particular notice was, that some of the party who had gone to seek for sea-

shells, &c., caught a crab in the very act of putting off his coat. It is well known that all animals of the class to which the crab belongs, cast their shells once a-year, but there are few instances recorded of the operation having been actually seen taking place. The parties who saw the process, describe it as being very like what a person does when he is wriggling himself out of a coat that is a little too tight for him. Most of the party proceeded northward to Marsden, examining as they progressed, the peculiar geological features of the magnesian limestone, here worn into picturesque arches, lofty pillars, or by the never-ceasing action of the ocean, worn into deep and extensive caverns, there cut into towering cliffs, or sometimes crumbling away before the power of the waves, forming heaps of larger or smaller blocks at the base of the main mass of which they once formed a portion. After the party had explored this interesting locality as long as their time allowed, they turned their course southward and dined at the Roker Baths Hotel. After dinner, the following papers were read :—

"On some of the habits of the horse leech, *Hœmopsis sanguisuga*, with notices of some rare insects," by Mr. Hardy.

"Notice of the occurrence of *Limnoria terebrans*, at the mouth of the Tyne," by Mr. Albany Hancock.

Mr. Hardy also exhibited some very remarkable viviparous heads of the common cocksfoot grass, *Dactylis glomerata*.

THE PRESIDENT'S NOTES ON THE FOURTH FIELD MEETING.

The flight of the locust, which we saw and marked down, and again sprung as if it had been a lark, was strong, quick, and well sustained. The insect evidently had the power of proceeding a long way without any fresh impulse from the ground, and could turn in any direction. It was scarcely smaller as seen flying than the larger dragon flies.

The day was cloudless, and the air delightful; an extraordinary host of that brilliant insect the scarlet admiral butterfly, *Vanessa atalanta*, were on the wing. They were flying past us or resting on the autumnal flowers, which are peculiarly fragrant

on the magnesian limestone, by dozens and scores together, opening and shutting their brilliant wings in the sunshine.

Having enjoyed a long ramble as far as Marsden, we returned to the refreshment of an excellent dinner at Roca, for so the older maps denominate the place. The name might seem a little exotic and romantic, although well bestowed in allusion to the rocks and cliffs along the shore. In accordance with the taste of the present day, the name has been revised, and as there is a railway not far off, it is written Roker, so that it may rhyme with poker and stoker.

We had the gratification of being accompanied this day by a learned native of Iceland, Mr. T. G. Repp, late of the Advocates' Library, in Edinburgh, and now of Copenhagen. Mr. Repp has been the editor and latin translator of the *Laxdœla Saga*, and the author of a valuable treatise on Trial by Jury among the Scandinavian nations, and other learned works.

FIFTH FIELD MEETING.

October 29, 1846.

The last Field Meeting of the year was held at Tynemouth, on Thursday the 29th October. The party breakfasted and dined at the Star and Garter Hotel, in that village. After breakfast, the party proceeded to Whitley, visited the quarries, in a pond in which, Mr. A. Hancock, Mr. Loftus, and others, collected specimens of a rare shell, first discovered there by Mr. Alder and the Rev. Mr. Mark, and named by the former gentleman *Planorbis lævis*. They then went to Whitley House, where the party had an opportunity of inspecting the very extensive and valuable collection of shells belonging to Mr. J. H. Fryer, who, thinking that the body as well as the mind should be cared for, had provided a very substantial luncheon. After this had been done full justice to, the party proceeded northward, but not far, as the day was waning, and some of the gentlemen wished to examine the indications of the 90 fathoms dike at Cullercoats, and

also the fine specimen of what is called the "Northern Drift," at the the mouth of the Tyne. At this latter locality, Mr. Carr, the president, pointed out several remarkable examples of blocks of various kinds of stone (Basalt, Mountain Limestone, Millstone Grit, Coal Sandstone, &c.)—which exhibited strong marks of glacial action. In the morning three communications were read from Mr. Loftus, *viz.* :—an account of the occurrence of the glow-worm, near Gibside ; a list of new localities of several rare British shells ; and a letter to the President, recommending that the members of the club should communicate at the meetings any information with respect to Natural History, which they may have obtained in their researches, in the intervals between those said meetings. Mr. Albany Hancock read a very interesting paper on the varieties of *Buccinum undatum.* This shell, one of the larger Whelks which inhabit our coast, is found at various depths and under various circumstances. Some occurring in 40 fathoms water, some in water of only half that depth, whilst other examples are found within the tide-marks. Mr. Hancock stated, that as the circumstances in which the shell is found, vary, so the character of the shell is altered. The *comparatively* deep water variety is thin and delicate, occasionally exceedingly so, because it lives at the bottom of water, which, at the depth mentioned, is nearly, if not entirely, still. The bottom of the water, on which it lives, is also muddy. Coming nearer in shore, or into shallower water, we find another form of this shell, thicker and stronger than the last. We have not time to describe all the varieties, we may, however, state that the extreme forms are so opposite that they have been described as distinct species. But a careful examination of the habits and habitats, shews that the variety of form, under which they appear, is only what might be expected from the *variety* of circumstances in which they exist.

Mr. Hancock has in preparation a full account of the different varieties of this interesting Mollusk, so that the members of this Club, as well as other parties interested in the subject, will shortly have before them an accurate and skilful account of this Protean shell.

THE PRESIDENT'S NOTES ON THE FIFTH FIELD MEETING.

On this, our last meeting, for an excursion in furtherance of the objects of the Club, we spent an agreeable and instructive day, notwithstanding the lateness of the season. The attractions in the cabinet and library at Whitley House, were really endless, and I left them with the feeling, that in spite of Mr. Fryer's exertions that our curiosity should be fully gratified, we had only made a beginning before the shortness of an autumn day warned us to proceed. I had the pleasure of showing, after breakfast, a very good sample of Spanish chesnuts, ripened on the trees at Dunston Hill. They have this year been perfectly matured, perhaps, even more completely than in 1826. We have some fine young trees growing, which were raised from the seed of that season. But the river Tyne is, perhaps, not far from the northern limit where this southern tree will bring its fruit to maturity, even in the warmest summers.

I will conclude by mentioning a circumstance of the habits of the Tawny Owl, *Strix Stridula*, which I mentioned to some of our ornithologists at the Ovingham meeting. That bird does not seem to be known as a bold and rapacious robber of the nests of some of our stronger birds at the time when it is feeding its own young. It has been protected now for a few years at Dunston Hill. In 1844 a pair of Tawny Owls reared and ushered into the world three hopeful young, after having fed them assiduously upon the trees for many weeks after they had left the nest. The food must often have consisted in great part of worms, snails, and slugs, for the old birds brought it every minute from the ground in the immediate vicinity of the trees where the young were perched. This, however, might only be considered as a whet to their appetites before dinner; for the parents made repeated and persevering attacks upon three or four magpie nests, sometimes during half an hour at a time. As the defence was spirited and gallant, they were often repulsed; but, finally, I found the remains of young magpies under the favourite perch of the young owls, and one morning the bloody head and feathers of an old magpie, conspicuous from its size and the want of

any cerous skin about the beak. This then, I thought, must have been taken when roosting. In 1845 the old owls alone were seen, and they passed the summer in sedate retirement, and seemed to rest from the labours of propagation; neither did they molest the magpies. But in 1846 they began to be very active early in the spring, and by the beginning of May again had their young owlets out upon the branches. Walking out about nine o'clock one evening, I heard a pertinacious attack going on against a pair of magpies that had their nest in the top of a very tall sycamore. At last instead of the frantic chattering of the poor magpies, one of them began to shriek in agony like a hare when caught in a noose; and it was evident the owl was endeavouring to drag it out—the mother bird—by the head from the entrance of the nest. I ran down to the spot to prevent the perpretration of such murder, and arrived in time to separate the combatants by striking against the stem of the tree with a stick. Before the next morning the young of our only pair of rooks had disappeared from the nest, in a situation where nothing but the owls could have injured them. This was too bad; a decree went forth against the young owls, and they paid the penalty of their voracious appetites.

It is thus evident that the magpie's instinct in arching over her nest is necessary to enable her and her mate to defend it against rapacious birds. Probably the raven, the buzzard, and the kite, may be all disposed to make unfriendly visits, wherever their race has not been exterminated by pitiless gamekeepers. But it is evident that the tawny owl is a formidable enemy. The reluctance of the rook to build out of society may also be better understood, as it cannot defend its open nest against the owl at night; and also one reason why the instinct of the daw leads it always to seek the shelter of a hole, although, as Mr. Waterton remarks it appears to be as hardy a bird as the rook. That wisdom and beneficence which never err may have given them instincts for other and more important ends than human eyes may ever be able to descry, but it is always gratifying when we think we can in part understand the utility and design of differences so striking.

I will now conclude by the agreeable statement that our numbers now amount to more than eighty, and that we have been permitted to add the names of some fair honorary members, who have not only lent us their general encouragement, but have sent some beautiful specimens of dried plants, algæ, and corallines, for examination.

The last meeting of the year was held on Monday evening, the 15th Nov., 1846, conjointly with the Natural History Society, in the rooms of that institution, the President of the club, Ralph Carr, Esq., in the chair.

The President read a paper introductory to a future contribution, concerning various proper names of places in Durham and Northumberland. It was stated that the geography of these districts is rich in significant terminations, of easy etymology, descriptive of hills, vales, waters, woodlands, precipices, pastures, villages, hamlets, enclosures, &c. ;—that although much has been done by the researches of Mr. Brockett and others, yet the etymological part of the question may be further elucidated from the Anglo-Saxon and old Norse languages, care being had in no case to trench upon ground under which an older Celtic element might be concealed ; that the different English counties offer great variety in the distribution and grouping of the significant popular endings, and that to compare them with those near home, may afford no small interest to a traveller ;—that in every part of the country the old popular names possess a certain grace and dignity from their close connexion with the cultivated speech and literature of our Anglo-Saxon forefathers ; whilst those of modern invention, with all their affectation of classical or foreign sound, are comparatively worthless. A paper was also read by Mr. T. J. Bold, on the corn-weevil, a beetle which, along with another small coleopterous insect, commits fearful ravages amongst bonded corn. Mr. Albany Hancock's paper on *Limnoria terebrans*, a small species of crab which commits great havoc in sub-marine wood-work, was re-read, as the subject is of great importance from the great destruction of sound

timber caused by this small animal, which is not more than the tenth part of an inch in length, and yet from its amazing numbers in certain localities is truly formidable to those who have to construct and pay for sub-marine wood work.

Mr. Peacock, of Sunderland, one of the members of the Club, exhibited specimens of this minute but destructive animal, which, by his account, had committed extensive ravages in the docks of the above-named town.

ABSTRACT OF THE PROCEEDINGS OF THE COMMITTEE DURING THE YEAR.

In order that the proposed lists might be made as nearly complete as possible, it was determined that parties not members should be desired to co-operate. In accordance with this resolution, Mr. R. E. Bewick was requested by the committee to become a member, and to be one of the sub-committee for forming a list &c., of the Fishes of the district. Mr. Bewick declined becoming a member, but promised to cordially assist the views of the Club in any way he could. Mr. Embleton, of Embleton, was also applied to for his assistance, but from that gentleman no answer was received.

The committee determined also, that the Lists, Transactions, &c., should be printed in 8vo., and that the printing should be entrusted to the Messrs. Hodgson. The last matters of any importance transacted previously to the annual meeting were, the fixing of a day for that meeting, and resolving that Mr. Von Voorst should be requested to undertake the publication of the transactions, &c., of the Club.

ANNUAL MEETING.

19*th February*, 1847.

Ralph Carr, the President, in the Chair.

The president read a short address detailing the circumstances

which led to the formation of the Club, and then requested the Secretary to read his report of the various field meetings, to which the chairman appended various remarks as the report of each meeting was read.

A letter was read from Mr. Alder, stating that he had received a communication from Dr. Johnston, of Berwick upon Tweed, proposing that the Tyneside and Berwickshire Naturalists' Field Clubs should hold, in the summer, a joint meeting at Alnwick. This proposition was agreed to, with the understanding that it should not take place until the opening of the Newcastle upon Tyne and Berwick Railway.

It was resolved, that in future there shall be one President, three Vice-Presidents, two Secretaries (one of whom to act as Treasurer), and ten Committee.

The following gentlemen were elected officers for the ensuing year :—

PRESIDENT.

The Rev. John F. Bigge.

VICE-PRESIDENTS.

J. H. Fryer, Esq.
Joshua Alder, Esq.
D. B. White, Esq., M. D.

SECRETARIES.

Mr. John Thornhill.
Mr. Thomas Burnet.

TREASURER.

Mr. Thornhill.

COMMITTEE.

Mr. Ralph Carr,
Mr. W. K. Loftus.
Dr. Charlton,
Mr. Albany Hancock,
Mr. J. Hancock,
Mr. John Thompson,
Mr. Rich. Howse,
Mr. George Burnett,
Mr. John Storey,
Dr. Embleton.

The thanks of the meeting were then voted to the President for his services during the past year, and also for his conduct as chairman of the meeting.

LIST OF MEMBERS.

A

Abbs, The Rev. G. C., *Cleadon,*
Adamson, Charles, *Westgate Street,*
Adamson, William, *Westgate Street,*
Alder, Joshua, *Ravensworth Terrace,*
Allport, J. J., *Gateshead,*
Armstrong, Joseph, *Courant Office, Pilgrim Street,*
Armstrong, Pearson, *Lovaine Place.*
Atkinson, George C., *West Denton,*
Atkinson, John Ismay, *Wylam.*

B

Backhouse, William, *Darlington,*
Balmer, George, *Cloth Market,*
Bell, Thomas, *Land Surveyor, Cumberland Row,*
Bigge, The Rev. John F., *Stamfordham,*
Blacklock, Joseph, *St. Nicholas' Church Yard,*
Bold, T. J., *Cloth Market,*
Bruce, The Rev. J. C., *Percy Street,*
Burnet, Thomas, *Summerhill Terrace,*
Burnett, George, *Clayton Street,*
Burnett, George, *Grey Street,*
Burnett, Nicholas, *Black Hedley, Shotley Bridge.*

C

Carr, The Rev. Charles, *Ryton,*
Carr, Ralph, *Dunston Hill,*
Charlton, Edward, M. D., *Eldon Square,*
Clarke, George, *Walker,*
Coxe, The Rev. R. C., *Newcastle,*
Creighton, William, *Morpeth,*
Cundill, The Rev. John, *Durham,*
Currie, Robert, *Grey Street.*

D

Dees, Robert Richardson, *Solicitor, Newcastle,*
Donkin, Armorer, *Newcastle.*

E

Elliott, Robert, M. D., *Carlisle,*
Ellison, Nathaniel, *Murton House,*
Embleton, Dennis, M. D., *Blackett Street.*

F

Featherstonhaugh, The Rev. W., *Ovingham,*
Fryer, J. H., *Whitley.*

G

Glover, Robert M., M. D., *Northumberland Street,*
Green, R. Y., *Solicitor,* 8, *Mosley Street,*
Greenhow, Thomas M., *Eldon Square,*
Greenwell, The Rev. William, *Univ. Coll., Durham.*

H

Hancock, Albany, *St. Mary's Terrace,*
Hancock, John, *St. Mary's Terrace,*
Hardy, James, *Berwick-upon-Tweed,*
Hayton, The Rev. Mr., *Sunderland,*
Houseman, John, M. D., *Barras Bridge,*
Howse, Richard, Jun., *Trafalgar Street,*
Hurst, T. G., *Seaton Delaval,*
Hutton, William, *Grey Street.*

I

Ingham, Robert, *Westoe.*

K

Kaye, William, *Blackett Street,*
Kell, William, *Gateshead,*
King, William, *Newcastle.*

L

Liddell, Matthew, *Gosforth,*
Loftus, W. K., *Stand House.*

M

Mather, Edward, *Solicitor, Grey Street,*
Mole, J. H., *Blackett Street,*
Moore, John, *Bishopwearmouth.*

O

Oliver, Daniel, ter^{s}., *Bigg Market.*

P

Paige, the Rev. Lewis, A. M., 7, *St. James's Street,*
Pattinson, Hugh Lee, *Washington,*
Peacock, Reginald, *Sunderland,*
Peacock, Septimus, *Sunderland,*
Pearson, William, *Surgeon, Hexham,*
Pigg, Thomas, Jun., *Northumberland Street,*
Plummer, Robert, *Newcastle,*
Potter, H. G., *Jesmond Terrace,*
Preston, John H., *Solicitor, Greenfield Place.*

R

Radford, James, *Grey Street,*
Rippon, George, *North Shields,*
Robson, Christopher, *Grainger Street.*

S

Sewell, Joseph, *Heaton,*
Sidney, M. J. F., *Cowpen,*
Sopwith, Thomas, *Allenheads,*
Storey, John, *St. Mary's Place.*

T

Tait, George, *Alnwick,*
Taylor, John, *Lovaine Row,*
Thompson, H. A., *Grey Street,*
Thompson, John, *Elswick Terrace,*
Thompson, the Rev. Mr., *Unthank,*
Thornhill, John, *Mulgrave Terrace, Gateshead,*
Thornton, J. L., *Northumberland Court,*
Trevelyan, Arthur, *Wallington,*
Turner, John, *High Bridge, Newcastle.*

W

Wailes, George, *Ridley Place,*
Weatherley, Capt. J. D., *New Bridge Street,*
White, David B., M. D., *Portland Place,*
Wight, Rev. Mr., *Newcastle,*
Winship, William, *Surgeon, Percy Street.*

The Treasurer in Account with the Tyneside Naturalists' Field Club.

	£.	s.	d.		£.	s.	d.
By 47 Subscriptions at 5s., ...	11	15	0	By paid for Postage-Stamps, Printing, and Stationery,	7	10	6
				Balance in hand, ...	4	4	6
	£11	15	0		£11	15	0

I.—*Notice of the Capture of Anobium molle.*

By T. J. Bold, Esq.

[Read July 3, 1846.]

Since the last meeting of this Society, I have captured in abundance *Anobium molle*, Linn., an insect, which, although recorded by Mr. Selby in his "Fauna of Twizell," published in the third volume of the "Annals of Natural History," has not since then, to my knowledge, been noticed as occurring in the counties of Northumberland or Durham.

I found it in the vicinity of Newcastle in its various stages of larva, pupa, and imago.

The larva appears to differ in habit from that of the typical species, which is generally found in the interior of wood, whilst this finds its pabulum in the inner bark of the Scotch fir (*Pinus sylvestris*), forming its tortuous burrows, at one time, wholly in the bark, at another eating equally of the bark and wood, and in very few instances perforating the wood itself.

The pupa is enclosed in a fine, soft, whitish, silken cocoon, and is found in the same locale as the larva.

The imago, or perfect insect, I found on the same pales in which I got the larva and pupa: they are those pales by the road-side at the foot of Benton Bank. I first observed it on the 31st of May last, and have since, at intervals, noticed it up to the present time. It has a most grotesque appearance when at rest, the head forming a right angle with the body; and I observed, that although it falls when touched, or apprehensive of danger, yet it does not simulate death, as others of this genus do, but runs with celerity or takes wing with a readiness that quite astonished me.

Another trait in its character also differs from any thing that I have before noticed in this tribe; I allude to their dismembering each other when in confinement. I put a great number of

specimens into quills, and when I came to set them the following morning, I found that in the short space of one hour they had so effectually dismembered each other, as not to leave me one perfect example.

Mr. Stephens, in his description of this species, says, that the elytra have "the apex rounded and somewhat glossy;" but does not mention a pale spot, which is just within the apex of each elytron, and which is more particularly conspicuous when the insect is alive.

THOMAS JOHN BOLD.

Newcastle, July 1, 1846.

The specimens exhibited are—

Anobium molle, in its various stages.

Trypodendron domesticum, a rare species, taken by Mr. James Hardy, near Axwell Park, in March last.

Ophonus pubescens, also taken by Mr. Hardy, on the banks of the Wear, near Southwick, in May.

II.—*Notice of the Occurrence of Limnoria terebrans at the mouth of the Tyne.* *By* Albany Hancock, Esq.

[Read September 11, 1846.]

Four or five weeks ago, whilst rambling along the coast at the mouth of the river, I stumbled on the remains of a few salmon-net stakes, not far from Clifford's fort. On examining these stakes, which were near low water mark, I found that they were reduced to less than half their original diameter, by the ravages of a small crustaceous animal, which had penetrated the wood in every direction, and that I had really got hold of the formidable *Limnoria terebrans*—the dread of the maritime engineer.

The attention of naturalists was first drawn to this destructive little animal by Mr. Robert Stevenson, of Edinburgh, Civil Engineer, who discovered it whilst erecting the Bell-Rock lighthouse. It had attacked the beams supporting the temporary wooden beacon, and had done much injury. Specimens of the wood, containing the animal, were forwarded to Dr. Leach, who named it as above. Since then it has been found in various ports in England, Scotland, and Ireland: it has also been observed on the coasts of France and the Netherlands, and more recently has been detected in America.

The ravages of the *Limnoria* are of the most alarming nature: it attacks equally all kinds of wood, except teak; and in the course of three years it has been known to reduce logs of Norwegian pine ten inches square to seven inches, that is, at the rate of an inch in the year. No effectual preventive, I believe, has yet been discovered. Sheathing with copper and driving broad-headed nails all over the surface of the wood are the most successful modes adopted by engineers: painting and tarring have also been resorted to with variable results; but any covering of this kind is so liable to be abraded that it cannot be relied on, even supposing that it affords complete protection when first applied.

This animal, so detrimental to our docks and other submerged wooden works connected with marine affairs, is scarcely two lines long, and is otherwise so insignificant in appearance that most persons, at first sight, would deem it unworthy of a thought. It is allied to the sea wood lice (the *Oniscidæ*), and is supposed to feed on the wood into which it bores. I have some reason, however, to doubt the truth of this, for I have found minutely comminuted wood in the entrance of the burrows, as if thrown out by the animal. If so, then the *Limnoria* is no exception, as has been supposed, to the general rule, that all the Crustacea feed on animal substances.

In conclusion, I beg to apologise for having trespassed on the time of the Club, with the present communication, which certainly I would not have done, had not the subject of it possessed more than ordinary interest. It belongs also to the district in which we are now assembled, and I thought it proper to make known that we have this troublesome animal at the mouth of the Tyne: and I am acquainted with no better way of doing so than through the medium of this Society.

Newcastle, Sept. 10, 1846.

III.—*Notes on damage done to Wheat by* Cucujus monilicornis *and* Calandra granaria. *By* T. J. Bold.

[Read Nov. 23, 1846.]

I have frequently had my attention drawn to the damage done to warehoused grain, by the corn weevil (*Calandra granaria*, Linn.); and recently, an instance has come within my notice, in which it has been accompanied by another small coleopterous insect (*Cucujus monilicornis*, Marsh.), and this circumstance having enabled me to form something like an estimate of the loss which they occasion, I am induced to bring before the Club a few notes on the subject; hoping that they may not be without interest, especially as no English author has given any direct computation of the havoc committed by those pests.

A parcel of two hundred quarters of Rostock wheat, of fine quality, weighing 61lbs. per Winchester bushel, was bonded in the summer of 1844; and from causes which it is here unnecessary to mention, was allowed to remain in the warehouse until the latter part of this summer (1846). When sampled it was found to be of various weights; 60 qrs. weighed 44¼lbs. per bushel; 80 qrs. weighed 46½lbs., and the remaining 60 qrs. 56¼lbs., being an average of 49lbs.; and shewing a deficiency of 12lbs. on each bushel, or 96lbs. per qr.; and on the whole 200 qrs. a deficiency of 19,200lbs.; equal in measure to 38 qrs. 6 bushels; which at the present (Nov. 4) market value of 64*s.* per qr., will amount to 124*l.*, nearly one-fifth of the total value of the wheat. But it must be remembered that this calculation is made on the mere loss of weight; without noticing the great deterioration of quality; for it will be seen, by the sample exhibited, that the insects have taken the farinaceous, or internal portion of the grain, leaving the outer portion, consisting merely of the husk or bran; and what is left is rendered so "unsweet" as to be totally unfit for human food; consequently, its value is so

much reduced, that, I have not the least doubt, but that the actual loss is more than double the computed amount. A curious circumstance, and which I do not remember to have seen satisfactorily accounted for, is the bad condition of all grain infested with weevils, it being always more or less "heated." This heating the warehouse-men attribute to the natural warmth of the beetles; but I would think, that it is more likely to be caused by the tendency to fermentation of the moistened and injured grain. The difference of weight mentioned—44¼, 46½, and 56¼ lbs. per bushel, is caused by the position of the wheat in the warehouse; the lightest is from the centre of the loft, where the grain generally lies thickest, and the heaviest, from the outside or ends of the heap, which are cooler and not so much infested as the centre, where the temperature is much higher, and more congenial to the habits of the insects.

The agents in this destruction are *Cucujus monilicornis*,* and *Calandra granaria*. The first is a very small beetle not exceeding one line in length. Curtis, in the "Journal of the Royal Agricultural Society of England," Part I., 1846, p. 104, has made some remarks on the species of *Cucujus* that have been found in granaries, and, amongst others, mentions that, *C. monilicornis* "was observed in granaries, and corn-bins, in Norfolk, about 30 years back, in the month of December." Whether or not this species is attendant on the weevils, I am unable to say. I have cut open some of the grains of wheat, and found as many as five or six individuals in each grain. Curtis, in the wheat that he examined from Ancona, which was infested by *C. testaceus*, found two or three dead individuals, in the interior of the grain, and the husk was pierced with very minute holes. I have also detected *C. monilicornis* in Madras rice, imported direct from the East Indies.

But the principal agent in this mischief is the weevil, and it is not a little singular that the larva, which is said to "make the greatest havoc amongst the corn," is undescribed by British

* I had a two ounce phial filled with living specimens brought me in the beginning of November. They had a peculiar, strong, unpleasant smell.

Entomologists. It has, however, been described, and its transformations traced, by Olivier*, whose account has been adopted by succeeding naturalists.

The countless multitudes in which the corn weevil sometimes occurs almost exceed belief; the men who had the care of this parcel of wheat assured me, that during the summer they regularly screened it once a month, or once in five weeks, and that at each screening they got about fourteen bushels of weevils.† The quantity of weevils may appear incredible to those unacquainted with such matters, but it must be borne in mind, that, under favourable circumstances, they increase amazingly. Kirby and Spence, in the "Introduction to Entomology," Vol. I., p. 170, speaking of the corn weevil say, "sometimes this pest becomes so infinitely numerous, that a sensible man engaged in the brewing trade once told me, speaking perhaps rather hyperbolically, that they collected and destroyed them by bushels; and no wonder, for a single pair of these destroyers may produce in one year above six thousand descendants." De Geer makes them still more prolific. He asserts that, "a single pair, in the course of a season, will produce (among themselves, and their descendants,) twenty-three thousand six hundred individuals;‡ and an instance came under my own observation, in which six bushels of weevils alone were taken at one screening, out of eight or ten lasts of Danish rye.

The weevils do not confine their ravages to wheat and rye, but have been found to attack barley, malt, oats, and maize, with equal readiness; and Curtis observed some, that during the winter ate up some pearl barley.

The great importance of this subject has led to the suggestion of a variety of expedients for the destruction of the weevils; but unfortunately a practically useful one is still a desideratum. It is said that the odour of spirits of turpentine, and even fumigation with sulphur, have been tried without benefit. Screening the

* Encyclopédie Methodique, Vol. V., p. 488.

† Of course this would include *Cucujus*, *Weevils*, and the excrement of the latter, which is a white, round seed-like substance.

‡ Encycl. Brit. Vol. IX. p. 175.

infected grain appears to be the only effectual remedy; but this process becomes very expensive, from the frequency with which it has to be repeated.

THOS. J. BOLD.

November, 1846.

IV.—*A Catalogue of the Insects of Northumberland and Durham, drawn up at the request of the Tyneside Naturalists' Field Club.* *By* JAMES HARDY, and THOMAS JOHN BOLD.

INSECTA MANDIBULATA.

ORDER 1. COLEOPTERA, *Aristotle.*

SECT. 1. PENTAMERA, *Latreille.*

TRIBE 1. CHILPODOMORPHA, *Mac Leay.*

STIRPS 1. GEODEPHAGA, *Mac Leay.*

SUB-TRIBE 1. ADEPHAGA, *Clairville.*

FAMILY 1. CICINDELIDÆ, *Kirby.*

1. CICINDELA, *Linn.*

1. C. CAMPESTRIS, *Linn.*

Steph. Illust., Mand., i. 11.

Heaths, warm banks and sandy shores, appearing as early as March. Twizell, Long Benton, Elswick, Winlaton Mill ; and on the coast near Marsden, Whitburn, and Ryhope.

FAMILY 2. CARABIDÆ, *Leach.*

SUB-FAMILY 1. BRACHINIDES, *Westw.*

2. DEMETRIAS, *Bonelli.*

1. D. ATRICAPILLUS, *Linn.*

Steph. Illust., Mand., i. 15.

On the Links at Hartlepool in April.—*J. H.* Marsden.—*Mr. W. Peacock.*

3. DROMIUS, *Bonelli.*

1. D. AGILIS, *Fab.*

Steph. Illust., Mand., i. 21.—*Carabus agilis, Fab., Syst. El.* i. 185.

Under bark and in moss. "Twizell."—*P. J. Selby, Esq.* Ravensworth.—*J. H.* Long Benton.—*T. J. B.*

2. D. QUADRIMACULATUS, *Linn.*

Steph. Illust., Mand., i. 21.

Common : under the bark of trees during the spring and winter months.

3. D. QUADRINOTATUS, *Panz.*

Steph. Illust. Mand., i. 21. *β. Ibid.* i. 22. *pl.* i. *f.* 4.

Under the bark of fir, ash, and other trees : Gosforth, Gibside, Ravensworth, Dunston-hill, and woods above Swalwell, in January and February. Var. *β.* with the pale spots on the elytra united, was "taken near Darlington, in company with a profusion of variety *α.*"—*Mr. C. Horner.* (Steph. Illust., Mand., i. 176.)

4. D. MELANOCEPHALUS, *De Jean.*

Steph. Illust., Mand., i. 22. *pl.* i. *f.* 5.

"Twizell." *P. J. Selby, Esq.* On the banks of the Team, near Ravensworth. Sea-coast at Whitley, Marsden, and Hartlepool. March—Oct.

5. D. FASCIATUS, *Payk.*

Steph. Illust., Mand., i. 24.

"Twizell."—*P. J. Selby, Esq.* Sea-coast at Whitley, in May and Sept.—*T. J. B.*

6. D. LINEARIS, *Oliv.*

Steph. Illust., Mand., i. 25.

Generally distributed. Apr.—Oct.

7. D. FOVEOLUS, *Gyll.*

Steph. Illust., Mand., i. 26.

Grassy banks on the sea-shore at Marsden.—*G. Wailes, Esq.*

4. LAMPRIAS, *Bonelli.*

1. L. CHLOROCEPHALUS, *Ent. Hefte.*

Steph. Illust., Mand., i. 30.

"Not very uncommon under stones near Newcastle," (Steph. Illust. i., 177.) ; and on the sea-banks at Whitley.—*G. Wailes, Esq.* Near Boldon in moss upon the limestone rocks, and at Marsden under stones, in April and May.—*Mr. A. Hancock.* "Woods about Durham."—*Mr. T. J. Bungey* (Ornsby's Durham). Banks near Ryhope.—*Mr. W. Peacock.*

SUB-FAMILY 2. SCARITIDES, *Westwood.*

5. CLIVINA, *Latreille.*

1. C. FOSSOR, *Linn.*

Steph. Illust., Mand. i., 39.

Common under stones and rubbish.

2. C. COLLARIS, *Herbst.*

Steph. Illust., Mand., i. 40, *pl.* iii. *f.* 3.—*Curtis, Brit. Ent., pl.* 175.

Beneath stones by the side of the Tyne and Derwent. May and June.

6. DYSCHIRIUS, *Bonelli.*

1. D. GIBBUS, *Fab.*

Steph. Illust., Mand., i. 43.—Scarites gibbus, *Fab. Syst. El.* i. 126.

Jarrow-slake.—*G. Wailes, Esq.*

SUB-FAMILY 3. HARPALIDES, *Westw.*

DIVISION 1. FERONIDEA, *Westw.*

7. PATROBUS, *Megerle.*

1. P. RUFIPES, *Fab.*

Steph. Illust., Mand., i. 119.—Carabus rufipes, *Fab. Syst. El.* i. 184.

Under stones, &c. It appears in February.

8. CALATHUS, *Bonelli.*

1. C. MELANOCEPHALUS, *Linn.*

Steph. Illust., Mand., i. 98.

Common.

2. C. CISTELOIDES, *Ill.*

Steph. Illust., Mand., i. 99.

Common. The variety with the antennæ and legs pitchy black has been noticed in one or two instances.

3. C. FULVIPES, *Gyll.*

C. fulvipes, *Boisd. et Lacord. Faun. Ent. Paris*, i. 203, 2., *Heer, Fn. Col. Helv.* i. 54, 3.—C. crocopus, *Steph. Illust., Mand.*, i. 99. *Steph. Manual, No.* 191.

Abundant on the coast; Whitley, South Shields, Ryhope, Hartlepool, and Seaton Carew. March—Sept.

5. C. FUSCUS, *Fab ?*

Steph. Illust., Mand., i. 99.

Two specimens at Greencroft, D.—*T. J. B.*

6. C. MOLLIS, *Marsh.*

Steph. Illust., Mand., i. 101.—Carabus mollis, *Marsh.* i. 456. "Twizell."—*P. J. Selby, Esq.* "Castle Eden Dean."—*G. Wailes, Esq.* Frequent on the Links at South Shields. March —Oct.

9. AMPHYGINUS, *Haliday.*

1. A. PICEUS, *Marsh.*

Haliday, Entomologist, 175.—Carabus piceus, *Marsh.* i. 444. Calathus piceus, *Steph. Illust., Mand.*, i. 98, *pl.* vi. *f.* 3.

In the neighbourhood of Bamburgh and Twizell.—*P. J. Selby, Esq.* Bradley Mill.—*T. J. B.* "Durham."—*Ornsby's* Durham. It frequents the roots of trees and decayed stumps.

10. SYNUCHUS, *Gyllenhal.*

1. S. NIVALIS, *Ill.*

S. vivalis, *Steph. Illust., Mand.*, i. 97.

Sea coast at South Shields in July.—*T. J. B.*

11. PRISTONYCHUS, *De Jean.*

1. P. TERRICOLA, *Ill.*

Sphodrus Terricola, *Steph. Illust., Mand.*, i. 85.

Common in cellars and bake-houses.

12. SPHODRUS, *Clairville.*

1. S. LEUCOPTHALMUS, *Linn.*

Steph. Illust., Mand., i. 84.

In cellars and warehouses, not abundant. A specimen in an outhouse at Twizell, and another in a cellar at Lucker.—*P. J. Selby, Esq.* Newcastle and Long Benton.

13. PLATYNUS, *Bonelli.*

1. P. ANGUSTICOLLIS, *Fab.*

Steph. Illust., Mand., i. 83. Carabus angusticollis, *Fab. Syst. El.* i. 182.

"Twizell."—*P. J. Selby, Esq.* Ovingham and Bradley Mill; Ravensworth and Cocken Woods; common on the banks of the Tyne and Derwent; "under stones near Kepyer."—(*Ornsby's* Durham); under sea-weed between Sunderland and Ryhope.

14. ANCHOMENUS, *Bonelli.*

1. A. PRASINUS, *Fab.*

Steph. Illust. Mand., i., 82.—Carabus prasinus, *Fab. Syst. El.*, i., 206.

Common beneath stones.

A variety in Mr. Albany Hancock's collection has the thorax wrinkled transversely; the elytra blue, a shade paler on the sides; the legs and antennæ rufo-piceous.

2. A. ALBIPES, *Ill.*

Steph. Illust. Mand. i., 82.—A. sordidus, *Ibid.*, i., 82.—Carabus pallipes, *Fab. Syst. El.*, i. 187.

Abundant on the banks of streams. It is also met with on the coast, and occasionally hybernates under bark.

3. A. OBLONGUS, *Fab.*

Steph. Illust. Mand., i., 82.—Carabus oblongus, *Fab. Syst. El.*, i., 186.

Local; under the bark of willows and beneath moss in damp woods. "Common near Newcastle."—*G. Wailes, Esq.* Dunston, and in plantations on the Team, near Ravensworth. Dec., June.

15. AGONUM, *Bonelli.*

1. A. MARGINATUM, *Linn.*

Steph. Illust. Mand., i., 85.

On the shore at Prestwick Car.—*G. Wailes, Esq.*

"We got them under the leaves of the yellow water-lily, in places where the water had dried up."—*A. Hancock.*

2. A. PARUMPUNCTATUM, *Fab.*

Steph. Illust. Mand., i., 87.—Carabus parumpunctatus, *Fab. Syst. El.*, i. 199.

Abundant beneath stones and moss in dry or heathy places.

3. A. VIDUUM, *Ill.*

Steph. Illust. Mand., i., 88.

"Twizell."—*P. J. Selby, Esq.* Newcastle.—*G. Wailes, Esq.*

4. A. VERSUTUM, *Sturm.*

Steph. Illust. Mand., i., 88.—A. læve, *Steph. Illust., Mand.*, i., 88.—*Heer, Fn. Col. Helv.*, i. 62, 88.

"Twizell."—*P. J. Selby, Esq.*

5. A. MŒSTUM, *Sturm.*

Steph. Illust. Mand., i., 89.—A. emarginatum, *Gyll., Steph. Illust., Mand*, i., 89.

Rare at Twizell.—*P. J. Selby, Esq.* Prestwick Car, Kenton. "Durham,"—*Rev. G. Ornsby;* Ravensworth, Whickham, Boldon Flats, &c.

6. A. QUADRIPUNCTATUM, *De Geer.*

Steph. Illust. Mand., i., 90. *pl.* vi. *f.* i.

One specimen at Long Benton.—*T. J. B.*

Mr. Stephens, in his description of this species in the 'Manual,' observes, that "the third interstice from the suture has four deep impressions." My specimen has also four impressions on each elytron, but differently disposed. There are three deeply impressed punctures on the third interstice, one about the middle and the other two towards the apex; while on the fourth interstice, there is an additional puncture much nearer the base than any of the former.—*T. J. B.*

7. A. ATRATUM, *Sturm.*

Steph. Illust. Mand., i., 91.

"Durham."—*Mr. T. J. Bungey.* Rather frequent in moist woods on the Team.—*J. H.* Gibside.—*T. J. B.*

Immature insects have the elytra pitchy testaceous.

8. A. MICANS, *Nicol.*

Steph. Illust. Mand., i., 91.—A. cursitor, *Kirby, Steph. Illust. Mand.*, i., 91.

Under the bark of willows, and in the decayed stems of thistles in moist ditches; Dunston, and the banks of the Team.

The thorax is narrow in proportion to the elytra and transversely wrinkled, and the upper surface has a brassy tint. The legs and antennæ are fuscous. In young individuals the elytra are pale testaceous, and these are perhaps the *Agonum fuliginosum* of English entomologists. It is common in spring.

9. A. PICEUM, *Linn.*

Steph. Illust. Mand., i., 92.

"Twizell."—*P. J. Selby, Esq.* Newcastle.—*G. Wailes, Esq.*

From the characters given by Stephens, I am led to consider this as an immature variety of some of the others, perhaps of *A. atratum.*—*J. H.*

10. A. PICIPES, *Fab.*

Steph. Illust. Mand., i., 93.—Carabus picipes, *Fab. Syst. El.*, i., 203.

"Durham."—*Rev. G. Ornsby.* Abundant at Boldon Flats.—*T. J. B.*

16. OLISTHOPUS, *De Jean.*

1. O. ROTUNDATUS, *Payk.*

Odontonyx rotundatus, *Steph. Illust. Mand.*, i., 96. *pl.* vi. *f.* 2.

Common in moory districts: Prestwick Car, Gateshead Fell, Gibside, Boldon, &c. It is found at all seasons.

17. PLATYDERUS, *Stephens.*

1. P. RUFICOLLIS, *Marsh.*

Steph. Illust. Mand., i., 102.—Carabus ruficollis, *Marsh.*, i., 456.

Local and scarce: beneath loose cinders and stones on the coast at South Shields, in April and May.—*T. J. B.*

18. ARGUTOR, *Megerle.*

1. A. VERNALIS, *Fab.*

Steph. Illust. Mand., i., 103.—Carabus vernalis, *Fab. Syst. El.*, i., 207.

Under stones, decaying leaves and rubbish. Boldon, Dunston, woods on the Team. March and April.

2. A. ERYTHROPUS, *Marsh.*

Steph. Illust. Mand., i., 105.—Carabus erythropus, *Marsh.*, i. 461.

Common under stones in a clayey soil.

3. A. STRENUUS, *Panz.*

Heer. Faun. Col. Helv., i., 66, 5.—Harpalus pullus, *Gyll. Ins. Suec.*, iv., 429. *(Heer).*—Argutor pullus, *Steph. Illust. Mand.*, i., 105?

"Twizell."—*P. J. Selby, Esq.* Woods on the Team in spring. —*J. H.*

This species which I had considered as the *A. pullus* with a doubt, the late Rev. G. T. Rudd pointed out to me as the true *A. strenuus.* The underside of the thorax is obsoletely and sparingly punctured, and the thighs are black, as are the antennæ, excepting the basal joint, which is rufous. The *A.*

strenuus, of Duft., Gyll., Steph., Sturm., Boisd. et Lacord.,—and the *A. pygmæus* of Sturm and Heer, appears to be identical with *A. erythropus* of Marsham, which has the underside of the thorax "deeply and thickly punctured." Mr. Selby considers the puncturing of the thorax a variable character, and is inclined to think that the two species unite. "I find," he observes, "the punctures on the underside of the thorax to vary in different examples from faint and indistinct to strong and well marked." —*J. H.*

4. A. ANTHRACINUS, *Gyll.*

Steph. Illust. Mand., i., 105.

Under heath at Prestwick Car in April.—*T. J. B.*

19. PŒCILUS, *Bonelli.*

1. P. CUPREUS, *Linn.*

Steph. Illust. Mand., i., 110.—P. rufifemoratus, *Ib.*, i., 110. "Twizell."—*P. J. Selby, Esq.* "Common near Newcastle."—*G. Wailes, Esq.* "Durham."—*Rev. G. Ornsby.* Ravensworth.

2. P. VERSICOLOR, *Ziegler.*

Steph. Illust. Mand., i., 110.

On pathways, &c., very common throughout the year.

20. OMASEUS, *Ziegler.*

1. O. ORINOMUM, *Leach.*

Steph. Illust. Mand., i., 114, *pl.* vii., *f.* 3.

A single specimen on the Cheviots.—*P. J. Selby, Esq.* One near South Shields in June.—*T. J. B.*

2. O. NIGRITA, *Fab.*

Steph. Illust. Mand., i., 114.—Carabus nigrita, *Fab. Syst. El.*, i., 200.

Common on moist heaths, &c.

A variety with the region of the scutellum depressed occurs not unfrequently; and there is great disparity in the size of individual insects. At Prestwick Car, where there is a great scarcity of stones, it makes choice of rather a singular residence, viz., the dried dung of cattle, under which it lurks in profusion.

3. O. MELANARIUS, *Ill.*

Steph. Illust. Mand., i., 115.

Abundant.

This species both in the larva and imago state feeds on earthworms and slugs.

21. STEROPUS, *Megerle.*

1. S. MADIDUS, *Fab.*

Steph. Illust. Mand., i., 116.—Carabus madidus, *Fab., Syst. El.*, i., 181.

Common.

2. S. ÆTHIOPS, *Kugelan.*

Steph. Illust. Mand., i., 117. S. concinnus, *Curt. Brit. Ent., pl.* 171.

"Twizell."—*P. J. Selby, Esq.* On the north side of the Cheviots.—*Mr. G. Little.* In the stump of a tree at Lanchester in August.—*T. J. B.*

22. BROSCHUS, *Panzer.*

1. B. CEPHALOTES, *Linn.*

Steph. Illust. Mand., i., 118.

Very common on the sea-coast.

It occurs beneath stones and sea-weed, but more frequently it inhabits deep burrows in the firm sand: it has also been found on the banks of the Derwent, near Axwell Park, where it has likewise excavated for itself a subterraneous residence. It comes abroad in the evening, and its retreats may be readily discovered by following the tracks which it leaves behind, in these nocturnal excursions. Mr. Albany Hancock observes that its chief food seems to consist of *Philopedon geminatus;* Mr. Peacock has seen it conquer and devour *Ocypus olens;* and we, besides a variety of other fare, have detected it preying on *Oniscus asellus.*

23. STOMIS, *Clairville.*

1. S. PUMICATUS, *Panz.*

Steph. Illust. Mand., i., 118.

Not unfrequent under stones and rubbish. April, Sept.

24. PTEROSTICHUS, *Bonelli.*

1. P. PARUMPUNCTATUS, *De Jean.*

P. brunnipes, *Steph. Illust. Mand.*, i., 121.

Local, but abundant: Newcastle, Benwell, Ouseburn Dean, Long Benton, Dunston, Ravensworth, Gateshead Fell, Boldon.

It is first found in February, and the males make their appearance somewhat earlier than the females. It was first detected in the vicinity of Newcastle by W. C. Hewitson, Esq., author of the "Illustrations of the Eggs of British Birds," who found his first specimens in the Ouseburn Dean, in 1829.—*(Edinburgh Journal of Natural and Geographical Science, i., 376.)*

"It frequents the woody denes in this neighbourhood, inhabiting beneath stones, being very active when disturbed, and though plentiful on the 18th of October last, when I had the pleasure first of discovering it, and of taking upwards of twenty specimens in one hour, yet, on the 6th November, it had almost disappeared. It ranks among the largest of our Adephagous insects, and is a valuable addition to the British cabinet."—W. C. Hewitson.

25. Platysma, *Bonelli.*

1. P. niger, *Fab.*

Steph. Illust. Mand., i., 124.—Carabus niger, *Fab. Syst. El.*, i., 178.

Common. Twizell, Long Benton, Gateshead Fell, Boldon, Dunston, Marsden, &c.

26. Abax, *Bonelli.*

1. A. striola, *Fab.*

Steph. Illust. Mand., i., 125.—Carabus striola, *Fab. Syst. El.*, i., 188.

Spittal Links, N. Durham. "Not uncommon in Northumberland."—*G. Wailes, Esq.* Ouseburn Dean, Long Benton, &c. "Castle Eden Dean."—*G. Wailes, Esq.* "Durham."—*Mr. T. J. Bungey.* Gibside, Dunston, Seaham, &c.

27. Amara, *Bonelli.*

1. A. eurynota, *Ill.*

Steph. Illust. Mand., i., 127. *pl.* vi., *f.* 6.

Common.

2. A. trivialis, *Gyll.*

Steph. Illust. Mand., i., 129.

"Twizell."—*P. J. Selby, Esq.* Newcastle. "Durham."—*Rev. G. Ornsby.*

3. A. VULGARIS, *Linn.*
Steph. Illust. Mand., i., 128.
"Twizell."—*P. J. Selby, Esq.*

4. A. LÆVIS, *Sturm.*
Steph. Illust. Mand., i., 130.
Newcastle.—*G. Wailes, Esq.*

5. A. CURSOR, *Sturm.*
Steph. Illust. Mand., i., 130.—A. familiaris, *Steph. Illust. Mand.*, i., 133.
Common.

6. A. COMMUNIS, *Fab.*
Steph. Illust. Mand., i, 133.
Common.

7. A. TIBIALIS, *Payk.*
Steph. Illust. Mand., i., 135.
Newcastle.—*G. Wailes, Esq.*

8. A. PLEBEIA, *Gyll.*
Steph. Illust. Mand., i., 132.
Common.

SUB-G. CELIA, *Zimm.*

9. A. INGENUA, *Duft.*
Stephens' Manual, No. 272. A. lata, *Steph. Illust. Mand.*, i., 127.
Newcastle.—*G. Wailes, Esq.*

10. A. BIFRONS, *Gyll.*
Steph. Illust. Mand., i., 130.
Two specimens from South Shields.—*T. J. B.*

28. BRADYTUS, *Stephens.*

1. B. APRICARIUS, *Fab.*
Steph. Illust. Mand., i., 137.—Carabus apricarius, *Fab. Syst. El.*, i., 205.
Common.

2. B. FERRUGINEUS, *Linn.*
Steph. Illust. Mand., i., 137.
Rare; on the coast at South Shields in April and July.—*T. J. B.*

29. CURTONOTUS, *Stephens.*

1. C. PICEUS, *Fab.*

Stephens' Manual, i., *No.* 284.—C. aulicus, *Steph. Illust. Mand.*, i., 139.

Not uncommon on dry soils. Near Bamburgh, and at Norham.—*P. J. Selby, Esq.* Gibside, Gateshead Fell, Dunston, Marsden, South Shields, Ryhope Dean, &c.

It is frequently seen rambling over plants in hedges, and at Tynemouth, in September, it has been found feeding on the seeds of *Centaurea nigra;* having thrust itself into the centre of the capitula, or "hard-heads" as they are termed, till it was almost concealed. In winter and cold weather it descends deeply into the soil. In its structure and habits it has a strong affinity with Zabrus.

DIVISION 2. HARPALIDEA, *Westw.*

30. HARPALUS, *Latreille.*

1. H. RUFIMANUS, *Marsh.*

Steph. Illust. Mand., i., 143.—Car. rufimanus, *Marsh.*, i., 441. "Twizell."—*P. J. Selby, Esq.*

2. H. LIMBATUS, *Dufts.*

Steph. Illust. Mand., i., 149.

Under stones and loose turf: "Twizell."—*P. J. Selby, Esq.* Gateshead Fell, Gibside, Ryhope Dean.—March, Sept.

3. H. ÆNEUS, *Fab.*

Steph. Illust. Mand., i., 155.—Carabus æneus, *Fab. Syst. El.*, i., 197.

Common.

4. H. RUFICORNIS, *Fab.*

Steph. Illust. Mand., i., 158.—Carabus ruficornis, *Fab. Syst. El.*, i., 180.

Common, especially on the coast. April, October.

31. OPHONUS, *Ziegler.*

1. O. PUNCTICOLLIS, *Payk.*

Steph. Illust. Mand., i., 162.

"Twizell."—*P. J. Selby, Esq.* At the foot of Ryhope Dean,

in April.—*J. H.* South Shields in April, and Whitley, in May. —*T. J. B.*

2. O. PUBESCENS, *Payk.*

Steph. Illust. Mand., i., 164.

Under stones and rejectamenta below the castle at Tynemouth, and on the borders of Jarrow-slake.—*G. Wailes, Esq.* Marshes of the Wear, above Southwick, in June.—*J. H.*

32. TRECHUS, *Clairville.*

1. T. DORSALIS, *Fab.*

Steph. Illust. Mand., i., 167, *pl.* ix. *f.* 4.

From moss at Gosforth, in February.—*T. J. B.*

2. T. RUFICOLLIS, *Steph.* ?

Steph. Illust. Mand., i., 168. ?

Near Usworth, and on Throckley Fell.—*Mr. A. Hancock.*

3. T. AQUATICUS, *Panz.*

Steph. Manual, No. 369.—T. minutus, *Steph. Illust. Mand.*, i., 169.

Common.

4. T. SIMILIS, *Dej.*

Acupalpus, similis, *Heer. Fn. Col. Helv.*, i., 118, 4.

Under stones, and at the roots of heath; Gateshead Fell; Lobley Hill, and Prestwick Car.—*J. H.*

5. T. BRUNNIPES, *Sturm.*

Steph. Manual, No. 370.—T. pallipes, *Steph. Illust. Mand.*, i., 168.

Gateshead Fell, Gibside, Ravensworth, West Boldon. March —August.

6. T. FULVUS, *Marsh.*

Steph. Illust. Mand., i., 169.—Carabus fulvus, *Marsh.*, i., 456.

Common; "Twizell."—*P. J. Selby, Esq.* Long Benton, Heaton, Gateshead Fell, and Boldon. About the roots of *Senecio Jacobæa* at South Shields.

7. T. PLACIDUS, *Gyll.*

Steph. Illust. Mand., v., 384.—*Steph. Manual, No.* 375.

Acupalpus placidus, *Heer, Fn. Col. Helv.*, i., 118, 1.

Under stones near Dunston, in June.—*J. H.*

8. T. COLLARIS, *Payk.*

Steph. Manual, No. 376.

"Twizell."—*P. J. Selby, Esq.* "Durham."—*Ornsby's Durham.*

33. BLEMUS, *Ziegler.*

1. B. PALUDOSUS, *Gyll.*

Steph. Illust. Mand., i., 171. *Hardy, in Berwick Club's Proceedings*, ii., 195.

Rare; one specimen at Long Benton, and another in the Dean above Winlaton Mill, in June.

2. B. PALLIDUS, *Sturm.*

Steph. Manual, No. 378. *Hardy, in Berwick Club's Proceedings*, ii., 195.

Rare; Tyneside, and on the Ballast Heaps at South Shields.—*T. J. B.* Dr. Johnston finds it in the vicinity of Berwick-upon-Tweed; it has also been detected further to the north.

3. B. MICROS, *Herbst.*

Curtis, Brit. Ent. pl. 310.—B. rubens, *Steph. Illust. Mand.*, i., 172.

Rare; Newcastle.—*G. Wailes, Esq.* Beneath rejectamenta on the Team, in January.—*J. H.* There are also two specimens in Mr. John Hancock's collection, taken within the district.

4. B. LONGICORNIS, *Sturm.*

Steph. Illust. Mand., i., 172.

"Twizell."—*P. J. Selby, Esq.*

34. EPAPHIUS, *Leach.*

1. E. SECALIS, *Payk.*

Steph. Illust. Mand., i., 173.

Not common, though widely distributed; Jarrow Slake.—*G. Wailes, Esq.* Long Benton, Kenton, Gibside, &c., in June.

DIVISION 3. CHLÆNIDEA, *Westw.*

35. LORICERA, *Latreille.*

1. L. PILICORNIS, *Fab.*

Steph. Illust. Mand., i., 69.—Carabus pilicornis, *Fab. Syst. El.*, i., 193.

Under moss and stones in heathy soils, from the coast to the highest upland. Common all the year.

36. Badister, *Clairv.*

1. B. bipustulatus, *Fab.*

Steph. Illust. Mand., i., 72.—Carabus bipustulatus, *Fab. Syst. El.*, i., 203.

Under stones not unfrequent; "Twizell."—*P. J. Selby, Esq.* Ouseburn, Haydon Bridge, Marsden, West Boldon, Sunderland, Ryhope Dean, &c. Feb.—August.

37. Trimorphus, *Stephens.*

1. T. humeralis, *Bon.*

Badister humeralis, *Boisd. et Lacord. Faun. Ent. Paris.*, i. 198, 4.—*Heer. Faun. Ent. Helv.*, i., 49, 4.—Trimorphus scapularis, *Steph. Illust. Mand.*, i., 180.

Under moss at the roots of recently felled trees; Meldon Park, Capons-cleugh, near Haydon Bridge, in April.—*G. Wailes, Esq.*

38. Licinus, *Latreille.*

1. L. depressus, *Payk.*

Curtis Brit. Ent. pl. 75.—*Steph. Illust. Mand.*, i., 73.

Of this rare insect two specimens have occurred; one taken by the late Rev. G. T. Rudd, at the sea-shore end of Castle Eden Dean, and another by myself, on the sandy coast between Hartlepool and Black-hall rocks, in April.—*J. H.*

Sub-family 4. Carabides, *Westw.*

Division 1. Carabidea, *Westw.*

39. Cychrus, *Fabricius.*

1. C. rostratus, *Linn.*

Steph. Illust. Mand., i., 45.—*Curtis Brit. Ent., pl.* 426.

"Not uncommon during greater part of the year in Northumberland."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* "Common at the roots of trees in Maiden Castle Wood."—*Ornsby's* Durham. Tanfield Dean, Gateshead Fell, Ravensworth, Swalwell, between Boldon and Hylton, Marsden, Ryhope Dean, &c.

40. Carabus, *Linn.*

1. C. catenulatus, *Fab.*

Fab. Syst. El., i., 170.—*Steph. Illust. Mand.*, i., 48.

Common.

2. C. MONILIS, *Fab.*

Fab. Syst. El., i., 171.—*Steph. Illust. Mand.*, i., 49.

"Twizell."—*P. J. Selby, Esq.*

3. C. GRANULATUS, *Linn.*

Steph. Manual, No. 88.—C. cancellatus, *Steph. Illust., Mand.*, i., 50.

Common. It is frequently found under the bark of decayed trees in the winter months.

4. C. ARVENSIS, *Fab.*

Fab. Syst. El., i., 174.—*Steph. Illust. Mand.*, i., 51.

"Common on heaths, Northumberland."—*G. Wailes, Esq.* Prestwick Car.—*Mr. J. Hancock.* Black Fell.—*Mr. A. Hancock.* Follingsby Bog.—*G. Wailes, Esq.* April—June.

5. C. VIOLACEUS, *Linn.*

Steph. Illust. Mand., i., 52.

Common under heaps of stones, moss, &c., inland as well as on the sea banks.

6. C. GLABRATUS, *Fab.*

Fab. Syst. El., i., 170.—*Steph. Illust. Mand.*, i., 52.

On the Cheviots.—*P. J. Selby, Esq.*

7. C. NEMORALIS, *Ill.*

Steph. Manual, No. 96.—C. hortensis, *Steph. Illust. Mand.*, i., 53.

"In gardens at Stockton."—*Hogg's Stockton.* "Twizell."—*P. J. Selby, Esq.* Newcastle Town Moor, Throckley Fell, Gibside, Cullercoats' Banks, Gateshead Nurseries, South Shields, Ryhope Dean, under heaps of small coal at the pit mouth, Haswell, Hartlepool. April—September.

8. C. NITENS, *Linn.*

Sowerby Brit. Mis., i., *pl.* 27.—*Steph. Illust. Mand.*, i., 56.

"Not uncommon on the heaths of Durham."—*Rev. J. Harriman*, Oct. 1, 1804. *(Sowerby's Brit. Mis., p. 55).* "Common on heaths in Northumberland."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* "Rass Castle, near Chillingham," June 15th, 1836.—*Berwickshire Naturalists' Club.* Prestwick Car, in April and June. Callerton Fell, August 13.—*Messrs. A. and J. Hancock.* Haltwhistle.—*Mr. Thornhill.*

41. LEISTUS, *Fröhlich.*

1. L. SPINIBARBIS, *Fab.*

Steph. Illust. Mand., i., 63.—Carabus spinibarbis, *Fab. yst. El.*, i., 181.

Rather frequent. "Two splendidly coloured specimens were sent me from Newcastle by Mr. Wailes."—*Steph. Illust. Mand.*, i., 179. Heaton and Whitley. "Castle Eden Dean." —*G. Wailes, Esq.* Marsden, Gateshead Fell, Swalwell, Axwell, Boldon Flats. March—December.

2. L. FULVIBARBIS, *Hoffg.*

Curtis, Brit. Ent., pl. 176.—*Steph. Illust. Mand.*, i., 64.

Under stones and beneath bark of decayed trees. "Twizell." —*P. J. Selby, Esq.* Near Fenham and Kenton. "Castle Eden Dean."—*G. Wailes, Esq.* Ravensworth, Woods above Swalwell, Cleadon.

3. L. JANUS, *Newman.*

Newman Ent. Mag., i., 286.—*Steph. Illust. Mand.*, v., 373.

Under decayed leaves in Ravensworth woods.—*G. Wailes, Esq.*

4. L. SPINILABRIS, *Fab.*

Steph. Illust. Mand., i., 65.—Carabus spinilabris, *Fab. Syst. El.*, i., 204.

Under stones: Heaton, Dunston, Lobley Hill, Gateshead Fell, Black Fell, Cleadon. In the crevices of a limestone rock near South Shields. March—November.

5. L. RUFESCENS, *Fab.*

Steph. Illust. Mand., i., 65.—Carabus rufescens, *Fab. Syst. El.*, i., 205.

In woods, &c. "Twizell."—*P. J. Selby, Esq.* "Castle Eden Dean."—*G. Wailes, Esq.* Long Benton, Winlaton Mill, Gibside, South Shields, Lobley Hill. June—Sept.

DIVISION 2. ELAPHRIDEA, *Westw.*

42. HELOBIA, *Leach.*

1. H. BREVICOLLIS, *Fab.*

Steph. Illust. Mand., i., 61.—Carabus brevicollis, *Fab. Syst El.*, i., 191.

Abundant throughout the year. It frequents moist as well

as dry situations, and takes readily to the water when pursued, even venturing to conceal itself at the bottom, where it has the power of remaining submerged for a considerable time.

2. H. NIVALIS, *Payk.*

Steph. Manual, No. 113.—H. Gyllenhalii, *Steph. Illust. Mand.*, i., 62.

"Twizell."—*P. J. Selby, Esq.* Scotswood Dean, and "Castle Eden Dean."—*G. Wailes, Esq.* Ryhope Dean.—*Mr. W. Peacock.* Abundant under stones and rejectamenta by the side of the Derwent. May—August.

This has all the subaquatic habits of a Peryphus.

43. BLETHISA, *Bonelli.*

1. B. MULTIPUNCTATA, *Linn.*

Steph. Illust. Mand., ii., 36.—*Curtis, Brit. Ent., pl.* 326.

"Prestwick Car, common."—*G. Wailes, Esq.* It was not unfrequent in 1826 and some subsequent years.

44. ELAPHRUS, *Fab.*

1. E. CUPREUS, *Megerle.*

Steph. Illust. Mand., ii., 34.

In marshes and by sides of ponds. "Newcastle."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Prestwick Car; on the Wear above Southwick. May and June.

2. E. RIPARIUS, *Linn.*

Steph. Illust. Mand., ii., 35.

Sides of ponds. "Newcastle."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Prestwick Car and Gibside. "At the Reeds, near Houghall."—*Ornsby's Durham.*

45. NOTIOPHILUS, *Duméril.*

1. N. AQUATICUS, *Linn.*

Steph. Illust. Mand., ii., 32.—v., 388.

Common.

2. N. TIBIALIS. *Steph.*

Steph. Illust. Mand., v., 388.

Common. This appears to be a variety of the preceding.

3. N. BIGUTTATUS, *Fab.*

Steph. Illust. Mand., ii., 33.—v., 389.

Common.

4. N. QUADRIPUNCTATUS, *De Jean.*

Steph. Illust. Mand., ii., 190.—*Boisd. et Lacord. Faun. Ent. Paris.*, i., 2.

Newcastle and Long Benton.—*T. J. B.*

The French entomologists, now consider this as a variety of *N. biguttatus;* and Mr. Bold's specimens confirm this view, the additional impressions on the elytra being neither constant nor uniform.

SUB-FAMILY 5. BEMBIDIIDES, *Westw.*

46. CILLENUM, *Leach.*

1. C. LATERALE, *Leach.*

Curtis, Brit. Ent., pl. 200.—*Steph. Illust. Mand.*, ii., 4.

There is a specimen in Mr. John Hancock's collection, taken at Elswick, 29th April, 1827.

47. TACHYS, *Ziegler.*

1. T. BINOTATUS, *Steph.*

Steph. Illust. Mand., ii., 5.

Common in damp situations.

2. T. IMMUNIS, *Kirby.*

Steph. Illust. Mand., ii., 6.

"Twizell."—*P. J. Selby, Esq.* "Newcastle."—*G. Wailes, Esq.*

3. T. MINUTISSIMUS, *Leach.*

Steph. Illust. Mand., ii., 7.—Carabus bistriatus, *Megerle. Duft. Faun. Aust.*, ii., 205?

One specimen in a field between Swalwell and Winlaton Mill. —*J. H.*

48. PHILOCTHUS, *Stephens.*

1. P. ÆNEUS, *Spence.*

Steph. Illust. Mand., ii., 7.

On the banks of the Team near Ravensworth, and on the coast at South Shields and Hartlepool in April.—*J. H.*

All the specimens examined have an indistinct pale spot near the apex of the elytra. It is more convex and less broad than the next, and the legs and antennæ are almost black. We have, however, our doubts of its claims to specific distinction, as there are intermediate varieties.

2. P. FUSCIPES, *De Jean ?*

Steph. Illust. Mand., ii., 8.

Abundant on the borders of pools near Prestwick Car. June.

3. P. BIGUTTATUS, *Ill.*

Steph. Illust. Mand., ii., 8.

In moist places. "Twizell."—*P. J. Selby, Esq.* Long Benton, Gibside, Ravensworth Woods, Sunderland, Hartlepool. It is a vernal insect.

4. P. GUTTULA, *Ill.*

Steph. Illust. Mand., ii., 9.

"Twizell."—*P. J. Selby, Esq.* Newcastle.—*G. Wailes, Esq.*

49. OCYS, *Kirby.*

1. O. CURRENS, *Kirby.*

Steph. Illust. Mand., ii., 10.—Elaphrus Pumilio, *Dufts. Faun. Aust.*, ii., 214.

Meldon Park.—*G. Wailes, Esq.* "Castle Eden Dean."—*Rev. W. Little.* Marsden.—*J. H.*

2. O. MELANOCEPHALUS, *Leach.*

Steph. Illust. Mand., ii., 10, *pl.* x., *f.* 2.

Under the bark of decayed trees in moist situations. Plantations on the Team, Dunston, Swalwell, and Gibside. December —June.

50. PERYPHUS, *Megerle.*

1. P. FEMORATUS, *Sturm.*

Steph. Illust. Mand., ii., 12.—v., 384.

Common. "Twizell."—*P. J. Selby, Esq.* On the banks of the Team and Derwent, all the year.

2. P. CONCINNUS, *Kirby.*

Steph. Illust. Mand., ii., 12.—v., 385.

Rather uncommon : banks of the Tyne, and by the side of the Derwent, near Axwell Park. May—November.

3. P. RUPESTRIS, *Fab.*

Bembidium rupestre, *Boisd. et Lacord. Faun. Ent. Paris.*, i., 276, 13.—*Heer, Fn. Col. Helv.*, i., 129, 25. Elaphrus rupestris, *Fab. Syst. El.*, i., 246.—Peryphus littoralis, *Steph. Illust., Mand.*, ii., 13.—v., 385.

Common. It winters under bark, or in large companies be-

neath stones; and frequents the sea-coast, as well as river banks and moist pastures.

4. P. SAXATILIS, *Gyll.*

Steph. Illust. Mand., ii., 12.—v., 385.

Common on the banks of the Tyne and Derwent. Feb.—Nov.

There is a large variety occasionally to be met with having pale legs, the elytra suffused with reddish brown, and tinged more or less with bluish green.—*T. J. B.*

5. P. LUNATUS, *Andersch.*

Steph. Illust. Mand., ii., 13. *pl.* x. *f.* 3.

Rare; by the side of the Derwent.—*T. J. B.*

Stephens' figure is from a young specimen, in which the elytra are pale, and the fasciæ very indistinct. Mature individuals, especially males, are of a rich dark mahogany colour; and the fasciæ are very variable, being in some instances quite imperceptible.—*T. J. B.*

6. P. NITIDULUS, *Marsh.*

Steph. Illust. Mand., ii., 14.—Carabus nitidulus, *Marsh.* i., 454.

Widely dispersed; banks of the Tyne, Lobley Hill, Gibside, Dunston, Boldon, Marsden, Sunderland, Hartlepool.—April, —November.

7. P. DECORUS, *Zenker.*

Carabus decorus, *Panz. Fn. Ger.*, 73, 4.—Bembidium decorum, *Boisd. et Lacord. Faun. Ent. Paris.*, i., 279, 19.—*Heer, Fn. Col. Helv.* i., 132, 35.—Peryphus viridi-æneus, Spence.—(*Steph. Illust. Mand.*, ii., 15.)

Banks of rivers. "Twizell."—*P. J. Selby, Esq.* Ouseburn, and on the banks of the Derwent, above Winlaton Mill. June, —July.

8. P. AGILIS, *Spence.*

Steph. Illust. Mand., ii., 15.

"Twizell."—*P. J. Selby, Esq.* Banks of the Tyne and, in the gravel of a rivulet, in a dean above Winlaton Mill.

9. P. CNEMERYTHRUS, *Steph.*

Steph. Manual, No. 421.—P. tibialis, *Steph. Illust. Mand.*, ii., 15.

Abundant on the banks of rivers and brooks.

Like several of the other species its habits are sub-aquatic. It lurks beneath stones and gravel, kept continually moist by percolation from the stream.

10. P. LEACHII, *Spence.*

Steph. Illust. Mand., ii., 16.

Rare. "Castle Eden Dean."—*Ornsby's Durham.* Banks of the Derwent.—*T. J. B.*

11. P. ATROCŒRULEUS, *Steph.*

Steph. Illust. Mand., ii., 17.

Banks of the Derwent in June.—*T. J. B.* Ryhope Dean.—*Mr. W. Peacock.*

51. LOPHA, *Megerle.*

1. L. QUADRIGUTTATA, *Fab.*

Steph. Illust. Mand., ii., 22.—Carabus 4 guttatus, *Fab. Syst. El.*, i., 207.

Newcastle.—*G. Wailes, Esq.* "Castle Eden Dean."—*Rev. W. Little.* South Shields in April.—*J. H.*

2. L. NIGRA, *Wilkin.*

Steph. Illust. Mand., ii., 24.

Two specimens from the vicinity of Newcastle.—*T. J. B.*

3. L. MINIMA, *Marsh.*

Steph. Illust., Mand., ii., 24.

Marshes af the Wear, above Southwick, in June.—*J. H.*

52. TACHYPUS, *Megerle.*

1. T. CELER, *Fab.*

Steph. Illust. Mand., ii., 26.

Common.

2. T. PROPERANS, *Hoff.*

Steph. Illust. Mand., ii., 26.—Bembidium velox, *Erichson, Käf. der Mark. Brand.*, i., 134.

"Twizell."—*P. J. Selby, Esq.* Newcastle.—*G. Wailes, Esq.*

3. T. CHALCEUS, *Steph.*

Steph. Illust. Mand., ii., 27.

"Twizell."—*P. J. Selby, Esq.*

4. T. BIPUNCTATUS, *Linn.*

Steph. Illust. Mand., ii., 28.

Rare: banks of the Tyne. June.

5. T. STRIATUS, *Fab.*

Steph. Illust. Mand., ii., 28.—Elaphrus striatus, *Fab. Syst. El.*, i., 245.

On river banks not uncommon. "*Durham*,"—*Rev. G. Ornsby's Durham.* Ouseburn, and by the Derwentside, in April and June.—*T. J. B.*

53. BEMBIDIUM, *Illiger.*

1. PALIEDOSUM, *Panz.*

Steph. Illust. Mand., ii., 30.

On the sandy shores of rivers. "Twizell."—*P. J. Selby, Esq.* "Durham."—*Mr. T. J. Bungey.* Plentiful on the banks of the Derwent, near Winlaton Mill, and Gibside, in June.

2. B. FLAVIPES, *Linn.*

Steph. Illust. Mand., ii., 30.

"Durham."—*Mr. T. J. Bungey.* Swalwell, and on the banks of the Derwent. April—Aug.

3. B. PALLIPES, *Megerle.*

Steph. Illust. Mand., ii., 31.

With the other species on the banks of the river Till.—*P. J Selby, Esq.*

STIRPS 2. HYDRADEPHAGA, *Mac Leay.*

FAMILY 1. DYTICIDÆ, *Leach.*

SUB-FAMILY 1. HALIPLIDES, *Westwood.*

52. HALIPLUS, *Latreille.*

1. H. ELEVATUS, *Panz.*

Steph. Illust. Mand., ii., 39.

Common : Ouseburn and Boldon.—*T. J. B.* April—July.

2. H. FULVUS, *Fab.*

Steph. Manual, No. 478.—H. ferrugineus, *var. Steph. Illust. Mand.*, ii., 40.—*Curtis, Brit. Ent., pl.* 730.

In stagnant waters, common. April—July.

3. H. OBLIQUUS, *Fab.*

Steph. Illust. Mand., ii., 41.—Dytiscus obliquus, *Fab. Syst. El.*, i., 270.

In pools, common. "Newcastle."—*G. Wailes, Esq.* Long Benton and Marsden; frequent among confervæ. April.

There are two varieties; in the one the elytra are spotted, in the other lineated with black.

4. H. LINEATOCOLLIS, *Marsh.*

Steph. Illust. Mand., ii., 41.—Dytiscus lineatocollis, *Marsh.*, i., 429.

Brooks; common. July—Sept.

5. H. RUFICOLLIS, *De Geer.*

Steph. Illust. Mand., ii., 42.—*Erichson, Käf. der Mark. Brand.*, i., 186.—*Heer. Fn. Col. Helv.*, i., 163, 10. H. melanocephalus, *Steph. Illust. Mand.*, ii., 43.—H. fulvicollis, *Steph. Manual*, No. 484.

Ponds: abundant. March—Aug.

6. H. CINEREUS, *Deg.*

Aubé Iconog. Col. Europ., v., 30.—*Heer. Faun. Col. Helv.*, i., 163, 8. H. affinis, *Steph. Illust. Mand.*, ii., 42.

"Newcastle."—*G. Wailes, Esq.*

SUB-FAMILY 2. DYTICIDES, *Westwood.*

55. LACCOPHILUS, *Leach.*

1. L. HYALINUS, *De Geer.*

Steph. Manual, No. 550. L. minutus, *Steph. Illust. Mand.* ii., 64.

Common. April—June.

56. HYDROPORUS, *Clairville*

1. H. ASSIMILIS, *Payk.*

Heer, Fn. Col. Helv., i., 153, 4.—H. frater, *Steph. Illust. Mand.*, ii., 50, *pl.* xi., *f.* 4.

Ponds. "Twizell."—*P. J. Selby, Esq.* Prestwick Car, Boldon, Marsden, &c.

2. H. ELEGANS, *Illig.*

Dytiscus elegans, *Panz. Fn. Germ.*, 24 *f.* 5. H. depressus, *Steph. Illust. Mand.*, ii., 51.

In gravelly rivers and brooks, common. "Twizell."—*P. J. Selby, Esq.* Ouseburn, Derwent, &c. March—Sept.

3. H. DUODECIMPUSTULATUS, *Fab.*

Dytiscus 12, pustulatus, *Fab. Syst. El.*, i., 270. H. 12 pustulatus, *Steph. Illust. Mand.*, ii., 51.

In streams, common. May—Aug.

4. H. PARALLELO-GRAMMUS, *Sturm.*

Heer. Fn. Col. Helv., i., 154, 8.—H. lineatus, *Steph. Illust. Mand.*, ii, 52.—Dytiscus lineatus, *Marsh.*, i., 426.

"Twizell."—*P. J. Selby, Esq.*

5. H. DORSALIS, *Fab.*

Steph. Illust. Mand., ii., 53.—Dytiscus dorsalis, *Fab. Syst. El.* i., 269.

"Twizell."—*P. J. Selby, Esq.* Newcastle.—*T. J. B.*

6. H. LATUS, *Rudd.*

Steph. Illust. Mand., ii., 192.

Rare; Ouseburn in July.—*T. J. B.*

7. H. SEPTENTRIONALIS, *Gyll.*

Hyphydrus septentrionalis, *Gyll. Ins. Suec.*, iv., 385.—Hydroporus alpinus, *Steph. Illust. Mand.*, ii., 54., *pl.* xi., *f.* 5.

Common in gravelly brooks : Ouseburn, Derwent, &c. April —August.

8. H. DAVISII, *Curtis.*

Curtis Brit. Ent., pl. 343.—*Steph. Illust. Mand.*, v., 391.

Among gravel; in a brook near Ravensworth, and in the Derwent. April—Aug.

9. H. PALUSTRIS, *Linn.*

Steph. Manual, No. 515. H. 6 pustulatus, *Steph. Illust. Mand.*, ii., 54.

Very common in ponds and running waters.

10. H. ANGUSTATUS : *Corpore oblongo-ovato, capite rufescente, thoracis disco fusco, lateribus dilutioribus, elytris crebre evidenter punctatis, magis minusve fuscescentibus, pedibus rufis, antennis testaceis, articulis apicalibus fuscis.* Long. 1.—1½ lin. H. angustatus, *Sturm ? Schaum, Zoologist*, 1892.—H. tristis, *Steph. Illust. Mand.*, ii., 55 ?

At Prestwick Car, and elsewhere near Newcastle.

Oblong-ovate, narrow, fuscous or black, shining, glabrous : head red, with a moderate depression on each side in front, between which there is occasionally a triangular dusky spot, crown more or less fuscous; thorax dusky ferruginous, paler at the sides, posterior margin obliquely impressed, and with the sides,

thickly punctulate, anterior, scarcely impressed and slightly punctulate, disk sub-convex, smooth, or variously occupied with punctures; elytra narrow, convex, attenuated behind, black or fuscous, with the sides, shoulders and apex more or less rufescent, conspicuously punctured, the punctures placed slightly apart; body black beneath, rather strongly punctate; legs ferruginous; antennæ testaceous with the tips dusky.

One specimen is entirely black, except the front of the head which is red; others have the thorax red beneath as well as above.—*J. H.*

11. H. LINEATUS, *Fab.*

Boisd. et Lacord. Faun. Ent. Paris., i., 336, 19.—*Heer. Fn. Col. Helv.*, i., 158, 22.—Dytiscus lineatus, *Fab. Syst. El.*, i., 372 ?—Hydroporus ovalis, *Steph. Illust. Mand.*, ii., 58.—Dytiscus ovalis, *Marsh.*, i., 425.—Dytiscus ovatus, *Fab. Syst. El.*, i., 269.

Prestwick Car, Marsden, and Boldon Flats. April—Sept.

12. H. PUBESCENS, *Gyll.*

Schaum, Zoologist, 1892.—H. melanocephalus, *Marsh.*, *Steph. Illust. Mand.*, ii., 60.—*Heer. Fn. Col. Helv.*, i., 157, 19. —H. planus, *Marsh.*, *Steph. Illust. Mand.*, ii., 60.—H. caliginosus, *Steph. Manual*, No. 536.

Stagnant waters, common.

13. H. MEMNONIUS, *Nicol.*

Steph. Manual, No. 537.—H. jugularis, *Babington, in Loudon's Mag. Nat. His.*, v., 328.—*Steph. Illust. Mand.*, v., 392.

Newcastle and near Heaton, in July.—*T. J. B.*

This also includes the *H. subelongatus*, *H. marginatus*, and *H. deplanatus*, of Stephens.—*Vide Schaum, Zoologist*, 1892.

14. H. ERYTHROCEPHALUS, *Linn.*

Steph. Illust. Mand., ii., 60.

Common.

15. H. XANTHOPUS, *Steph.*

Steph. Manual, No. 541. H. fusculus, *Leach, Edinb. Encyclop.*, ix., 84, 51, 1.—H. flavipes, *Steph. Illust. Mand.*, ii., 61.—H. planus, *Steph. Manual, No.* 540.

Newcastle—*T. J. B.*

16. H. PLANUS, *Fab.*

Boisd. et Lacord. Faun. Ent. Paris., i., 332, 10.—*Heer. Fn. Col. Helv.*, i., 155, 12.—Hyphydrus planus, *Gyll. Ins. Suec.*, i., 531.—Hydroporus ater, *Forst., Steph. Illust. Mand.*, ii., 61.—H. holosericeus, *Marsh., Ib.*, ii., 61.—H. pubescens, *Ib.*, ii., 61.—H. fuscatus, *Ib.*, ii., 62.

Common.

For the synonymes we are indebted to the valuable paper of Dr. Schaum, *Zoologist*, ubi sup.

17. H. RIVALIS, *Gyll.*

Schaum Zoologist, 1890.—Hygrotus fluviatilis, *Leach, Steph. Illust. Mand.*, ii., 46., *pl.* xi., *f.* 2.

In gravelly brooks, common. "Meldon Park."—*G. Wailes, Esq.* Ouseburn, Boldon, Ravensworth, and in the Derwent. April—August.

18. H. CONFLUENS, *Fab.*

Dytiscus confluens, *Fab. Syst. El.*, i., 270.—Hygrotus confluens, *Steph. Illust. Mand.*, ii., 47.

In ponds, common. "Newcastle."—*G. Wailes, Esq.* Long Benton, Gateshead, Ravensworth, Marsden, Black Fell. March —July.

19. H. RETICULATUS, *Fab.*

Heer. Fn. Col. Helv., i., 161, 32.—Dytiscus reticulatus, *Fab. Syst. El.*, i., 270.—Hygrotus collaris, *Steph. Illust. Mand.*, ii., 47.

Long Benton, and common at Prestwick Car, in May.—*T. J. B.*

20. H. INÆQUALIS, *Fab.*

Heer. Fn. Col. Helv., i., 160, 31.—Dytiscus inæqualis, *Fab. Syst. El.*, i., 272.—Hygrotus inæqualis, *Steph. Illust. Mand.*, ii., 48.

In ponds and brooks, common.

21. H. LEPIDUS, *Oliv.*

Boisd. et Lacord. Faun. Ent. Paris., i., 336, 20.—Hygrotus scitulus, *Spence, Steph. Illust. Mand.*, ii., 49, *pl.* xi. *f.* 3.

Ponds and slow running streams, common. "Twizell."—*P. J. Selby, Esq.* Prestwick Car, Ouseburn, Marsden, Boldon Flats, Black Fell. All the year.

22. H. PICTUS, *Fab.*

Heer. Fn. Col. Helv., i., 159, 25.—Dytiscus pictus, *Fab. Syst. El.*, i., 273.—Hygrotus pictus, *Steph. Illust. Mand.*, ii., 49.

Ponds. "Newcastle."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Prestwick Car, Marsden, and Boldon Flats.

57. HYPHIDRUS, *Illiger.*

1. H. OVATUS, *Linn.*

Steph. Illust. Mand., ii., 45.

"Newcastle."—*G. Wailes, Esq.* Prestwick Car, in July.—*T. J. B.*

58. PÆLOBIUS, *Schönherr.*

1. P. HERMANNI, *Fab.*

Steph. Illust. Mand., ii., 44.—Dytiscus Hermanni, *Fab. Syst. El.*, i., 255.

"Once near Newcastle, by Mr. Hewitson."—*G. Wailes, Esq.*

59. COLYMBETES, *Clairville.*

1. C. FUSCUS, *Linn.*

Steph. Illust. Mand., ii., 69.—C. striatus, *Ib.* i. c., 68.

Stagnant waters, common.

In February, 1846, an individual was noticed at Marsden, sheltered under sea-weed. The winter was a mild one, that tempted it to be thus early abroad.

2. C. PULVEROSUS, *Knoch.*

Steph. Illust. Mand., ii., 69, *pl.* xii., *f.* 2.—Dytiscus conspersus, *Gyll. Ins. Suec.*, i., 482.

One specimen at Boldon, in May.—*T. J. B.*

3. C. EXOLETUS, *Forst.*

Steph. Illust. Mand., ii., 70.—Dytiscus collaris, *Payk. F. S.*, i., 200.

Not rare: Prestwick Car. April—July.

4. C. GUTTATUS, *Payk.*

Steph. Illust. Mand., ii., 66.

"Newcastle."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* "Durham."—*Ornsby's Durham*, p. 203. Gosforth and Gibside.

5. C. CHALCONOTUS, *Kugelan.*

Steph. Illust., Mand., ii., 76.—Dytiscus concinnus, *Marsh.*, i., 427.

Common. "Twizell."—*P. J. Selby, Esq.* Prestwick Car, Long Benton, Boldon Flats, Sunderland. April—July.

6. C. AFFINIS, *Payk.*

Steph. Illust., Mand., ii., 78.

Rare. Prestwick Car in April.—*T. J. B.*

7. C. PALUDOSUS, *Fab.*

Steph. Illust., Mand., ii., 74.—Dytiscus paludosus, *Fab. Syst. El.*, i., 266.

Rare; Prestwick Car, Ouseburn, and Long Benton.—*T. J. B.*

8. C. FEMORALIS, *Payk.*

Steph. Illust., Mand., ii., 77.

Prestwick Car. April and July.

9. C. MACULATUS, *Linn.*

Steph. Illust., Mand., ii., 74.

Among gravel in the shallow parts of running streams, very common.

A dark variety is found in the Derwent.

10. C. VITREUS, *Payk.*

Steph. Illust., Mand., ii., 75.

For a knowledge of this species we are indebted to P. J. Selby, Esq., who finds it in a pool at Twizell, seemingly rare.

11. C. BIPUNCTATUS, *Fab.*

Boisd. et Lacord. Faun. Ent. Paris., i., 317, 10.—*Heer. Fn. Col. Helv.*, i., 150, 26.—C. nebulosus, *Forst. Steph. Illust., Mand.*, ii., 72.

Common.

12. C. STURMII, *Gyll.*

Steph. Illust., Mand., ii., 78.

Not uncommon.

13. C. BIPUSTULATUS, *Linn.*

Steph. Illust., Mand., ii., 80.

Abundant.

A dark chesnut variety is often met with.

Like the other species, it takes flight in the evening, and this

accounts for its being found during the day in situations that do not correspond with its actual habits. On the sea-coast it occurs frequently upon the sands, or concealed beneath stones.

14. C. FULIGINOSUS, *Fab.*

Steph. Illust., Mand., ii., 67.—Dytiscus fuliginosus, *Fab. Syst. El.*, i., 263.

Common.

15. C. FENESTRATUS, *Fab.*

Steph. Illust., Mand., ii., 82.—Dytiscus fenestratus, *Fab. Syst. El.*, i., 264..

"Twizell."—*P. J. Selby, Esq.*

16. C. ATER, *De Geer.*

Steph. Illust., Mand., ii., 82.

"Durham."—*Ornsby's Durham.* Common at Marsden and Boldon Flats in July.

17. C. OBSCURUS, *Marsh.*

Steph. Illust., Mand., ii., 82.—Dytiscus obscurus, *Marsh*, i., 414.

Rare; Boldon Flats in July.—*T. J. B.*

This was found in a pool unaccompanied by the preceding species.

60. ACILIUS, *Leach.*

1. A. SULCATUS, *Linn.*

Steph. Illust., Mand., ii., 93.

Stagnant waters, common.

61. DYTICUS, *Geoffroy.*

1. D. MARGINALIS, *Linn.*

Steph. Illust., Mand., ii., 89.

Common in stagnant pools.

2. D. PUNCTULATUS, *Fab.*

Fab. Syst. El., i., 259.—*Steph. Illust., Mand.*, ii., 90.

Common in pools.

FAMILY 2. GYRINIDÆ, *Leach.*

62. GYRINUS, *Geoff.*

1. G. MARINUS, *Gyll.*

Steph. Illust., Mand., ii., 96.—G. æneus, *Leach. Ib. l. c.* 95.

Budle Bay.—*G. Wailes, Esq.* Prestwick Car, Ouseburn, Marsden, and Whitburn. March—August.

2. G. MINUTUS, *Fab.*

Fab. Syst. El., i., 276.—*Steph. Illust., Mand.*, ii., 96. *pl.* xiii., *f.* 2.

Borders of pools in the vicinity of Newcastle.—*G. Wailes, Esq.*

3. G. NATATOR, *Linn.*

Steph. Illust., Mand., ii., 97.—G. substriatus, *Ib. l. c.*

Common.

It feeds upon Diptera and other insects that fall into the water, which it grasps betwixt its anterior legs, and plunging its mandibles into the thorax, imbibes the juices.

4. G. URINATOR, *Illig.*

Heer, Fn. Col. Helv. i., 165, 1.—G. lineatus, *Hoff., Steph. Illust. Mand.*, ii., 97, *pl.* xiii., *f.* 1.—*Boisd. et Lacord. Faun. Ent. Paris*, i., 342, 2.

Rare; in the Ouseburn from March to August.—*T. J. B.*

63. ORECTOCHEILUS, *Eschscholtz.*

1. O. VILLOSUS, *Ill.*

Gyrinus villosus, *Steph. Illust., Mand.*, ii., 98.

In the Wansbeck, near Meldon Park.—*G. Wailes, Esq.* Ouseburn in August.—*T. J. B.*

SUB-TRIBE 2. RYPOPHAGA, *Stephens.*

STIRPS I. PHILHYDRIDA, *Mac Leay.*

FAMILY 1. PARNIDÆ, *Mac Leay.*

SUB-FAMILY 1. PARNIDES, *Westw.*

64. PARNUS, *Fabricius.*

1. P. PROLIFERICORNUS, *Fab.*

Steph. Illust., Mand., ii., 103.

On the borders of weedy pools; Prestwick Car, Gosforth, Long Benton, Boldon Flats, &c.—*T. J. B.* April—July.

2. P. AURICULATUS, *Panz.*

Steph. Illust., Mand., ii., 104.

Marshy land near Follingsby.—*Mr. A. Hancock.* Under moss in a field on the south side of the Derwent, opposite Axwell spa well.—*J. H.* Beneath stones, Ouseburn Dean.—*T. J. B.* April—September.

SUB-FAMILY 2. ELMIDES, *Westw.*

65. ELMIS, *Latreille.*

1. E. VOLKMARI, *Panz.*

Steph. Illust., Mand., ii., 106.—*Curtis, Brit.Ent. pl.* 294.

"Twizell."—*P. J. Selby, Esq.* Mill-stream, Ouseburn, July and August.—*T. J. B.*

2. E. TUBERCULATUS, *Müller.*

Steph. Illust., Mand., ii., 106.—*Heer. Faun. Col. Helv.*, i., 469, 2.—E. variabilis, *Leach. Steph. Illust. Mand.*, ii., 107, *pl.* xiii. *f.* 4.

"Twizell."—*P. J. Selby, Esq.* Mill-stream, Ouseburn, July and August—*T. J. B.*

I cannot trace any distinction betwixt the two supposed species I have ventured to unite. Our specimens vary in having the base of the elytra more or less bituberculate, and the upper surface, though most frequently piceous, has often a brassy tint.—This is quite consistent with Müller's character, "fusco vel piceo-æneus, coleopteris basi *obsolete* bituberculatis."—*J. H.*

3. E. LACUSTRIS, *Spence.*

Steph. Illust., Mand., ii., 107.

"Twizell."—*P. J. Selby, Esq.*

4. E. PARALLELIPIPEDUS, *Müller.*

Steph. Illust., Mand., ii., 108, *pl.* xiii. *f.* 5.

"Twizell."—*P. J. Selby, Esq.*

5. E. ÆNEUS, *Müller.*

Steph. Illust., Mand., ii., 108.

"Twizell."—*P. J. Selby, Esq.* Common; Mill-stream, Ouseburn, July and Aug.—*T. J. B.*

6. E. CUPREUS, *Müller.*

Steph. Illust., Mand., ii., 108.

Rare; Mill-stream, Ouseburn, July and Aug.—*T. J. B.*

FAMILY 2. HELOPHORIDÆ, *Mac Leay.*

66. HELOPHORUS, *Leach.*

1. H. AQUATICUS, *Linn.*

Steph. Illust., Mand., ii., 111.

Common.

2. H. GRANULARIS, *Linn.*

Steph. Illust., Mand., ii., 111.

Common.

3. H. GRISEUS, *Herbst.*

Steph. Illust., Mand., ii., 112.

Common.

4. H, VIRIDICOLLIS, *Kirby.*

Steph. Illust., Mand., ii., 112.

"Twizell."—*P. J. Selby, Esq.*

5. H. NUBILUS, *Fab.*

Steph. Illust., Mand., ii., 113.

"Twizell."—*P. J. Selby, Esq.* Long Benton, on the sands at Shields, Hartlepool, &c.

6. H. FENNICUS, *Payk.*

Steph. Illust., Mand., ii., 113.

"Twizell."—*P. J. Selby, Esq.* Long Benton, and Shotley Bridge in June and July.—*T. J. B.*

67. OCHTHEBIUS, *Leach.*

1. O. PYGMÆUS, *Fab.*

Steph. Illust., Mand., ii., 115.

Boldon Flats.—*T. J. B.* In the pools near Marsden.- *J. H.* April.

2. O. EXCULPTUS, *Müller.*

Heer, Fn. Col. Helv., i., 478, 5.—*Mulsant, Col. de France, Palp.*, 54, 2.—Enicocerus viridiæneus, *Steph. Illust., Mand.*, ii., 196, *pl.* xv., *f.* 6 *(mas).*—E. Gibsoni, *Curtis, Brit. Ent., pl.* 291.—*Steph. l. c.*, v., 379 *(fœm).*—E. tristis, *Curt. l. c., Steph. l. c.*, v., 379 *(mas).*

"Brook near Meldon, and at Tynemouth."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* In the Ouseburn, August.—*T. J. B.*

An interesting account of the larva of this species has been given by Mr. Wailes in the Entomological Magazine, vol. i., 256. The insects, where he observed them, frequented half-exposed blocks of coarse sandstone in brooks, lurking in the slight inequalities, on a level with the surface of the water, or a little above it. They occur most abundantly in autumn, when the

different stages of larvæ, pupæ, and perfect insect may be found in company. The larvæ are "anopluriform, measuring, when full grown, about two and a half lines in length, and half a line in width. They are of a uniform black, and have the apex of each abdominal segment fringed with very short hairs. Their food is most probably mucor, for they seem to be confined to rough slimy stones." When full grown, they form oval cells of mud, about two lines in the longest diameter, in which they become pupæ of a bright orange colour.

68. HYDRÆNA, *Kugellan.*

1. H. RIPARIA, *Kugel.*

Steph. Illust., Mand., ii., 117, and v., 399.

"Twizell."—*P. J. Selby, Esq.* Prestwick Car, Long Benton, Ouseburn, Boldon Flats, Gibside, &c.—*T. J. B.* March—Aug.

2. H. NIGRITA, *Müller.*

Steph. Illust., Mand., v., 400.—H. pusilla, *Steph. l. c.* ii., 118, *pl.* xiv., *f.* 3.

Rare : in the vicinity of Newcastle.—*T. J. B.*

2. H. MINUTISSIMA, *Gyll.*

Steph. Illust., Mand., ii., 118.

"Newcastle upon Tyne."—*W. C. Hewitson, Esq.* (Ent. Mag., i., 296.)

FAMILY 3. HYDROPHILIDÆ, *Mac Leay.*

69. LIMNEBIUS, *Leach.*

1. L. ATER, *Stephens.*

Steph. Illust., Mand., ii., 119., *pl.* xiv., *f.* 4.

Ouseburn, Ravensworth, Boldon, sides of the Derwent. June —September.

2. L. TRUNCATELLUS, *Thunb.*

Steph. Illust., Mand., ii., 120.—*Heer, Fn. Col. Helv.*, i. 481, 1.

Prestwick Car, Ouseburn, Boldon Flats, banks of the Derwent. June—September.

3. L. NITIDUS, *Marsh.*

Steph. Illust., Mand., ii., 122.

In a pond on the sea-side, near Whitburn.—*J. H.*

70. HYDROBIUS, *Leach.*

1. H. FUSCIPES, *Linn.*

Steph. Illust., Mand., ii., 128.—H. chalconotus, *Leach, Steph., l. c.*, ii., 128.

Common.

71. LACCOBIUS, *Erichson.*

1. L. MINUTUS, *Linn.*

Steph. Manual, No. 709.—*Heer, Fn. Col. Helv.*, i., 481.—Hydrobius bipunctatus, *Steph. Illust., Mand.*, ii., 132.

Common.

2. L. COLON, *Stephens.*

Steph. Manual, No. 710.—Hydrobius colon, *Steph. Illust., Mand.*, ii., 133.

"Twizell."—*P. J. Selby, Esq.* Boldon Flats.—*T. J. B.* Marsden.—*J. H.*

This, according to Mulsant, is a variety of *L. minutus.*

3. L. MARSHAMI, *Stephens.*

Steph. Manual, No. 712.—Hydrobius minutus, *Steph. Illust., Mand.*, ii., 133.—H. ochraceus, *Ib. l. c.*, 134.

"Twizell."—*P. J. Selby, Esq.* By the sides of pools near Marsden.—*J. H.*

4. L. GLOBULUS, *Payk.*

Hydrobius globulus, *Steph. Illust., Mand.*, ii., 135.—*Heer, Fn. Col. Helv.*, i., 484.—*Mulsant, Col. de France, Palp.*, 126, 3.—Laccobius limbatus, *Steph. Manual, No.* 716.

On the ground in damp places. Gosforth.—*T. J. B.* Common in Ravensworth woods.—*J. H.*

FAMILY 4. SPHÆRIDIIDÆ, *Leach.*

72. SPHÆRIDIUM, *Fab.*

1. S. SCARABÆOIDES, *Linn.*

Steph. Illust., Mand., ii., 154.

Common.

2. S. MARGINATUM, *Fab.*

Steph. Illust., Mand., ii., 156.—S. 4—maculatum, *Ib.*, ii., 155.—*Curtis, Brit. Ent., pl.* 518.

Less abundant than the preceding. Prestwick Car, Shields, Hartlepool, &c.

Fabricius considered this as a variety of his *S. bipustulatum*, and Mulsant adopts this view, though without good grounds, in Erichson's opinion, *vide* Ray Soc. Reports, 1844, p. 336.

3. S. BIPUSTULATUM, *Fab.* ?

Steph. Illust., Mand., ii., 155.

"Twizell."—*P. J. Selby, Esq.*

73. CERCYON, *Leach.*

1. C. LITTORALE, *Gyll.*

Steph. Illust., Mand., ii., 137.—C. ruficorne, *Kirby, Ib.*, ii., 137.—C. binotatum, *Ib., l. c.*—C. dilatatum, *Ib.*, ii., 138. —C. depressum, *Ib., l. c.*

Common along the sea-coast; beneath sea-weed, from January. All the varieties occur.

2. C. ANALE, *Payk.*

Heer, Fn. Ed. Helv., i., 491.—*Mulsant, Col. de France, Palp.*, 183, 15.—C. terminatum, *Steph. Illust., Mand.*, ii., 139.

Rare; Hartlepool.—*J. H.* Long Benton.—*T. J. B.*

3. C. HÆMORRHOIDALE, *Fab.*

Heer, Fn. Col. Helv., i. 489.—*Mulsant, Col. de France, Palp.*, 159, 2.—C. hæmorrhoum, *Steph. Illust., Mand.*, ii., 143 ?

Common.

The C. hæmorrhoidale of Stephens *(Illust., Mand.*, ii., 142*)* is also not uncommon in the spring months, but we have not been able to ascertain whether it has been characterized by any other appellation.

4. C. MELANOCEPHALUM, *Linn.*

Steph. Illust., Mand., ii., 144.

Common.

5. C. UNIPUNCTATUM, *Linn.*

Erichson, Käf. der Mark. B., i., 217.—*Heer, Fn. Col. Helv.*, i., 490.—*Mulsant, Col. de France, Palp.*, 164, 5.

Common.

6. C. QUISQUILIUM, *Linn.*

Mulsant, Col. de France, Palp., 166, 6.

Common. Usually considered as the male of the preceding, but according to Mulsant and Erichson, both sexes of each occur.

7. C. PYGMÆUM, *Ill.*

Steph. Illust., Mand., ii., 148.—*Heer. Fn. Col. Helv.*, i., 490.—*Mulsant, Col. de France, Palp.*, 170, 8.—C. conspurcatum, *Steph. Illust., Mand.*, ii., 145.—C. stercorator, *Ib.*, ii., 147.—C. merdarium, *Ib., l. c.*—C. erythropum, *Ib., l. c.*

"Twizell."—*P. J Selby, Esq.* South Shields, Gibside, and Prestwick Car.—*J. H.* Long Benton.—*T. J. B.*

8. C. BOLETOPHAGUM, *Marsh.*

Steph. Illust., Mand., ii., 140.—Megasternum boletophagum, *Mulsant, Col. de France, Palp.*, 187, 1.

Not uncommon in Fungi, in old skins, and under stones in damp situations.

I once found a great number, before a thunder storm, running about like Leiodes ; it sometimes occurs abroad late at evening. —*J. H.*

9. C. ATOMARIUM, *Fab.*

Steph. Illust., Mand., ii., 145.—*Heer. Fn. Col. Helv.*, i., 492.—Cryptopleurum atomarium, *Mulsant, Col. de France, Palp.*, 188, 1.—Cercyon crenatum, *Steph. Manual, No.* 744.—C. sordidum, *Ib., Illust., Mand.*, ii., 145, &c.

"Twizell."—*P. J. Selby, Esq.* Hartlepool, Ryhope Dean, Prestwick Car, Shields, Gibside.—*J. H.* Long Benton.—*T. J. B.*

74. CYCLONOTUM, *Erichson.*

1. C. ORBICULARE, *Fab.*

Steph. Illust., Mand., ii., 132.

"Twizell."—*P. J. Selby, Esq.*

FAMILY 5. AGATHIDIIDÆ, *Westw.*

75. PHALACRUS, *Payk.*

1. P. ULICIS, *Kirby.*

Steph. Illust., Mand., ii., 166.

On the Bents at South Shields in April.—*J. H.*

76. EPHISTEMUS, *Westw.*

1. E. GLOBULUS, *Payk.*

Psychidium globulum, *Heer. Fn. Col. Helv.*, i., 433.—

Ephistemus Gyrinoides, *Steph. Illust., Mand.*, ii., 168.—E. nigriclavis, *Ib. l. c.*—E. confinis, *Ib.* ii., 169, *pl.* xv. *f.* 2 ?

Under moss from the Ravensworth woods in spring, and on the banks of the Wear, below Hylton Castle.—*J. H.* The variety with greater part of the elytra testaceous, was found near Cullercoats in March.—*T. J. B.*

I find the varieties together under garden rubbish, and I can see no difference between them but what results from various degrees of maturity.—*J. H.*

77. LEIODES, *Latr.*

1. L. ACICULATA, *Kunzé.*

Steph. Illust., Mand., ii., 170.

Rare; sides of woods on the Derwent.—*J. H.*

2. L. POLITA, *Marsh.*

Steph. Illust., Mand., ii., 174.

Of not unfrequent occurrence on the borders of fields on the Derwent, above Swalwell, and at Gibside.—*J. H.*

3. L. FERRUGINEA, *Fab.*

Steph. Illust., Mand., ii., 175.—Anisotoma ferrugineum, *Gyll. Ins. Suec.*, ii., 564.

"Twizell."—*P. J. Selby, Esq.* Gibside.—*J. H.*

4. L. RUFIPENNIS, *Payk.*

Steph. Illust., Mand., ii., 176.—Anisotoma rufipenne, *Gyll. Ins. Suec.*, ii., 565.

Gibside, Winlaton Mill, Ravensworth, Marsden,—*J. H.* Long Benton, Prudhoe, in June.—*T. J. B.*

5. L. ARENARIA, *Rudd ?*

Steph. Illust., Mand., v., 403 ?

Under sea-weed on the sands at Marsden in March.—*J. H.*

Less than either of the two preceding, quite ovate, and convex, polished and glossy; head and thorax dark coloured, thickly and minutely punctulate; elytra ovate, rather expanded before the middle, very convex, shining ferruginous, with the suture deep black, and a black dash on the external margins, reaching from behind the shoulders to the apices, scarcely so deeply punctate as in L. rufipennis, with the alternate interstices interpunc-

ate as in that species; antennæ testaceous at the base, the club moderate, dusky, apical joint ovate, acuminate; legs testaceous, posterior tibiæ rather long, slender and bent, with few spines, femora toothless; breast slightly pitchy.

This very distinct insect appears to differ only in colouring from the species to which I have referred it. It has the colours ascribed to *L. litura*, but is quite ovate as to its shape.—*J. H.*

6. L. HUMERALIS, *Fab.*

Steph. Illust., Mand., ii., 178.—Anisotoma humerale, *Gyll. Ins. Suec.*, ii., 558.

"Twizell."—*P. J. Selby, Esq.* Gibside.—*Mr. T. Pigg.*—Gosforth in July.—*T. J. B.*

7. L. ABDOMINALIS, *Payk.*

Steph. Illust., Mand., ii., 179.—Anisotoma abdominale, *Gyll. Ins. Suec.*, ii., 557.

A single specimen at the border of a wood, on the south side of the Derwent, opposite Axwell Spa Well, in June.—*J. H.*

78. AGATHIDIUM, *Illiger.*

1. A. GLOBUS, *Payk.*

Steph. Illust., Mand., ii., 108, *pl.* xv. *f.* 4.—Annisotoma globus, *Gyll. Ins. Suec.*, ii., 568.

Very local. A considerable number of specimens were taken in spring, on a piece of detached bark, in one of the woods on the Team, near Ravensworth.—*J. H.*

2. A. STAPHYLÆUM, *Gyll ?*

Anisotoma staphylæum, *Gyll. Ins. Suec.*, ii., 569 ?—Agathidium ferrugineum, *Steph. Illust., Mand.*, ii., 180.

Two specimens have occurred, near to Gibside, in June.—They were running with great animation in the hot sunshine. The characters of Gyllenhal's *Anisotoma staphylæum*, correspond very closely, except when he states the apex of the elytra to be attenuated, and sub-acuminate. The apex, on the contrary, is quite obtuse.—*J. H.*

3. A. ATRUM, *Payk.*

Steph. Illust., Mand., ii., 180.—Anisotoma atrum, *Gyll. Ins. Suec.*, ii., 570.

Rare; in a quarry near Carr's Hill, Gateshead.—*J. H.*

4. A. SEMINULUM, *Linn.*

Steph. Illust., Mand., ii., 181.—Anisotoma seminulum, *Gyll. Ins Suec.*, ii., 573.

Rare; under bark in a wood above Swalwell, and in the Ravensworth woods, in spring.—*J. H.*

It is sometimes swept up running about after sunset.

5. A. ORBICULARE, *Herbst.*

Steph. Illust., Mand., ii., 181.—Anisotoma orbiculatum, *Gyll. Ins. Suec.*, ii., 574.

Rare; in a quarry at Carr's Hill, under bark at Ravensworth, and on the links near Hartlepool.—*J. H.*

Intermediate in size, between *A. Seminulum*, and *A. nanus*, but distinguished from both in being without sutural striæ.

6. A. NANUS, *Meg.*

Steph. Illust., Mand., ii., 183.

Under decaying branches and rubbish on the Derwent.—*J. H.*

79. CLAMBUS, *Fisch.*

1. C. ARMADILLUS, *De Geer.*

Steph. Illust., Mand., ii., 184., *pl.* xv., *f.* 5.—C. nitidus, *Ib.* v., 465.

In moss from Ravensworth woods.—*J. H.* Near Cullercoats in March.—*T. J. B.*

Of the three specimens taken, one is of a deep black on the upper surface.

STIRPS 2. NECROPHAGA, *Latr.*

FAMILY 1. SCAPHIDIIDÆ, *Mac Leay.*

80. SCAPHIDIUM, *Oliv.*

1. S. QUADRIMACULATUM, *Olio.*

Steph. Illust., Mand., iii., 3.—*Curt. Brit. Ent., pl.* 379.

One specimen, taken at Gibside.—*Mr. John Hancock.*

81. SCAPHISOMA, *Leach.*

1. S. AGARICINUM, *Linn.*

Steph. Illust., Mand., iii., 3.

Under the bark of a decayed ash tree, below the monument at Gibside.—*J. H.*

82. CATOPS, *Fab.*

1. C. ANGUSTATUS, *Fab.*

Heer. Fn. Col. Helv., i., 378.—Choleva augustata, *Steph. Illust., Mand.*, iii., 13.

Among moss and withered leaves, widely dispersed.

2. C. AGILIS, *Ill.*

Heer. Fn. Col. Helv., i., 379.—Choleva angustata, *Steph. Illust., Mand.*, iii., 14.

Marsden.—*J. H.*

Distinguished from the preceding by the breadth of the thorax posteriorly, which nearly equals that of the elytra, and by the curved intermediate tibiæ.

3. C. PICIPES, *Fab.*

Heer. Fn. Col. Helv., i., 379.—C. sericeus, *Steph. Illust., Mand.*, iii., 9.—C. fuscus, *Steph. Manual, No.* 883.

Common in cellars at Newcastle.—*T. J. B.* Under a dead mole at Gibside, and at Gateshead Fell.—*J. H.*

4. C. CHRYSOMELOIDES, *Panz.*

Steph. Illust., Mand., iii., 10.—*Heer. Fn. Col. Helv.*, i., 380.

"Twizell."—*P. J. Selby, Esq.* Coast, near Hartley, in September.—*T. J. B.*

5. C. MONTIVAGUS, *Heer.*

Heer. Fn. Col. Helv., i., 381.—C. affinis, *Steph. Illust., Mand.*, iii., 10 ?

Under a dead hare in the Ravensworth woods, in March.—*J. H.*

6. C. NIGRITA, *Erichs.*

Erichson, Käf. der Mark. B., i., 239.—*Heer. Fn. Col. Helv.*, i., 381.—C. fornicatus, *Steph. Illust., Mand.*, iii., 8.

Generally distributed. All the year.

7. C. MORIO, *Fab.*

Heer. Fn. Col. Helv. i., 382.—Choleva dissimulator *Spence, Lin. Trans.* xi., 150.—Catops dissimulator, *Steph. Illust., Mand.*, iii., 13.

With C. *montivagus* in Ravensworth woods.—*J. H.*

8. C. FUMATUS, *Spence.*

Heer, Fn. Col. Helv., i., 382.—Ptomophagus fumatus, *Steph.*

Illust., Mand., iii., 6.—Catops Frater, *Newman, Ent. Mag.*, i., 507.—*Steph. Illust., Mand.*, v., 405.

In the woods above Winlaton Mill, in Fungi, and in a field near Manshaven.—*J. H.* Gibside.—*T. J. B.*

9. C. VELOX, *Spence.*

Heer. Fn. Col. Helv., i., 383.—Ptomophagus velox, *Steph. Illust., Mand.*, iii., 6.

Gibside.—*T. J. B.* Ravensworth woods in Spring.—*J. H.*

10. C. WILKINII, *Spence.*

Ptomophagus Wilkinii, *Steph. Illust., Mand.*, iii., 7.—C. badius, *Heer. Fn. Col. Helv.*, i., 383 ?

In moss, in damp situations. Gibside.—*T. J. B.* Woods above Winlaton Mill, and on the banks of the Team.—*J. H.*

11. C. ANISOTOMOIDES, *Spence.*

Heer. Fn.. Col. Helv., i., 384.—Ptomophagus anisotomoides, *Steph. Illust., Mand.*, iii., 7.

In Fungi; near Kenton, in November.—*T. J. B.* Gibside.—*J. H.*

12. C. TRUNCATUS, *Ill.*

Ptomophagus truncatus, *Steph., Illust., Mand.*, iii., 5.—C. sericeus, *Heer. Fn. Col. Helv.*, i., 384.

Generally distributed. April—November.

83. COLON, *Herbst.*

1. C. BRUNNEUS, *Latr.*

Mylæchus brunneus, *Steph. Illust., Mand.*, iii., 4.

Rare: Kenton Bank foot, on Fungi; in November.—*T. J. B.* Grass fields above Swalwell, and near Dunston.—*J. H.* June.

FAMILY 2. SILPHIDÆ, *Leach.*

84. NECROPHORUS, *Fab.*

1. N. HUMATOR, *Fab.*

Steph. Illust., Mand., iii., 17.

Common. "Newcastle and Meldon Park."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* "Durham."—*Ornsby's Durham.* Tyneside, Long Benton, &c.

2. N. RUSPATOR, *Erichs.*

Heer, Fn. Col. Helv., i., 387.—N. vestigator, *Steph. Illust., Mand.*, iii., 18.

"Newcastle and Meldon Park."—*G. Wailes, Esq.* "Twizell." —*P. J. Selby, Esq.* In dead birds and other animals, at Prestwick, and Long Benton.—*T. J. B.* July—September.

3. N. MORTUORUM, *Fab.*

Steph. Illust., Mand., iii., 19.

In carcases of the smaller quadrupeds, and in Fungi. "Twizell."—*P. J. Selby, Esq.* Gosforth, Long Benton, Gibside, Winlaton Mill, &c. June—September.

4. N. VESPILLO, *Linn.*

Steph. Illust., Mand., iii., 20.

In dead animals. "Stockton."—*Hogg's Stockton.* "Newcastle and Meldon Park."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Sides of the Tyne and Team, Washington, Hartlepool, &c. April—September.

The oldest local notice of this species is contained in a MS. note, in a copy of Ray's Historia Insectorum, in the library of the Literary and Philosophical Society of Newcastle. The writer is unknown (Isaac Thompson ?), but it may be gathered, that he entomologized about Newcastle from 1749 to 1760. He mentions R. Harrison, the distinguished mathematician, as having brought him the eruca of the Puss Moth *(Cerura Vinula)*, "in saliceto suo in Pandon Dean deprehensam, 19 Jul. 1760." In respect to *N. vespillo*, he has written on the margin :—"Stridorum vexatus emittit, non multum a murino abludentem." This mouse-like querulous noise, is also the token of irritation in others of the species.—*J. H.*

85. NECRODES, *Wilkin.*

1. N. LITTORALIS, *Linn.*

Steph. Illust., Mand., iii., 21.—*Curtis, Brit. Ent., pl.* 334.

Carcases on river-banks, &c. "Meldon Park, Newcastle, seashore, Tynemouth ; common."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Tyneside, Town Moor, Long Benton, &c.

86. OICEOPTOMA, *Leach.*

1. O. THORACICA. *Linn.*

Steph. Illust., Mand., iii., 22.

Not uncommon beneath dead moles, birds, &c., and in Fungi. "Meldon Park, Witton-le-Wear, &c."—*G. Wailes, Esq.* "Dur-

ham."—*Ornsby's Durham.* Gibside, Winlaton Mill, &c. May —September.

2. O. RUGOSA, *Linn.*

Steph. Illust., Mand., iii., 22.

Common.

3. O. APPENDICULATA, *Sulzer.*

Heer. Fn. Col. Helv., i., 389.—O. sinuata, *Steph. Illust., Mand.*, iii., 23.

"Prestwick Car."—*G. Wailes, Esq.* "Durham."—*Ornsby's Durham.*

4. O. DISPAR, *Herbst.*

Steph. Illust., Mand., iii., 24.

Prestwick Car in July.—*Mr. A. Hancock.* Long Benton in May.—*T. J. B.* South Shields.—*J. H.*

Mr. Hancock found it feeding on *Lymneus stagnalis*, left exposed by the evaporation of the water, and this while the animal was evidently still alive.

87. SILPHA, *Linn.*

1. S. OBSCURA, *Linn.*

Steph. Illust., Mand., iii., 25.

"Twizell."—*P. J. Selby, Esq.* "Durham."—*Ornsby's Durham.* Under stones at Marsden, in May.—*Mr. A. Hancock.*

2. S. TRISTIS, *Ill.*

Steph. Illust. Mand., iii., 25.

Somewhat rare: "Meldon Park."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Long Benton, South Shields, Hartlepool. April and May.

3. S. NIGRITA, *Creutz.*

Steph. Illust., Mand., iii., 26.

"Newcastle, &c., very abundant."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* It is the commonest of the genus.

The larva is fond of earthworms, and the perfect insect will devour flies and other insects.

4. S. OPACA, *Linn.*

Steph. Illust., Mand., iii., 27.—*Curt. Brit. Ent., pl.* 742.

"Newcastle."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.*

88. PHOSPHUGA, *Leach.*

1. P. POLITA, *Sulzer.*

Heer, Fn. Col. Helv., i., 392.—Silpha lævigata, *Steph. Illust., Mand.*, iii., 27.

"Sea-shore, Marsden; not very abundant."—*G. Wailes, Esq.*

2. P. ATRATA, *Linn.*

Steph. Illust., Mand., iii., 28.

Common everywhere, and throughout the year.

FAMILY 3. NITIDULIDÆ, *Mac Leay.*

89. THYMALUS, *Latr.*

1. T. LIMBATUS, *Fab.*

Steph. Illust., Mand., iii., 31.—*Curt. Brit. Ent., pl.* 39.

One specimen beneath bark of Elm, Ravensworth, in November.—*J. H.*

90. NITIDULA, *Fab.*

1. N. PUNCTATISSIMA, *Ill.*

Steph. Illust., Mand., iii., 32.

"Very abundant in ashes."—*G. Wailes, Esq.* Gibside.—*T. J. B.* Above Swalwell, in willows.—*J. H.* January—May.

2. N. GRISEA, *Linn.*

Steph. Illust., Mand., iii., 33.

Gibside, in June.—*T. J. B.*

3. N. SORDIDA, *Fab.*

Heer, Fn. Col. Helv., i., 395.—N. depressa, *Steph. Illust., Mand.*, iii., 33.

Skins, dead animals, Fungi, &c.; Tyneside and elsewhere.—*J. H.* Gibside.—*T. J. B.* May—September.

4. N. COLON, *Linn.*

Steph. Illust., Mand., iii., 34.—*Curtis, Brit. Ent., pl.* 675.

Not very common. Sea-coast in April.—*T. J. B.* Tyneside, above Dunston, with the next, in May.—*J. H.*

5. N. DISCOIDEA, *Fab.*

Steph. Illust., Mand., iii., 34.

"Twizell."—*P. J. Selby, Esq.* Tyneside, &c., abundant. May and June.

6. N. BIPUSTULATA, *Linn.*

Steph. Illust., Mand., iii., 35.

"Twizell."—*P. J. Selby, Esq.* Tyneside, in May.—*J. H.*

7. N. OBSCURA, *Fab.*

Heer, Fn. Col. Helv., i., 395.—N. rufipes, *Steph. Illust., Mand.*, iii., 35.

One specimen with the preceding.—*J. H.*

8. N. OBLONGA, *Herbst.*

Steph. Illust., Mand., iii., 36.

"Twizell."—*P. J. Selby, Esq.*

9. N. OBSOLETA, *Fab.*

Steph. Illust., Mand., iii., 38.

On the flowers of *Viburnum opulus*, near Dunston, and at Gibside.—*J. H.* On Fungi, Prudhoe, in June.—*T. J. B.*

10. N. DEPRESSA, *Ill.*

Heer, Fn. Col. Helv., i., 399.—N. æstiva, *Steph. Illust., Mand.*, iii., 37 ?

Common in flowers. June.

11. N. PUSILLA, *Ill.*

Steph. Illust., Mand., iii., 39.—*Heer. Fn. Col. Helv.*, i., 399.

Under bark, Ouseburn Dean, in April.—*T. J. B.*

12. N. PYGMÆA, *Gyll.*

Steph. Illust., Mand., iii., 119.

Under bark of Scotch pine, on the Team, Ravensworth, in March.—*J. H.* A good species.

91. STRONGYLUS, *Herbst.*

1. S. FERVIDUS, *Oliv.*

Steph. Illust., Mand., iii., 43.

"Twizell."—*P. J. Selby, Esq.*

2. S. FERRUGINEUS, *Fab.*

Steph. Illust., Mand., iii., 44.

"Gibside."—*G. Wailes, Esq.*

92. CAMPTA, *Kirby.*

1. C. LUTEA, *Herbst.*

Steph. Illust., Mand., iii., 44.

"Twizell."—*P. J. Selby, Esq.* Gibside and Winlaton Mill,

on the flowers of the white thorn and meadowsweet. June—August.

93. MELIGETHES, *Kirby.*

1. M. RUFIPES, *Linn.*

Steph. Illust., Mand., iii., 45.—Nitidula rufipes, *Heer, Fn. Col. Helv.*, i., 401.

Cocken, on the flowers of brambles.—*Mr. Albany Hancock.* On the flowers of hawthorn, near Dunston, Swalwell, and Gibside.—*J. H.* Gosforth, in August.—*T. J. B.*

My specimens are a small variety, with the margins of the thorax concolorous, and the legs piceous.—*J. H.*

2. M. VIRIDESCENS, *Fab.*

Steph. Illust., Mand., iii., 46.—M. cœruleus, *Marsh., Ib. l. c.*

In flowers, common.

3. M. ÆNEUS, *Fab.*

Steph. Manual, No. 964.—M. Urticæ, *Steph. Illust., Mand.*, iii., 47.

In flowers, common.

4. M. PEDICULARIUS, *Linn.*

Steph. Illust., Mand., iii., 47.

In flowers, common.

5. M. SUBRUGOSUS, *Gyll?*

Steph. Illust., Mand., iii., 48?

"Twizell."—*P. J. Selby, Esq.*

6. M. ERYTHROPUS, *Marsh.*

Steph. Illust., Mand., iii., 49.

"Twizell."—*P. J. Selby, Esq.*

‡ 94. CARPOPHILUS, *Leach.*

‡1. C. HEMIPTERUS, *Linn.*

Steph. Illust., Mand., iii., 51.

An imported species, frequently found in raw sugar, figs, &c.

95. CATERETES, *Herbst.*

1. C. BIPUSTULATUS, *Payk.*

Steph. Illust., Mand., iii., 51.

On the spikes of *Carex pendula*, banks of the Derwent, above Winlaton Mill, and of *C. paniculata*, on the Wear, above Southwick.—*J. H.*

2. C. PEDICULARIUS, *Linn.*

Steph. Illust., Mand., iii., 52.

"Twizell."—*P. J. Selby, Esq.* Near Newcastle.—*T. J. B.*

3. C. URTICÆ, *Fab.*

Steph. Illust., Mand., iii., 52.

On the nettle, common.

4. C. RUFILABRIS, *Latr.*

Steph. Illust., Mand., iii., 54.—C. Junci, *Kirby, Ib., l. c.*—C. nitidus, *Kirby, l. c.*, 53.—C. rubicundus, *Heer, Fn. Col. Helv.*, i., 411.—C. pallidus, *Ib., l. c.*

In damp situations, rare. "Twizell."—*P. J. Selby, Esq.* Long Benton.—*T. J. B.* Gibside.—*J. H.*

After examining a considerable number of specimens, I am convinced that the synonymes cited belong to one species. It is first entirely testaceous or fuscous, then the head, thorax, and tip of the elytra are piceous, with the apex of the abdomen red, and finally the upper surface deepens to a glossy black, with the front of the head alone rufous. The less depth of puncturing alluded to by Dr. Heer, in his *C. pallidus*, is a characteristic of immaturity in most of the Coleoptera.—*J. H.*

96. BYTURUS, *Latr.*

1. B. TOMENTOSUS, *Fab.*

Steph. Illust., Mand., iii., 80.—*Curt., Brit. Ent., pl.* 618.

On the flowers of the mountain ash, raspberry, and the bramble, frequent. When found on the mountain ash, it is in general more deeply coloured.

FAMILY 4. ENGIDÆ, *Mac Leay.*

SUB-FAMILY 1. TROGOSITIDES, *Westw.*

97. IPS, *Herbst.*

1. I. QUADRIGUTTATA, *Fab.*

Steph. Illust., Mand., iii., 93.

Under bark of oak, and decayed bird cherry, above Winlaton Mill.—*J. H.* March—May.

2. I. QUADRIPUNCTATA, *Herbst.*

Steph. Illust., Mand., iii., 94.—*Curt. Brit. Ent. pl.* 306.

Under bark of ash, Gibside, in February.—*J. H.* Bark of felled Scotch Fir, Gosforth, in June.—*T. J. B.*

Sub.—G. Pityophagus, *Shuck.*

3. I. ferruginea, *Linn.*

Steph. Illust., Mand., iii., 94.

"Twizell."—*P. J. Selby, Esq.* Under bark of felled Scotch fir, Gosforth, in June.—*T. J. B.*

‡98. Trogosita, *Fabr.*

‡1. T. mauritanica, *Linn.*

Steph. Illust., Mand., iv., 221.—*Curt. Brit. Ent. pl.*, 734.

Common in shops and warehouses. Imported in rice, &c., from the East Indies.

99. Rhyzophagus, *Herbst.*

1. R. ferrugineus, *Payk.*

Steph. Illust., Mand., iii., 100.

"Under bark of felled beeches, in Meldon Park, in April, and in Dec., 1830."—*G. Wailes, Esq.* "Twizell."—*P. J. Selby, Esq.* Beneath bark of felled Scotch fir, Gosforth; common.—*T. J. B.*

2. R. cylindricus, *Steph.*

Steph. Illust., Mand., iii., 100.

"Twizell."—*P. J. Selby, Esq.*

3. R. depressus, *Fab.*

Steph. Manual, No. 1130.

Rare; beneath bark of felled Scotch fir, Gosforth, in June and July.—*T. J. B.*

4. R. cyanipennis, *Hardy.*

Hardy, Ann. and Mag. Nat. Hist., xix., 379.

A single specimen under the bark of alder, on the southern bank of the Derwent, between Winlaton Mill, and Gibside woods, in June.

Dr. Schaum (*Zoologist*, 1877, 1888), has referred this species doubtfully to *R. cæruleus* of Watlt, but as I have not had the opportunity of consulting that author's description, I must still leave it as a matter of uncertainty.—*J. H.*

5. R. rufus, *Marsh.*

Steph. Illust., Mand., iii., 100.

"Twizell."—*P. J. Selby, Esq.*

6. R. DISPAR, *Payk.*

Steph. Illust., Mand., iii., 101.

Common under bark of decayed and felled trees. The larvæ lie often as thick as fly-blow.

7. R. BIPUSTULATUS, *Fab.*

Steph. Illust. Mand., iii., 101.—Cerylon, bipustulatum, *Curt. Brit. Ent. pl.*, 579.

Under bark; "Twizell."—*P. J. Selby, Esq.* Ravensworth, Swalwell, Gibside.—*J. H.*

100. CERYLON, *Latr.*

1. C. HISTEROIDES, *Panz.*

Steph. Illust., Mand., iii., 96.

Very rare; under bark of mountain ash, near Ravensworth, in spring.—*J. H.*

101. MONOTOMA, *Herbst.*

1. M. PICIPES, *Herbst.*

Steph. Illust., Mand., iii., 102.

Woolsington, in August, and common on hot bed frames at Long Benton, from May to July.—*T. J. B.* Ravensworth and Gibside.—*J. H.*

2. M. ANGUSTATA, *Marsh.*

Steph. Illust., Mand., iii., 102.

With the preceding, but less abundant.—*T. J. B.* Ravensworth.—*J. H.*

102. CRYPTOPHAGUS, *Herbst.*

1. C. POPULI, *Payk.*

Steph. Ilust., Mand., iii., 74.—*Curt. Brit. Ent. pl.* 160.

"Twizell."—*P. J. Selby, Esq.*

2. C. CELLARIS, *Fab.*

Steph. Illust., Mand., iii., 77.—*Heer, Fn. Col. Helv.*, i. 424.

Houses and cellars, common.

The elytra are very minutely punctulate.

3. C. SCANICUS, *Linn.*

Heer, Fn. Col. Helv., i., 424, non autem Engis scanicus, *Steph. Illust., Mand.*, iii., 92.—C. humeralis, *Steph. Illust., Mand.*, iii., 74.

"Twizell."—*P. J. Selby, Esq.* Not uncommon in houses, Newcastle; near Dunston; wood edges, above Swalwell, Axwell Park, and Gibside. June.

Shaped exactly like *C. cellaris,* but with the elytra more strongly punctured,

4. C. ABIETIS, *Payk.*

Steph. Illust., Mand., iii., 77.—*Heer, Fn. Col. Helv.*, i., 425.

C. Ullicis, *Kirby, Steph. Illust., Mand.*, iii., 76.

On furze, common, and also in fir plantations.

I have seen no type of *C. Abietis,* but by comparing the descriptions, I do not find any essential distinction between it and *C. Ulicis,* except the "obscure tooth" said to be in the sides of the latter. It may be gathered that both have slender antennæ, and the thorax narrowed behind, with the breadth anteriorly somewhat exceeding the length. The anterior angle of the thorax, on each side, is produced into an obtuse lobe, which is toothed posteriorly, but behind that there is nothing worthy of the name of tooth, that I can trace. It is, moreover, a fact, that the species so abundant on the furze, is often, equally numerous, on the spruce fir.—*J. H.*

5. C. FUMATUS, *Marsh.*

Steph. Illust., Mand., iii., 76.—*Heer, Fn. Col. Helv.*, i., 426.

"Twizell."—*P. J. Selby, Esq.* Under bark near Ravensworth and Swalwell, in autumn and spring.—*J. H.* Cellars, Newcastle—*T. J. B.*

Smaller than *C. cellaris,* rather more strongly punctate, and more deeply coloured, with the thorax subquadrate, the elytra parallel, the antennæ shorter and rather stouter.

6. C. SCUTELLATUS, *Newm.*

Newman, Ent. Mag., ii., 202.—*Steph. Illust., Mand.*, v., 408.

"In the collection of *G. Wailes, Esq.*" *l. c.*

Mr. Wailes has informed me that the type of this species was an individual specimen, not now in his possession. I have two specimens that appear referrible to it, though differing slightly in colouring. They are about the size of *C. Abietis,* with the head and thorax dark fuscous, dullish, rather minutely and thickly punctured, griseous pubescent; the latter quadrate, with a small

lobe at the anterior angles, furnished posteriorly with a tooth, and there is a minute denticulation in the middle of the sides. The elytra are slightly wider than the thorax, rather convex, the sides sub-parallel, tip conical, scutellum and a cloud along the suture, behind it dark fuscous, the rest testaceous brown, somewhat shining, thickly and very minutely punctulate, and bearing a short griseous pubescence. Antennæ short, with a moderate sized club, as well as the legs, rufous. If it be only a variety it comes nearest *C. fumatus*, of which Marsham has made the remark, "modo testaceum, modo ferrugineum, modo *nigro-ferrugineum*." My specimens were taken under a stone near South Shields, and under rubbish, on the Team, near Ravensworth, in March.—*J. H.*

103. ANTHEROPHAGUS, *Megerle.*

1. A. PALLENS, *Linn.*

Steph. Illust., Mand., iii., 72.

On the flowers of Umbelliferæ. "Twizell."—*P. J. Selby, Esq.* Gibside, Axwell, near Dunston, &c., in August.

2. A. SILACEUS, *Herbst.*

Steph. Illust., Mand., iii., 73.

Twizell."—*P. J. Selby, Esq.* On the flowers of *Angelica sylvestris*, in a wood to the west of Winlaton, and in Gibside woods.—*J. H.* September. Long Benton, in August, and at Gosforth, amongst tares, in September.—*T. J. B.*

SUB-FAMILY 2. CUCUJIDES, *Westw.*

‡104. CUCUJUS, *Fab.*

‡1. C. MONILICORNIS, *Marsh.*

Steph. Illust. Mand., iv., 223.

Abundant in a grain warehouse at Shields. It has also been noticed in rice imported from the East Indies.—*T. J. B.*

FAMILY 5. MYCETOPHAGIDÆ, *Westw.*

105. TETRATOMA, *Herbst.*

1. T. FUNGORUM, *Herbst.*

Steph. Illust. Mand., iii., 91.

"Twizell."—*P. J. Selby, Esq.*

2. T. ANCORA, *Fab.*

Gyll. Ins. Suec., ii., 555.—*Curt. Brit. Ent., pl.* 123.—*Steph. Illust., Mand.*, iii., 91.—*Hardy, Ber. Club Proc.*, ii., 194.—Tetratoma picta, *Newman, Ent. Mag.*, ii., 202.—*Steph. Illust., Mand.*, v., 408.

"In Mr. Wailes' collection."—*Stephens, l. c.*

A motley insect. Mr. Newman's description of *T. picta* exactly coincides with Gyllenhal's *var. b.*

106. PHLOIOPHILUS, *Waterh.*

1. P. EDWARDSII, *Waterh.*

Steph. Illust., Mand., iii., 81, *pl.* xviii., *f.* 1.—P. Cooperi, *Ib. l. c.*, 82.—P. bimaculatus, *Ib. l. c.*

One specimen under the bark of beech, on the edge of the first wood on the Derwent, nearest Swalwell, in February.—*J. H.*

The specimen, strictly speaking, agrees with *P. Cooperi*, but the three species described by Stephens, appear to be only one, with variations created, as in *Tetratoma ancora*, by a changeable disposition of colouring.—*J. H.*

107. TYPHÆA, *Kirby.*

1. T. FUMATA, *Linn.*

Curt. Brit. Ent., pl. 702.—*Steph. Manual, No.* 1069.

"Twizell."—*P. J. Selby, Esq.* Axwell, by sweeping.—*T. J. B.*

108. MYCETÆA, *Kirby.*

1. M. FUMATA, *Marsh.*

Steph. Illust., Mand., iii., 80, *pl.* xvii., *f.* 1.—Atomaria hirta, *Steph., l. c.*, iii., 66.—Mycetæa hirta, *Curt. Brit. Ent., pl.* 502.—*Steph. Manual, No.* 1030.—*(Westwood's Synopsis,* 14*).*

In cellars, Newcastle and Gateshead, and on a hot bed at Long Benton; found at all seasons.

As might be surmised from its haunts, its habits are nocturnal. Unless under the incitement of the summer temperature, it rarely ventures out till evening, when it issues forth with *Latridii, Cryptophagi*, and other lovers of gloom. Like them its food is mucor.

109. ATOMARIA, *Kirby.*

1. A. PHÆOGASTER, *Marsh.*

Steph. Illust., Mand., iii., 65.

In Fungi, at Gibside.—*T. J. B.* Woods above Winlaton Mill, and at Ravensworth.—*J. H.* April—August.

2. A. ATRICAPILLA, *Kirby.*

Steph. Illust., Mand., iii., 66.

Not uncommon among moss, roots of grass, &c., at the borders of woods, &c.; Gibside, Swalwell, Ravensworth, South Shields, Hartlepool.—*J. H.*

3. A. NIGRIPENNIS, *Payk.*

Steph. Illust., Mand., iii., 67.

Cellars, Newcastle, throughout the year.—*T. J. B.*

A. castanea, Kirby, appears to be the immature state of this species.

4. A. ATRA, *Herbst.*

Steph. Illust., Mand., iii., 67.

Under rubbish, and occasionally in carcases, &c. "Twizell." —*P. J. Selby, Esq.* Swalwell, Gibside, Ravensworth, Shields, &c.—*J. H.* Long Benton, &c.—*T. J. B.*

The male is smaller and narrower.

5. A. FUSCIPES, *Gyll.*

Steph. Illust., Mand., iii., 68.

On the sea coast at Hartley; at Gibside, Shotley Bridge, &c. —*T. J. B.*

6. A. FIMETARIUS, *Fab.*

Heer, Fn. Col. Helv., i., 429.—A. rufipes, *Steph. Illust., Mand.*, iii., 68?

Gibside.—*J. H.*

Antennæ stout, elytra oblong, deeply punctate, somewhat as in *A. atra*, rather thickly griseous pubescent.

7. A. RUFICORNIS, *Marsh.*

Steph. Illust., Mand., iii., 68.

"Twizell."—*P. J. Selby, Esq.*

8. A. NIGRIROSTRIS, *Kirby.*

Steph., Illust., Mand., iii., 69.—A. alpina, *Chevrier, Heer, Fn. Col. Helv.*, i., 430.

Two specimens, wood border, above Swalwell.—*J. H.*

9. A. NIGRIVENTRIS, *Kirby?*

Steph. Illust., Mand., iii., 69?—A. nitidula, *Heer, Fn. Col. Helv.*, i., 429?

Gibside.—*J. H.*

Much resembling *A. fimetarius*, but narrower, and more minutely and thickly punctate.

110. ANISARTHRIA, *Waterh.*

1. A. PERPUSILLA, *Marsh.*

Steph. Illust., Mand., iii., 62.

Hot bed at Long Benton, in profusion.—*T. J. B.* Moss from Ravensworth and Gibside.—*J. H.* April—October.

111. TRICHOPTERYX, *Kirby.*

1. T. ATOMARIA, *De Geer.*

Steph. Illust., Mand., iii., 60.

Common under dead leaves, in moss, Fungi, and on the sea-coast under algæ.

2. T. PUSILLA, *Gyll.*

Steph. Illust., Mand., iii., 60.

"Twizell."—*P. J. Selby, Esq.*

3. T. MINUTA, *Steph.*

Steph. Illust., Mand., iii., 61.

"Twizell."—*P. J. Selby, Esq.*

4. T. BRUNNEA, *Marsh.*

Anisarthria brunnea, *Steph. Illust., Mand.*, iii., 64.—*Manual, No.* 125.

In decayed wood, Gibside, Winlaton Mill, &c.—*J. H.*

Examined under a high magnifying power, the following characters are presented: oblong, flattish, shining, pubescent; head and thorax brunneous black, with the edges piceous, coarsely and widely punctate, the latter narrowed at the base; elytra oblong, subtruncate at the apex, testaceous, coarsely and irregularly punctate; legs and antennæ testaceous. It belongs to Heer's second division of the genus.—*J. H.*

112. HOLOPOPARAMECUS, *Curtis.*

‡1. H. DEPRESSUS, *Curt.*

Curt. Ent. Mag., i., 186.—*Brit. Ent., pl.* 614.—*Steph. Illust., Mand.*, v., 410.

Two specimens, in a shop window, Newcastle.—*T. J. B.*

An imported species. Mr. Westwood has is it from Sierra Leone.

113. SILVANUS, *Latr.*

‡1. S. SURINAMENSIS, *Linn.*

Steph. Illust., Mand., iii., 104., note.

Common in shops and warehouses, but imported in rice, sugar, &c.

‡2. S. DENTATUS, *Marsh.*

Steph. Illust., Mand., iii., 104., note.

Equally abundant with the preceding, and like it imported.

3. S. UNIDENTATUS, *Fab.*

Steph. Illust., Mand., iii., 105.

On cheese covered with Fungi, Newcastle.—*T. J. B.*

114. LATRIDIUS, *Herbst.*

1. L. LARDARIUS, *De Geer.*

Steph. Illust., Mand., iii., 111.

Among nettles, &c. : "Twizell."—*P. J. Selby, Esq.* Shields, Long Benton, Gibside, Prudhoe, Swalwell, Ravensworth, Sunderland, Hartlepool.

2. L. ANGUSTICOLLIS, *Schüp.*

Steph. Illust., Mand., iii., 111.

Three specimens among Carices in the marshes of the Wear, above Southwick.—*J. H.*

3. L. TRANSVERSUS, *Oliv.*

Steph. Illust., Mand., iii., 112.

"Twizell."—*P. J. Selby, Esq.* Not uncommon by the borders of fields, &c. Gibside, Swalwell, Long Benton, Shields, &c.

4. L. PORCATUS, *Herbst.*

Steph. Illust., Mand., iii., 113.

Common in cellars and houses, and occasionally under bark. On decayed flowers of hawthorn, above Winlaton Mill.

5. L. TESTACEOUS, *Waterh.*

Steph. Illust., Mand., iii., 14.

"Twizell."—*P. J. Selby, Esq.*

115. CORTICARIA, *Marsh.*

1. C. PUBESCENS, *Ill.*

Steph. Illust., Mand., iii., 106.

On the coast, at Marsden, on *Ammophila arundinacea;* under

stones, and in grass fields, Gateshead, Swalwell, Gibside. March, and June.

2. C. CRENULATA, *Schiip.*

Steph. Illust., Mand., iii., 107.

"Twizell."—*P. J. Selby, Esq.*

3. C. LINEARIS, *Payk ?*

Steph. Illust., Mand., iii., 108 ?

Three specimens at Gateshead.—*J. H.*

Agrees pretty closely with the descriptions, but the interstices appear to be rather punctured than rugulose. Specimens in Mr. Walker's collection, taken near London, do not present any difference.

4. C. FERRUGINEA, *Marsh.*

Steph. Illust., Mand., iii., 108.

In houses, Newcastle, and on boards around a hot-bed at Long Benton.—*T. J. B.* Borders of woods, Swalwell, Winlaton Mill, Gibside, &c.—*J. H.* May—August.

5. C. GIBBOSA, *Herbst.*

Steph. Illust., Mand., iii., 109.

On furze, and at wood borders: Gibside, Ravensworth, Swalwell.—*J. H.* Long Benton.—*T. J. B.*

6. C. TRANSVERSALIS, *Schiip.*

Steph. Illust., Mand., iii., 109.

Prestwick Car, Winlaton Mill, Gibside, &c.—*J. H.* Sea-coast, near Hartley, in July.—*T. J. B.*

FAMILY 6. DERMESTIDÆ, *Leach.*

116. DERMESTES, *Linn.*

1. D. LARDARIUS, *Linn.*

Steph. Illust., Mand., iii., 121.—*Curtis, Brit. Ent., pl.* 682.

"Newcastle."—*W. C. Hewitson, Esq.* In houses and shops, common.

2. D. MURINUS, *Linn.*

Steph. Illust., Mand., iii., 122.

Shops, &c., in Newcastle. At a dead dog, Long Benton.—*T. J. B.*

‡3. D. VULPINUS, *Fab.*

Steph. Illust., Mand., iii., 123.

"Twizell."—*P. J. Selby, Esq.* Newcastle.—*T. J. B.*

117. ATTAGENUS, *Latr.*

1. A. PELLIO, *Linn.*

Steph. Illust., Mand., iii., 126.

"Meldon Park."—*G. Wailes, Esq.* Long Benton, Newcastle, Boldon, &c.—*T. J. B.* April—September.

118. ANTHRENUS, *Geoff.*

1. A. MUSEORUM, *Linn.*

Steph. Illust. Mand., iii., 129.

"Gibside, on flowers."—*G. Wailes, Esq.*

ABSTRACT

OF

PAPERS COMMUNICATED TO DIFFERENT MEETINGS,

NOT PRINTED IN THE BODY OF THE WORK.

At the July meeting, Mr. Hardy read notices of some entomological excursions. Mr. H.'s object was to record the occurrence of some insects, rare in the district of the Club's operations, with notices of their habits. The insects were principally observed or collected in the marshes which lie between Hylton Castle and Southwick, on the north side of the Wear, a mile or two above Sunderland. These marshes are liable to frequent inundations, and consequently afford few coleoptera excepting those of semi-aquatic habits. Mr. Hardy visited the place in the beginning of June, and found the number of species of insects very limited, and, excepting in one instance, the number of individuals. Insects belonging to the order *Diptera* were the most numerous. Mr. Hardy met with *Ophonus pubescens*, which, as he had not taken it before, was interesting. It was extremely local, being confined to the circuit of a few yards, on a rather drier spot than the rest of the locality. On this place he found it by turning over some broken bricks, and by digging in the soil underneath, he found it in considerable numbers; it occurred also among the matted tufts of the Thrift. Those which he found amongst the soil were pale yellow, having but lately emerged from the pupa, which he found also in some numbers. Mr. H. mentioned that although confined to very narrow bounds in the places where it occurs, nevertheless it is a widely dispersed insect, occurring in most parts of the island.

Mr. Hardy mentioned in the same paper some of the habits of *Brachyopa tricolor*, a rare British fly, which he had met with near

Gibside, in the County of Durham. It is a bolder insect than many of its congeners, suffering a near approach before it rises, and soon returns to the place from whence it had been disturbed. This species also, instead of retiring along with the sun, remains abroad till sometime after sunset. This habit Mr. Hardy also also observed in *Pachyta octo-maculata.* Mr. H. verified the observations of St. Fargeau on some of the habits of the *Tenthredinidæ,* having caught several species preying on other insects. After several observations on the abundance or scarcity of insects generally, this season, he concluded by noticing the capture of two specimens of *Bombus Skrimshirianus,* which is accounted one of our rarer large bees, but Mr. H. mentioned that he had frepuently met both with it and its nest in Berwickshire.

At the September meeting, Mr. Hardy read some notes on the habits of the Horse Leech *(Hæmopsis sanguisuga),* in which he stated, that he had verified by observation, what had been formerly stated respecting this animal, that the common earthworm appeared to be its ordinary food. Mr. H. also mentioned some species of plants in which he had observed monstrosities more than usually remarkable. Of *Dactylis glomerata,* he exhibited and described very extraordinary viviparous heads.

V.—*A Catalogue of the Mollusca of Northumberland and Durham.* *By* Joshua Alder.

[The preparation of this Catalogue was entrusted to a Sub-committee of the Club, consisting of Joseph Harrison Fryer, Albany Hancock, and Joshua Alder, and has been drawn up by the latter with the assistance of the two former. The names of the Sub-committee are indicated in the Catalogue by their initials.]

Several partial notices of the Mollusca, or, to speak more correctly, of the Shells of Northumberland and Durham, have from time to time appeared. The earliest is that of Wallis in the "Natural History and Antiquities of Northumberland," published in 1769. This work contains an account of 45 species and varieties, rather vaguely designated, after the fashion of the older naturalists, but most of which can be easily recognised. They consist principally of the most common and conspicuous species. No further contributions to the conchology of these counties appeared till 1816, when Sir Cuthbert Sharp published in his "History of Hartlepool," a pretty extensive list of the shells of that locality. This list appears to have been very carefully drawn up according to the best information of the time, but a few species have inadvertently been admitted into it, such as *Venus chione, Cardium aculeatum, Buccinum lineatum,* and *Strombus costatus,* which are certainly not inhabitants of our coast, and must either have come there by chance, or, what is more probable, other species somewhat similar in appearance have been taken for them. Several species in addition to Sir Cuthbert Sharp's list were given by Mr. Hogg, in his "Natural History of the Vicinity of Stockton." In 1822, Mr. Winch published a Catalogue of the Shells found at Lindisfarne, in the "Annals of Philosophy"; stated to be principally furnished by a lady. It was afterwards re-

printed in Raine's "History of North Durham." Here also one or two species appear to have been included by mistake, but, upon the whole, it is a pretty correct enumeration of the principal shells found on that part of the coast. A "Catalogue of the Land and Fresh-water Mollusca of the vicinity of Newcastle," by the writer of this notice, was published in our "Natural History Society's Transactions" in 1830, to which a Supplement was added in 1838. More recently, the contributions of Mr. William King, late curator of the Newcastle Museum, and of Mr. Richard Howse, to the "Annals of Natural History" have illustrated several of our rarer species. The excellent papers of Dr. Johnston on the Mollusca of Berwick Bay, published in the "Berwickshire Club Proceedings," may also be mentioned as coming partially within the limits of this Catalogue.

So much having already appeared in this department, it may be supposed that little remains to be done in order to give a complete list of the Mollusca of the two counties. It will be observed, however, that scarcely any notices of the naked or shell-less Mollusca have been included in these contributions, and that in the lists of shells, the minute and less conspicuous kinds, which form a considerable portion of the whole, have been generally overlooked. We have been anxious, too, rather to give the result of our own observations, and to verify by personal observation the species already published, than to make a compilation from old materials, did these contain a greater proportion of our Molluscan Fauna than they really do. The attention that we have paid for several years to the productions of this coast, together with the kind assistance of our friends, has enabled us to add largely to the materials already published.

The arrangement here adopted is that of Cuvier; but so much has been done since his time, especially towards the attainment of a knowledge of the animal inhabitants of shells, upon which any arrangements claiming to be natural must necessarily be based, that we have been obliged to make several modifications to meet the requirements of modern science. We are fully aware of the imperfections of many parts of this arrangement as it now stands, but we prefer, in the present transition state of the

science, to adhere in the main to some system already established, rather than to introduce changes that may not stand the test of further experience.

A spirit of rigid criticism is now abroad on the nomenclature of natural history, which makes it necessary to examine into the priority of each individual synonym in the genera and species. This we have done to the best of our ability and means; and we must acknowledge the great assistance we have derived in this respect from the excellent little Synopsis of the Swedish and Norwegian Mollusca lately published by Professor Lovén, of Stockholm, entitled "Index Molluscorum litora Scandinaviæ Occidentalia habitantium." as well as from his obliging communications. Our acknowledgments are equally due to Mr. Sylvanus Hanley for his kind assistance in identifying several of the Linnæan species; an assistance which his laborious and critical examination of the Linnæan Cabinet renders him peculiarly able to afford.*

Had there been any work which we could have taken as a text book, our task in drawing up this Catalogue would have been comparatively light, but at present no such work on British Mollusca exists, though the desideratum is in the course of being supplied by the "History of British Mollusca and their Shells" by Professor E. Forbes and Mr. Hanley, one or two parts of which have already appeared; but as it will not be completed for three years, we shall not be able to avail ourselves of it on the present occasion.

As our Catalogue is exclusively confined to the Mollusca, three classes of Testaceous animals that have usually appeared in British works on shells do not find a place in these pages; these are, the *Foraminifera*, the *Cirrhipoda*, and the *Testaceous Annelida*. Modern investigations have proved that these belong to entirely different departments of the animal kingdom, to which they must now be assigned—the first to *Zoophytes*, the second to *Crustacea*, and the third to *Annelida*.

* Mr. Hanley is about to publish the results of this examination in a work exclusively devoted to the species preserved in the cabinet of Linnæus, the value of which every naturalist must appreciate.

But if our Catalogue exclude some of the objects usually associated with the Mollusca, it will, on the other hand, be found more than usually extensive in two classes, which have seldom obtained a place in our local lists, namely, the *Nudibranchiata* and the *Tunicata*. In the latter so little has hitherto been done that, even with the kind assistance of of our friend Professor Edward Forbes, we have found the greatest difficulty in referring our species to any of those already described, and it has consequently become necessary to publish descriptions of many of them.

The coast over which our observations extend, is in some respects not particularly favourable for the production of molluscous animals: possessing none of those sinuosities and sheltered bays within which these animals generally find the conditions most favourable to their development. The coast line of Northumberland and Durham is, on the contrary, bare and exposed, and the sea beats upon its shores much more roughly than in most of the localities celebrated for their marine productions. It is nevertheless not without some advantages. Its extensive sands are unmixed with shingle, and consequently afford a suitable habitation for many bivalves; which, however, are nearly extirpated on some of the most frequented parts of the coast. From the nature of the strata, too, the rocks do not dip very abruptly into the sea, but run out at a very slight inclination, leaving a great extent of surface at low tides, accessible to the naturalist, and not unproductive of marine animals. In the inland portion of the country the surface is a good deal diversified, but upon the whole it is rather too hilly, particularly in the western parts, to be very productive of the land and fresh-water Mollusca, which are generally thinly scattered in upland and exposed situations. The vallies, however, produce not an inconsiderable number of the land species: these abound most on limestone, and a few species are nearly confined to that description of rock. Owing to the small extent of marshes and ditches, in addition to the lower temperature, the fresh-water species are much less abundant here than in the south of England.

The generalizations of Professor E. Forbes, in his able Paper on the Northern Drift, published in the "Memoirs of the Geological

Survey of Great Britain," have demonstrated the use of local Faunas like the present, in furnishing materials for working out some of the most interesting problems that Natural History affords; but for the true solution of problems of this kind, it is not only necessary that local Catalogues should be as complete as possible in the productions of the district, but that care should also be taken not to introduce species by mistake, or on imperfect evidence, which might give a false idea of their geographical range, and vitiate the generalizations founded upon them. Impressed with this conviction, we have been particularly careful in scrutinizing the earlier published Catalogues, and comparing them with the geographical limits of species as far as already known; in doing this, we have been led to reject some species only found in a dead state, which deference to previous authorities might otherwise have induced us to retain.

One source of error, which, without great care, is likely to vitiate our Fauna, is the quantity of shells brought in ballast by the coal ships. This ballast, dredged in the rivers and harbours of the south of England, is, in consequence of the dues payable for its deposit on shore, frequently cast overboard at sea, and shells from it are occasionally washed up on the adjoining sands. We have endeavoured to ascertain as far as possible what shells are attributable to this source, but we cannot be sure that in every case we have succeeded.

The exposed nature of the coast is not favourable to the use of the dredge, and consequently very few explorations have been made with that useful aid to the naturalist. Our own exploits in that way, we must confess to have been nearly complete failures, owing principally to our inability to stand the exposure and motion of an open sea. Mr. King and Mr. Howse have made attempts at deep water dredging, on the cod-fishing grounds at a considerable distance from the shore, the results of which have appeared in the "Annals of Natural History." Though these can scarcely be called successful, there cannot be a doubt that under more favourable circumstances excellent results might be obtained from deep-water dredging off our coast, but the expense and discomfort of the undertaking, as prosecuted in the fishing

boats, together with the great uncertainty of the weather when the grounds are reached, are drawbacks which will prevent its being often attempted. A trial made by Mr. Howse of dredging in fifteen to twenty fathoms water, undertaken for the purpose of gaining information for this Catalogue, has been attended with better success, as the notices of species obtained by it will shew.

The Molluscan Fauna of the coast of Northumberland and Durham partakes, as might be expected, much more of the characters of that of northern Europe than of more southern latitudes. On comparing it with the "Index Molluscorum" of Lovén, we find that about half the species of our Catalogue are inhabitants of the Scandinavian shores, whilst scarcely a fifth part are to be found in the Mediterranean. In both cases the greater proportion are bivalves. Dr. Philippi enumerates about one hundred and fifty* marine species, common to Britain and Sicily, but not more than a third of them reach our north-eastern shores, and it is curious that none of the latter are really southern forms, they being nearly all of a cosmopolite character and equally common to the north of Europe. Compared with the British Fauna our coast affords more than half the number of species found on the shores of Great Britain and Ireland. The species most characteristic of our locality are,—

Bullæa pectinata,,
quadrata,
Bulla Cranchii,
Amphisphyra hyalina,
Fusus Norvegicus,
Turtoni,
Islandicus,
Barvicensis,
Velutina plicatilis,
Scalaria Trevelyana,
Natica Montagui,
helicoides,
Grœnlandica,
Margarita helicina,
Nucula tenuis,
Modiola nigra,
Astarte compressa,
Neæra cuspidata,
Panopæa Norvegica.

* We limit our comparisons here to the marine Mollusca, as the geographical distribution of the land and fresh water species has been treated of elsewhere.—*See* Newc. Nat. Hist. Trans.—Forbes in Brit. Assoc. Report, 1839,—and Gray's Turton's Manual.

Fusus antiquus and *gracilis, Cyprina Islandica,* and *Modiola vulgaris,* from their size and frequent occurrence, form a conspicuous part of our Fauna, but their general diffusion through most of the British seas prevents our considering them as characteristic of this locality. These species, however, are rare on the southern coast of England. Of northern forms, whose absence is deserving of remark, perhaps the most conspicuous is *Lottia testudinalis,* so widely spread in northern latitudes and abundant on many parts of the west of Scotland, as well as in Ireland and Wales. This species does not appear to inhabit any part of the eastern coast of Britain. Other northern species, not uncommon on the western shores of Scotland, are also absent here; of these we may mention *Lima hyans, Terebratula caput-serpentis, Crania anomala, Pecten niveus,* and *nebulosus, Leda pygmæa* and *Margarita carnea.* The following south of England species do not occur with us,—

Bulla hydatis,
Eulima polita,
Scalaria clathratula,
Truncatella Montagui,
Ianthina fragilis,
Rissoa crenulata,
striatula,
Phasianella pullus,
Trochus umbilicatus,
striatus,
crassus,
Pleurotoma gracilis,
septangularis,
purpurea,
Fusus muricatus,
Erato lævis,
Ovula patula,
Fissurella reticulata,
Calyptræa Chinensis,
Modiola Gibbsii,
Arca lactea,
Cardium aculeatum,
exiguum.
Cytherea chione,
Tellina depressa,
Petricola irus,
Pandora obtusa,
Galeomma Turtoni,
Gastrochæna pholadia,
Pholas parva,
papyracea,
dactylus.

These may all be considered southern forms which have not reached our limits, but it is worthy of remark that some of them attain a much higher latitude on the western side of Great Britain than they do on the eastern. Many others might be added,

but our object at present is only to point out the most characteristic forms. The absence of a few species of more extensive range may be accounted for by the exposed character of the coast.

Our Catalogue contains altogether 394 species, divided as follows :—

Cephalopoda,		6
Gasteropoda—		
Nudibranchiata,	44	
Pellibranchiata,	1	
Inferobranchiata,	1	
Tectibranchiata,	13	
Pulmonata,	80	
Pectinibranchiata,	92	
Scutibranchiata,	3	
Cyclobranchiata,	12	
Cirrhobranchiata,	3	
		249
Conchifera—		
Palliobranchiata,	1	
Lamellibranchiata,	108	
		109
Tunicata,		30
		394

It may be useful to give an idea of the distribution of these into different zones of depth, which we shall now endeavour to do by enumerating the most characteristic species in each zone. We have adopted the divisions of Professor E. Forbes, contracting a little their limits, the better to adapt them to the conditions observable on our coast. They are as follows :—

1. Littoral Zone.—Between high water-mark and the low water of ordinary tides.
2. Laminarian Zone.—Between low water and 12 fathoms.
3. Coralline Zone.—From 12 to 30 fathoms.
4. Region of Deep Water.—30 fathoms and upwards.

MM. Audouin and Milne Edwards, who first proposed the distribution of marine animals into zones of depth,* have adopted much smaller divisïons, and it would be easy to point out the limits of species, especially between tide marks, within much more contracted bounds, but the above broad and well-marked features are sufficient for our present purpose. Those species which from their numbers give a character to the *zone*, we have denoted by italics; those which from their rarity or partial distribution in Britain give a character to the locality, are distinguished by small capitals.

Littoral Zone.—Doris tuberculata, REPANDA, *bilamellata*, aspera; *Goniodoris nodosa;* Ancula cristata; Eolis papillosa, NANA; Odostomia spiralis; Littorina petræa, *rudissima*, rudis, *littorea*, *retusa;* Rissoa *interrupta*, ulvæ; Lacuna pallidula; *Skenea planorbis; Trochus cinerareus; Purpura lapillus;* Coriocella tentaculata; *Patella vulgata; Chiton marginatus;* Modiola discrepans; *Mytilus edulis;* Pullastra vulgaris, perforans; Kellia suborbicularis; Mya truncata, arenaria; *Pholas crispata*, candida; Cynthia rustica; Ascidia depressa; Botryllus *Schlosseri*, RUBENS; Botrylloides Leachii.

Laminarian Zone.—Dendronotus arborescens; Eolis olivacea, *coronata*, RUFIBRANCHIALIS, picta; AMPHISPHYRA HYALINA, Rissoa *parva*, *striata*, semistriata; *Lacuna vincta*, var. quadrifasciata; MARGARITA HELICINA; Turritella terebra; Fusus turricula; Pleurotoma linearis, rufa; Buccinum undatum, var. 3; *Nassa incrassata; Cypræa Europea;* VELUTINA PLICATILIS; *Lottia virginea;* Patella *pellucida*, lævis; Chiton fascicularis, RUBER; Modiola discrepans; Cardium edule; Venus gallina; Tellina *tenuis, fabula;* Syndosmya alba; Mactra stultorum; Solen siliqua, ensis.

Coralline Zone.—*Polycera Lessonii; Tritonia plebeia;* Doto fragilis, *coronata;* BULLÆA PECTINATA, QUADRATA; BULLA CRANCHII, cylindracea; SCALARIA TREVELYANA; Odostomia interstincta; Rissoa inconspicua, punctura; Trochus tumidus; *Fusus antiquus*, *gracilis*, PROPINQUUS, clathratus; Buccinum

* Recherches pour servir à l'Histoire Naturelle du Littoral de la France, V. i., p. 235.

undatum, var. 2 ; Natica *Alderi*, MONTAGUI ; Velutina lævigata ; Chiton cinereus ; Nucula *nucleus*, TENUIS ; Leda caudata ; Modiola *marmorata*, NIGRA ; Cardium fasciatum ; Pullastra virginea ; ASTARTE COMPRESSA ; *Psammobia Feröensis;* Syndosmya prismatica ; Mactra elliptica ; NEÆRA CUSPIDATA ; Corbula gibba ; LYONSIA NORVEGICA ; Cynthia tuberosa, AMPULLA ; *Ascidia sordida ; Molgula arenosa ;* PELONAIA CORRUGATA.

DEEP WATER REGION.—Tritonia Hombergii ; Trochus tumidus ; Fusus antiquus, var. ; NORVEGICUS, TURTONI, ISLANDICUS, gracilis, var. ; Buccinum undatum, var. 1 ; NATICA GRŒNLANDICA ; TEREBRATULA PSITTACEA ; Modiola nigra ; Venus gallina, var. Prideauxiana ; *Cyprina Islandica ; Astarte Danmoniæ ;* PANOPÆA NORVEGICA.

Our best thanks are due to those gentlemen who have kindly furnished us with information for the following Catalogue ; more especially to the Rev. Geo. Cooper Abbes, of Cleadon ; to Mr. Wm. Backhouse, of Darlington ; to Mr. Robert Embleton, of Embleton ; and to Mr. Richard Howse.

MOLLUSCA.

* Cephala.

Class. CEPHALOPODA, *Cuvier.*

Order. DIBRANCHIATA, *Owen.*

Family. Octopodidæ, *Gray.*

1. ELEDONE, *Leach.*

1. E. ventricosa, *Grant.*

Sepia octopoda, Penn. Brit. Zool. iv. 53, t. 28, f. 44.

Octopus ventricosus, Johns. in Berw. Club Proc. i. 197.

Not uncommon. We once met with it thrown up in great abundance on Whitley sands.—*A. H.*

Dr. Johnston has given an excellent description of this species in the Berwickshire Club Proceedings.

Family. Sepiadæ, *D'Orbigny.*

2. SEPIOLA, *Leach.*

1. S. rondeletii, *Leach.*

Sepia sepiola, Penn. Brit. Zool. iv. 54, t. 29, f. 46.

Sepiola vulgaris, Johns. in Berw. C. Proc. i. 199.

Rather rare. Occasionally found in the stomachs of haddocks.

"Not unfrequently caught in the shrimp nets at Seaton."—*Mr. Hogg.*

We have only once met with the spawn of this species. Observing some capsules separately attached by short footstalks to a stone, brought in by the fishermen at Cullercoats, we carefully detached them with a penknife, and placed them in a phial of sea water. On taking a magnifier to examine our capture, we found several little *Sepiolæ* swimming briskly through the water in all directions, and the capsules lying empty at the bottom of the phial. The little creatures appeared to be of a blueish white; but, on looking again, about a minute afterwards, we found that

two of them had changed to red, and others were rapidly undergoing the same process. The change of colour in the cuttle fish tribe is well known to naturalists, and we, ourselves, had witnessed it partially in some of the larger species, but so sudden and complete a change appeared like magic, and we set about examining the process by which it was accomplished. The white individuals, we found, on looking more closely, were covered with minute spots, which appeared black from the concentration of the colouring matter, but at the will of the animal, or some other exciting cause with which we are unacquainted, they gradually enlarged until they spread out into circular red blotches, the edges of the adjoining ones nearly touching each other, and thus changing the general colour of the animal to red. By an inverse process the colour was again changed to white ; becoming red and white alternately several times during the day. Unfortunately they did not long survive. The young *Sepiolæ* on first bursting from the egg, appear to have the form and habits of the adult animal, with the exception that the tentacles are then not longer than the surrounding arms. The ink bag contained ink, which was ejected by some of the individuals before dying.

3. LOLIGO, *Lamarck.*

1. L. VULGARIS, *Lam.* (Common Calamary).

Sepia loligo, Penn. Brit. Zool. iv. 53, t. 27, f. 43.

Loligo vulgaris, Johns. in Berw. C. Proc. i. 198.

Not uncommon, Mr. Hogg states that they are much used for bait by the Hartlepool fishermen, who call them *ten-tails.*

The spawn of the Calamary is remarkable on account of its peculiar form and large size in proportion to the animal. A fine specimen of it is preserved in the Newcastle Museum. It consists of a great number of transparent gelatinous tubes, rounded at one end and attached by the other to the general mass—the whole appearing like an immense bundle of sausages. They are filled with ova, each containing a single embryo. The specimen in the Museum appears to be in the last stage of development, and the young animals may be readily seen through the transparent envelope.

2. L. SAGITTATA, *Lam.*

Loligo sagittata, Flem. Brit. Anim. 253.—Johns. in Berw. C. Proc. i. 199.

Rather rare. Frequently cast upon South Shields sands.—*Mr. R. Howse.*

3. L. MEDIA, *Linn.*

Sepia media, Penn. Brit. Zool. iv. 54, t. 29, f. 45.

One specimen only of this rare species has occurred to us; it was caught some years ago in the salmon nets at the mouth of the Tyne, and presented to us by Mr. John Hancock. "Occasionally seen at Hartlepool."—*Hogg's Nat. Hist. of Stockton.*

4. SEPIA, *Linnæus.*

1. S. OFFICINALIS, *Linn.* (Common Cuttle Fish).

Sepia officinalis, Penn. Brit. Zool. iv. 55.—Johns. in Berw. C. Proc. i. 200.

The dorsal plate or bone of the common cuttle fish is occasionally cast on shore on many parts of our coast, especially towards the north; but the animal itself is seldom met with. We have found it in the stomach of the cod at Cullercoats.

CLASS. GASTEROPODA, *Cuvier.*

ORDER. NUDIBRANCHIATA, *Cuvier.*

FAMILY. DORIDIDÆ, *Leach.*

5. DORIS, *Linnæus.*

1. D. TUBERCULATA, *Cuv.*

Doris Argo, Penn. Brit. Zool. iv. 43, t. 22, f. 22.

Doris tuberculata, Johns. in Ann. Nat. Hist. i. 50, t. 2, f. 1, 2, 3.

Frequent between tide-marks on the rocky parts of the coast.

2. D. JOHNSTONI, *Ald. and Hanc.*

Doris obvelata, Johns. in Ann. Nat. Hist. i. 52, t. 2. f. 4, 5, 6, 7.

Doris Johnstoni, Ald. and Hanc. Mon. Nudib. Moll., fam. 1, pl. 5.

Under stones between tide-marks, rather rare. Cullercoats and Newbiggin.

3. D. REPANDA, *Ald. and Hanc.*

Doris repanda, Ald. and Hanc. in Ann. Nat. Hist. ix. 32. Mon. Nudib. Moll., fam. 1, pl. 6.

Not unfrequent, but local. Among rocks, at and a little above low-water mark, north of Cullercoats haven. Rocks near the church, Newbiggin.

4. D. MERA, *Ald. and Hanc.*

Doris mera, Ald. and Hanc. in Ann. Nat. Hist. xiv. 330.

A single specimen was found under a stone near low-water mark in 1844.—*A. H.*

5. D. ASPERA, *Ald. and Hanc.*

Doris aspera, Ald. and Hanc. in Ann. Nat. Hist. ix. 32.

Common among rocks between tide-marks.

6. D. BILAMELLATA, *Linn.*

Doris bilamellata, Johns. in Ann. Nat. Hist. i. 53, t. 2, f. 8.

Common under stones between tide-marks, especially in the spring. Two varieties occur, one much larger than the other.

7. D. DEPRESSA, *Ald. and Hanc.*

Doris depressa, Ald. and Hanc. in Ann. Nat. Hist. ix. 32.

Under stones at low-water mark, Whitley; very rare.—*A. H.*

8. D. SPARSA, *Ald. and Hanc.*

Doris sparsa, Ald. and Hanc. in Ann. Nat. Hist. xviii. 293. Mon. Nudib. Moll., fam. 1, pl. 14.

A single example has occurred, found on *Cellepora pumicosa* from a fishing boat, Cullercoats.—*A. H.*

9. D. STELLATA, *Gmel.*

Doris pilosa, Johns. in Ann. Nat. Hist. i. 54, t. 2, f. 9, 10.

Among the rocks between tide-marks and a little beyond; not uncommon. This species is subject to great variation in colour and size. Four varieties occur on this coast, viz :—

Var. 1. Pure white.

2. Canary yellow; rare. A few specimens occurred at Newbiggin in 1843.—*J. A.*

3. Nearly black, or dull white spotted with black, through all the varieties of grey. (*Doris nigricans,* Flem. Brit. Anim. 283).

4. Large, and generally of a pale yellowish brown. This variety is rare with us, but common on some parts of the British coast, in rather deeper water than the other kinds.

10. DORIS SIMILIS, *Ald. and Hanc.*

Doris similis, Ald. and Hanc. in Ann. Nat. Hist. ix. 32.

From the fishing boats, Cullercoats; rather rare.

6. GONIODORIS, *Forbes.*

1. G. NODOSA, *Mont.*

Doris Barvicensis, Johns. in Ann. Nat. Hist. i. 55, t. 2, f. 11-13.

Goniodoris nodosa, Ald. and Han. Mon. Nudib. Moll., fam. 1. pl. 18.

Among the rocks at Tynemouth, Cullercoats, and Whitley; common. This is probably the *Doris marginata* of Hogg's Nat. Hist. of Stockton.

7. TRIOPA, *Johnston.*

1. T. CLAVIGER, *Müll.*

Triopa claviger, Johns. in Ann. Nat. Hist. i. 124.—Ald. and Hanc. Mon. Nudib. Moll., fam. 1. pl. 20.

Rare. We have twice met with this species from the fishing boats at Cullercoats, but never within tide-marks. The variety found on this coast is much smaller than those of the south of England.

8. POLYCERA, *Cuvier.*

1. P. QUADRILINEATA, *Müll.*

Doris flava, Mont. in Linn. Trans. vii. 79, t. 7, f. 6.

Polycera quadrilineata, Ald. in Ann. Nat. Hist. vi. 338, t. 9, f., 1-6.

On small sea weeds in pools near low-water mark, Tynemouth and Cullercoats; rather rare. Marsden, common.

2. P. OCELLATA, *Ald. and Hanc.*

Polycera ocellata, Ald. and Hanc. in Ann. Nat. Hist. ix. 33. Mon. Nudib. Moll., fam. 1, pl. 23.

Among the rocks near low-water mark; not rare. Cullercoats and Whitley.

3. P. LESSONII, *D'Orb.*

Polycera Lessonii, D'Orb. in Mag. de Zool. vii. 5, t. 105.

Polycera citrina, Alder in Ann. Nat. Hist. vi. 340, t. 9, f. 7-9.

On *Gemellaria loriculata*, in from 15 to 20 fathoms water; common. Cullercoats.—*J. A. and A. H.* Whitburn.—*Mr. R. Howse.*

9. ANCULA, *Lovén.*

1. A. CRISTATA, *Alder.*

Polycera cristata, Ald. in Ann. Nat. Hist. vi. 340, t. 9, f. 10, 11.

Ancula cristata, Ald. and Hanc. Mon. Nudib. Moll., fam. 1, pl. 25.

Among the rocks at Cullercoats and Whitley; common. Newbiggin.—*J. A.* Marsden.—*A. H.* Holy Island —*Dr. Johnston.*

10. IDALIA, *Leuckart.*

1. I. ASPERSA, *Ald. and Hanc.*

Idalia aspersa, Ald. and Hanc. Mon. Nudib. Moll., fam. 1, pl. 26.

One specimen found on *Fusus antiquus* from the fishing boats, Cullercoats.—*J. A.*

2. I. ELEGANS, *Leuck.* ?

Body convex, white, tinged with flesh colour; tentacles long and slender, with 4 long tentacular filaments in front, 2 at the base of each tentacle; lateral filaments 6 on each side, very long, the last bifid: there are also 3 rows of filaments on the back; the central one containing 3, the sub-lateral ones 5 each. Branchiæ, consisting of 11 slender pinnate plumes, largest in front, and becoming very small behind; the anterior plume is bifid. Length, half an inch.

An individual of this species was obtained by the Rev. G. C. Abbes from the fishing boats at Whitburn. It is similar to a specimen from Torbay, preserved in the British Museum, and labelled *Idalia elegans*, by Dr. Leach. There may be some

doubt, perhaps, whether it is the *I. elegans* of Leuckart. It differs from *I. aspersa* in having five rows of filamentary appendages, as well as in their greater length, and in the slender form and unequal length of the branchiæ, which in *I. aspersa* are stout and equal, forming a regular rosette. The prevailing colour in this genus is red; our individual was white.

Family. Tritoniadæ, *Johnston.*

11. TRITONIA, *Cuvier.*

1. T. Hombergii, *Cuv.*

Tritonia Hombergii, Flem. Brit. Anim. 284; Johnston in Ann. Nat. Hist. i. 114, t. 3, f. 1, 2.

From deep water, rather rare. Whitburn.—*Rev. G. C. Abbes.* From a fishing boat at Newcastle Quay.—*Mr. W. King.* The jaws are somtimes met with in the stomachs of fish caught on the coast. Dr. Johnston states that it is not uncommon in Berwick Bay.

We have frequently got a small white Tritonia from the fishing boats at Cullercoats and Newbiggin, very like the young of this species, but differing in colour, and never approaching it in size. It may possibly be distinct, but we refrain from describing it until we are better acquainted with the young of *T. Hombergii.* We have named it in manuscript *T. alba.* Mr. Abbes has sent us the same variety from Whitburn.

2. T. plebeia, *Johns.*

Tritonia plebeia, Johns. in Ann. Nat. Hist. i. 115, t. 3, f. 3, 4; Ald. and Hanc. Mon. Nudib. Moll., fam. 2, pl. 3.

On old shells and zoophytes, especially on *Alcyonium digitatum,* from rather deepish water, common. Cullercoats, Newbiggin, and Whitburn.

Fam. Eolididæ, *D'Orbigny.*

12. DENDRONOTUS, *Alder and Hancock.*

1. D. arborescens, *Müll.*

Dendronotus arborescens, Ald. and Hanc. Mon. Nudib. Moll., fam. 3, pl. 3.

Vars. *Tritonia pulchella,* Ald. and Hanc. in Ann. Nat. Hist. ix. 33.

Tritonia felina, Ald. and Hanc. in Ann. Nat. Hist. ix. 33.

Among the rocks near low-water mark at Cullercoats and Whitley, not uncommon. A specimen from Bamborough is labelled *Tritonia Trevelyana* by Dr. Leach in the British Museum.

13. DOTO, *Oken.*

1. D. FRAGILIS, *Forbes.*

Melibea pinnatifida, Johns. in Ann. Nat. Hist. i. 116.

Melibœa fragilis, Forbes Mal. Monen. 4, t. 1, f. 4.

On *Tubularia indivisa,* in about fifteen or twenty fathoms water, not rare. Cullercoats and Newbiggin.

2. D. CORONATA, *Gmel.*

Melibea coronata, Johns. in Ann. Nat. His. i. 117, t. 3, f. 5-8.

Doto coronata, Ald. and Hanc. Mon. Nudib. Moll., fam. 3, pl. 6.

Var. *Melibœa ornata,* Ald. and Hanc. in Ann. Nat. Hist. ix. 34.

On corallines near low-water mark, rather rare; common on *Plumularia falcata,* from the coralline zone on most parts of the coast.

14. EOLIS, *Cuvier.*

1. E. PAPILLOSA, *Linn.*

Eolidia papillosa, Johns. in Loud. Mag. Nat. Hist. viii. 376, f. 35. Ann. Nat. Hist. i. 118.

Under stones among the rocks between tide marks, not uncommon.

2. E. ROSEA, *Ald. and Hanc.*

Eolis rosea, Ald. and Hanc. in Ann. Nat. Hist. ix. 34.

Among the rocks at Cullercoats, rare.—*A. H.* This is rather a doubtful species, and may possibly be a variety of the last.

3. E. OBTUSALIS, *Ald. and Hanc.*

Eolis obtusalis, Ald. and Hanc. in Ann. Nat. Hist. ix. 34.

From the fishing boats, Cullercoats; rare.—*J. A.*

This is also nearly allied to *E. papillosa*, and requires further observation for its complete establishment.

4. E. PEACHII, *Ald. and Hanc.*

Eolis Peachii, Ald. and Hanc. in Ann. Nat. Hist. 2nd series, i. 191.

One specimen obtained from the fishing boats, Cullercoats.—*J. A.*

5. E. CORONATA, *Forbes.*

Eolis coronata, Ald. and Hanc. Mon. Nudib. Moll., fam. 3, pl. 12.

This very beautiful species is one of the commonest on our coast, near low-water mark.

6. E. CURTA, *Ald. and Hanc.*

Eolis curta, Ald. and Hanc. in Ann. Nat. Hist. xii. 234.

One specimen found among the rocks, at Whitley.—*A. H.*

Very nearly allied to *E. Drummondi*, of which it may be a variety.

7. E. RUFIBRANCHIALIS, *Johns.*

Eolidia rufibranchialis, Johns. in Ann. Nat. Hist. i. 121.

Among the rocks between tide marks, rather rare. Cullercoats and Whitley.

8. E. PELLUCIDA, *Ald. and Hanc.*

Eolis pellucida, Ald. and Hanc. in Ann. Nat. Hist. xii. 234. Mon. Nudib. Moll., fam. 3, pl. 19.

On a coralline brought in by the fishing boats at Cullercoats, very rare.—*A. H.*

9. E. GRACILIS, *Ald. and Hanc.*

Eolis gracilis, Ald. and Hanc. in Ann. Nat. Hist. xiii. 166.

Among the rocks north of Cullercoats, rare.—*A. H.* Newbiggin.—*J. A.* A variety occurs, smaller, less slender, and with the branchiæ of an orange colour: it may be distinct. We have also met with an Eolis, apparently belonging to this species, but with the branchiæ of a beautiful green colour. So great a variation in colour is not usual in the genus. These varieties require a re-examination, but the rarity of the species has hitherto prevented it.

10. E. ANGULATA, *Ald. and Hanc.*

Eolis angulata, Ald. and Hanc. in Ann. Nat. Hist. xiii. 165. Mon. Nudib. Moll., fam. 3, pl. 23.

On a stone brought in by the fishermen, Cullercoats.—*A. H.*

11. E. NANA, *Ald. and Hanc.*

Eolis nana, Ald. and Hanc. in Ann. Nat. Hist. ix. 36. Mon. Nudib. Moll., fam. 3, pl. 25.

Among the rocks at Cullercoats and Whitley, occasionally.

12. E. CONCINNA, *Ald. and Hanc.*

Eolis concinna, Ald. and Hanc. in Ann. Nat. Hist. xii. 234. Mon. Nudib. Moll., fam. 3, pl. 24.

Under a stone at low-water mark, Whitley.—*A. H.* Four individuals were found under the same stone in 1843, since which time the species has not been again met with.

13. E. OLIVACEA, *Ald. and Hanc.*

Eolis olivacea, Ald. and Hanc. in Ann. Nat. Hist. ix. 35. Mon. Nudib. Moll., fam. 3, pl. 26.

Among the rocks between tide marks, frequent. Cullercoats, Whitley, and Whitburn.

14. E. AURANTIACA, *Ald. and Hanc.*

Eolis aurantia, Ald. and Hanc. in Ann. Nat. Hist. ix. 34.

Near low-water mark, Cullercoats and Whitley, rather rare.

15. E. CINGULATA, *Ald. and Hanc.*

Eolis Hystrix, Ald. and Hanc. in Ann. Nat. Hist. ix. 35.

Eolis cingulata, Ald. and Hanc. Mon. Nudib. Moll., fam. 3, pl. 28.

A few specimens were found at low-water mark among the rocks north of Cullercoats, in 1841.—*J. A.*

16. E. VITTATA, *Ald. and Hanc.*

Eolis vittata, Ald. and Hanc. in Ann. Nat. Hist. ix. 35.

Two individuals, both rather injured, have been obtained at different times on corallines brought in on the fishing lines at Cullercoats.

17. E. NORTHUMBRICA, *Ald. and Hanc.*

Eolis Northumbrica, Ald. and Hanc. in Ann. Nat. Hist. xiii. 165; Mon. Nudib. Moll., fam. 3, pl. 31, f. 2, 3.

On a coralline from deep water, Cullercoats.—*A. H.*

18. E. PICTA, *Ald. and Hanc.*

Eolis pallida, Ald. and Hanc. in Ann. Nat. Hist. ix. 35.

Eolis picta, Ald. and Hanc. Mon. Nudib. Moll., fam. 3, pl. 33.

Among the rocks at Cullercoats, Whitley, and Tynemouth, frequent. Newbiggin.—*J. A.*

19. E. TRICOLOR, *Forbes.*

Eubranchus tricolor, Forbes Mal. Monen. 5.

Eolis violacea, Ald. and Hanc. in Ann. Nat. Hist. xiii. 166.

Eolis tricolor, Ald. and Hanc. Mon. Nudib. Mol., fam. 3, pl. 34.

One specimen found on a coralline from the fishing boats, Cullercoats.—*J. A.*

20. E. AMETHYSTINA, *Ald. and Hanc.*

Eolis amethystina, Ald. and Hanc. in Ann. Nat. Hist. xvi. 316.

One specimen found among the rocks at the north end of Cullercoats sands.—*A. H.*

21. E. DESPECTA, *Johns.*

Eolidia despecta, Johns. in Ann. Nat. Hist. i. 123.

Eolis despecta, Ald. and Hanc. Mon. Nudib. Moll., fam. 3, pl. 36.

Eighteen or twenty individuals were found together under a stone among the rocks at Whitley, feeding upon *Laomedea gelatinosa.*—*A. H.*

We have not met with the *Eolidia Cuvieri* of Dr. Johnston, found by him in Berwick Bay, though it is most likely an inhabitant of the Northumberland coast.

A small *Eolis* from Whitley rocks was described in the Annals of Natural History, under the name of *Eolis minuta.* The description was taken from an imperfect specimen, and as it has never occurred again, and there is a degree of uncertainty attending it, we have left it out of the present Catalogue.

ORDER. PELLIBRANCHIATA, *Alder and Hancock.*

15. LIMAPONTIA, *Johnston.*

1. L. NIGRA, *Johns.*

Limapontia nigra, Johns. in Loud. Mag. Nat. Hist. ix. 79.

On a conferva, in pools near high-water mark, Cullercoats; plentiful in the summer months.—*A. H.*

Order. INFEROBRANCHIATA, *Cuvier.*

16. PLEUROBRANCHUS, *Cuvier.*

1. P. PLUMULA, *Mont.*

Bulla plumula, Mont. Test. Brit. 214, t. 15, f. 9, and vign. 2, f. 5.

Pleurobranchus plumula, Johns. in Berw. C. Proc. ii. 27.

Between tide-marks, Holy Island.—*Dr. Johnston.*

Order. TECTIBRANCHIATA, *Cuvier.*

Fam. Aplysiadæ, *D'Orbigny.*

17. APLYSIA, *Linnæus.*

1. A. PUNCTATA, *Cuv.*

Laplysia depilans, Penn. Brit. Zool. iv. 42, t. 21, f. 21.

Aplysia mustelina, Johns. in Berw. C. Proc. ii. 29.

On sea-weeds beyond low-water mark, not uncommon; rare between tide-marks. Cullercoats, Whitley, and Newbiggin.

A specimen got at Newbiggin had the horny dorsal plate lined with a thin coating of shelly matter, not unlike what is seen in *Pleurobranchus membranaceus*; but as we did not observe any difference in the animal, we attribute it to the effect of age.

This Aplysia is very variable in its markings. It is often blotched and spotted with white.

Family. Bullidæ, *D'Orbigny.*

18. BULLÆA, *Lamarck.*

1. B. CATENA, *Mont.*

Bulla catena, Mont. Test. Brit. 215, t. 7, f. 7.

Bullæa catenata? Thorpe Brit. Mar. Conch. 138.

In shell sand, frequent. Tynemouth, Whitley, Newbiggin, and Cheswick. It has not been found alive on this coast, but appears to inhabit the Laminarian zone.

The description of *Bullæa catenata,* in Thorpe's "British Marine Conchology," agrees with this species, being a slight alteration of Montagu's, but the figure is that of *B. pectinata,* which is the *Scaphander catenata* of Leach. The latter species is described in the Addenda to the same work, under the name of *Bullæa catenulifera,* Macg.

2. B. PUNCTATA, *Adams.*

Bullæa punctata, Clark in Zool. Journ. iii. 339.

In shell sand, with the last, but not so common. Rarely found alive in pools among the rocks within tide marks.

This species has frequently been confounded with the last, but is perfectly distinct. The characters are accurately pointed out by Mr. Clark in the Zoological Journal.

3. B. PECTINATA, *Dillw.*

Bulla scabra, Mull. Zool. Dan. ii. 41, t. 71, f. 11, 12.

Bulla pectinata, Dillw. Cat. 481.

Scaphander catenata, Leach. Moll. (ined.).

Bullæa angustata, Phil. Moll. Sic. i. 121, t. 7, f. 17, b. c.

Bullæa catenulifera, Macg. Moll. Aberd. 187.

Bulla dilatata, S. Wood in Charlesw. Mag. Nat. Hist. iii. t. 7, f. 3.

Philine scabra, Lovén Ind. Moll. Scand. 9.

Bulla granulosa, Sars. (sec. Lovén).

Not uncommon in the Coralline Zone, and frequently found in the stomachs of haddocks, but the shell is seldom cast on shore. It occurs, however, in shell-sand, in the north of Northumberland.

We have more than once seen the animal in a fresh state but not alive. It is white, and above twice the size of the shell. The frontal disc is long, and without apparent eyes or tentacles, the sides of the foot broadly reflected, and the cloak, which probably covers the shell in a living state, is withdrawn when dead. The animal bears a great resemblance to that of *Bulla lignaria,* and the similarity in the form of the shell is also striking. We think it may probably have to be placed with that species in the genus *Scaphander* of Montfort, but the animals of this tribe require to be more carefully studied, and in the mean time, we prefer retaining the name *Bullæa,* of Lamarck, for these species, rather than making any further changes till the limits of the genera are better understood. The gizzard of *Bullæa pectinata* has more resemblance to the same organ in *B. aperta,* than to that of *B. lignaria,* having three triangular testaceous plates, similar to those of the former, but more slender and pointed.

As this species has had the misfortune to be much misunderstood, we have thought it desirable to give the synonyms of different authors. Philippi published it in the first volume of his "Enumeratio Molluscorum Siciliæ," under the name of *B. angustata*, but changed it in the second volume to *B. punctata*, Adams, and quotes *B. catena*, Mont., as a synonym.

4. B. QUADRATA, *S. Wood.*

Bulla quadrata, Wood in Charlsw. Mag. Nat. Hist. iii. 460, t. 7, f. 1.

Philine scutulum, Lovén Index Moll. Scand. 9.

Shell white, sub-diaphanous, globoso-quadrangular, rounded on the back and a little constricted above; covered with catenated spiral striæ, and having, in fresh specimens, one or two faint opake bands. Apex subtruncated, sunk in the centre, but not umbilicated, exposing scarcely one volution. Aperture large and wide, occupying nearly the whole of the shell: outer lip expanded above, and nearly straight at the side, the edge thin and slightly crenulated by the striae; a little angulated below; base wide and nearly straight; inner lip thin, bent a little above from the bulging of the body whorl into the aperture, not reflected but having a pretty strong margin of enamel laid over the whorl. Length $\frac{1}{4}$ in., breadth 2-tenths.

Of this interesting species a few fine specimens have been obtained at Whitburn, by the Rev. G. C. Abbes and Mr. R. Howse. It adds another to the species found fossil in the Crag, which have lately been ascertained to be still living in our seas.

Bulla quadrata differs from *B. catena* in the more globose and subquadrate form; also in having the apex broader and more depressed. In outline it more nearly resembles *B. aperta*. We have inserted a description of the recent shell, as its characters have not been all distinctly made out from the fossil.

5. B. PRUINOSA, *Clark.*

Bulla pruinosa, Clark in Zool. Journ. iii. 339.

A specimen of this rare species was dredged by Mr. R. Howse, off Whitburn, and another has also occurred to him in the stomach of a fish.

Bullæa aperta is included in Sir C. Sharp's list of Hartlepool

shells, and Captain Brown states that it is not uncommon on the Northumberland coast. We have not, however, been so fortunate as to meet with it, nor to hear of any one in this neighbourhood who has. We have, therefore, excluded it from the present list, more especially as we have no record of its having been met with by recent collectors on the north-eastern coast of Great Britain. It stands as a Frith of Forth shell on the authority of Captain Laskey.

19. BULLA, *Linnæus.*

1. B. CRANCHII, *Leach.*

Bulla Cranchii, Flem. Brit. Anim. 292.—Johns. in Berw. C. Proc. ii. 30.

Bulla punctura, Johns. in Edinb. New Ph. Journ. v. 79.

From the haddock grounds, rare. All the specimens we have seen have been obtained from the stomachs of haddocks. It was first noticed on our coast by the Rev. W. Mark. Several years ago we got about twenty individuals in one season, since which time we have not met with it again until a few months ago, when four specimens were obtained from one fish. We have examined several of the animals in a decomposed state, but could not find any trace of a gizzard. The shell has long been known to collectors as the *Bulla (Roxania) Cranchii* of Leach, first announced as British by Dr. Turton, and we presume it is the same described by Dr. Fleming under that name, though we can scarcely recognise our shell in his description. It is not, however, the *B. cornea* of Lamarck, which that author states he had from Dr. Leach under the name of *Bulla Cranchii.* That species is the *B. hydatis* of British authors.

2. B. UMBILICATA, *Mont.*

Bulla umbilicata, Mont. Test. Brit. 222, t. 7, f. 4.

Very rare. Two specimens have been obtained from the stomachs of fish.—*J. A.*

3. B. CYLINDRACEA, *Penn.*

Bulla cylindracea Mont. Test. Brit. 221, t. 7, f. 2.

From the coralline zone, frequent.

We have only once met with the animal alive. It is of a pale

straw colour, rather small in proportion to the shell, and retractile within it. The frontal disc is large, slightly bilobed behind, but not produced into tentacles, and without apparent eyes. The foot is small and a little extended, and folded up at the sides. The epidermis when fresh is of a rusty orange colour.

4. B. TRUNCATA, *Adams.*

Bulla truncata, Mont. Test. Brit. 223, t. 7, f. 5.

Frequent in shell-sand, and occasionally found alive in pools among the rocks.

The animal has been described by Dr. Johnston. It differs from the last in having the disc, which is short and square, produced posteriorly into longish pointed tentacles, with eyes at the anterior base. It is the type of the genus *Cylichna* of Lovén, in which he also includes the two preceding and the following species. This genus we should gladly have adopted, but that we have doubts whether the species he has referred it to really belong to the same generic group, which an examination of the animals alone can decide.

5. B. OBTUSA, *Mont.*

Bulla obtusa, Mont. Test. Brit. 223, t. 7, f. 3.

Rather rare. In sand at Cheswick, and Newbiggin.—*J. A.*

20. AMPHISPHYRA, *Lovén.*

1. A. HYALINA, *Turt.*

Bulla hyalina, Turt. in Loud. Mag. Nat. Hist. vii. 373.

Utriculus pellucidus, Brown, Illust. Rec. Conch. 59, t. 19, f. 10, 11.

In shell sand, not rare. We have once or twice found it alive in pools between tide-marks at Cullercoats.

The specimens from which Dr. Turton described his *Bulla hyalina*, we found in sand collected at Tynemouth. The *Utriculus pellucidus*, *U. candidus*, and *U. minutus* of Capt. Brown appear to us to be this shell in different stages of growth.

The animal of this species differs so materially from the other *Bullidæ* that we hesitate not to adopt the genus proposed for it by Professor Lovén. The absence of the frontal disc and the position of the tentacles (which are short and obtuse) in front

of the head and before the eyes, sufficiently distinguish it from the other genera of the family. The animal is white and retractile within the shell, from which it is seldom much protruded, keeping its eyes under the protection of the transparent shell, through which it looks as through a window. This practice we have noticed in several of the Mollusca, whose shells are transparent. It has no gizzard nor operculum.

FAMILY. ACTÆONIDÆ, *D'Orbigny.*

21. ACTÆON, *Montfort.*

1. A. TORNATILIS, *Linn.*

Voluta tornatilis, Mont. Test. Brit. 231.

From deepish water, rather rare. Occasionally found in the stomachs of fish.

The animal of this genus comes very near to that of Bulla, having a broad lobed disc in front, without tentacles. We find, too, that the branchial aperture is lateral, the cloak being closed across the front, and open only on the right side, which further confirms us in assigning it a place in this order. The operculum can scarcely be considered of more than generic importance.

ORDER. PULMONATA, *Cuvier.*

FAMILY. LIMACIDÆ, *Fleming.*

22. ARION, *Férussac.*

1. A. ATER, *Linn.* (Common black Slug).

Arion ater, Gray Turt. Man. 104.

In woods, fields, and hedges, very common.

Férussac considers the black head and tentacles, and the transverse black lines round the margin of the foot, to be the only permanent distinctive characters in this very variable species. The varieties we have observed in this neighbourhood are the following :—

1. Entirely black.
2. Black, with the sides of the foot yellow or orange.

3. Blackish above, with a black band on each side of the body, and the sides yellowish white.

4. Yellowish or greenish white, with black tentacles.

The young are always much paler than the adults, and are sometimes of a transparent white. We have not met with the rufous variety in this district.

2. A. FLAVUS, *Müll.*

Arion flavus, Fér. Hist. des Moll. Supp. 96; Bouchard Chantereaux Cat. des Moll. du Pas-de-Calais, 23.

Limax flavus, var. γ, Nilsson Moll. Suec. 5. "*Pallidus, clypeo flavo, dorso sub-cinerascente.*"

The variety has once occured to us; found on the moors near Haltwhistle by Mr. J. Blacklock.

M. Bouchard Chantereaux considers this species distinct from *A. ater*, and it has not the characters of the latter pointed out by Ferussac; but we know too little of it to give a decided opinion in so difficult a genus. Our individual was about an inch in length, with the body whitish, having a faint greyish tinge above. The shield and the posterior part of the body near the tail were of a pale canary yellow. Tentacles, grayish white. The mucus was deep orange-yellow. The mucus of *A. ater* is colourless or very faintly tinged with yellow.

3. A. HORTENSIS, *Fér.*

Arion hortensis, var. 2, Gray Turt. Man. 107.

Limax fasciatus, Nilsson Moll. Suec. 3.

Limax circumscriptus, Johns. in Edinb. Phil. Journ. v. 77.

In gardens, common.

A variety, or, as we are inclined to think, a species nearly allied to this, is found in woods. It is about twice the size of the garden slug, and its colour invariably yellowish fawn, inclined to amber, with a brown band on each side. We have never found the two kinds mixed, the one inhabiting woods, and the other cultivated grounds. This variety, we find, is well known to the Rev. B. J. Clarke, who also finds it constant in colour and markings. The mucus is orange yellow.

23. LIMAX, *Linnæus.*

1. L. MAXIMUS, *Linn.*

Limax cinereus, Müll. Verm. 5 ; Drap. Hist. Moll. 124, t. 9, f. 11.

Limax maximus, Gray Turt. Man. 112 ; Clarke in Ann. Nat. Hist. xii. 333, t. 10, f. 1.

In woods and fields, frequent.

2. L. ARBORUM. *Bouchard.*

Limax arborum, Bouch. Chan. Moll. du Pas-de-Calais, 28.

Limax arboreus, Clarke in Ann. Nat. Hist. xii. 334, t. 11, f. 4-10.

In woods at Wolsingham and Shotley Bridge.—*Mr. W. Backhouse.* Howick woods.—*Mr. R. Embleton.*

3. L. FLAVUS, *Linn.*

Limax variegatus, Drap. Hist. Moll. 127.

Limax flavus, Gray Turt. Man. 114 ; Clarke in Ann. Nat. Hist. xii. 338, t. 11, f. 11, 12.

In cellars, not common. Newcastle.—*J. A.* Sunderland.—*Mr. R. Howse.*

4. L. SOWERBII, *Fér.*

Limax carinatus, Gray Turt. Man. 115.

Limax Sowerbii, Clarke in Ann. Nat. Hist. xii. 338, t. 12, f. 14, 15.

Near Benwell.—*Mr. W. Backhouse.*

5. L. TENELLUS, *Müll.*

Limax tenellus, Müll. Verm. ii. 11. Nilsson Moll. Suec. 10 ; Drap. Hist. Moll. 127.

In a wood at Allansford, near Shotley Bridge.

A specimen of this interesting species was brought us from the above locality by Mr. Blacklock. It was of a pale, dull yellow, very transparent and lubricous, with an obscure band on each side of the shield and back ; the posterior part of the shield rounded ; the tentacles black ; length rather more than an inch; the mucus orange-coloured. In all these particulars it agrees with the description of *Limax tenellus*, given by Nilsson, in his

excellent little work, "Historia Molluscorum Sueciæ."* Wishing to have the opinion of the Rev. B. J. Clarke, whether this was the young of any of the species he has so admirably described, we sent him a drawing and description of it. Mr. Clarke states that but for the black tentacles he would have thought the drawing to represent the young of *Limax flavus*, but taking the description into consideration, he thinks us justified in considering it distinct. The blue tentacles are a permanent character in *L. flavus*, and M. Bouchard Chantereaux says that its mucus is colourless.

6. L. AGRESTIS, *Linn.*

Limax agrestis, Gray Turt. Man. 117; Clarke in Ann. Nat. Hist. xii. 338, t. 12, f. 13.

In fields and gardens; much too common.

7. L. BRUNNEUS, *Drap.*

Limax brunneus, Johns. in Berw. C. Proc. i. 154; Gray Turt. Man. 117.

In damp woods, frequent.

This species was introduced into our Fauna by Dr. Johnston, and considered to be the *L. brunneus* of Draparnaud, partly, perhaps, in conformity with our opinion. Draparnaud's species, however, is very obscure, and was unknown to Férussac. M. Bouchard Chantereaux finds a species in the north of France, which he considers to be the *L. brunneus*. His description of it agrees pretty well with our animal, but a comparison of the specimens would be necessary to pronounce on their complete identity. It is quite distinct from the dark variety of *L. agrestis*.

*As this is the first time the species has been noticed as British, we insert Nilsson's description :—"Animal parvum, vix 1¼ unc. longum. Clypeus lineis subtilibus concentricis striatus, apertura laterali postica. Collum supra linea longitudinali elevata, lateribus subreticulatis. Dorsum posticè compressum. Color clypei et dorsi postici luteus; dorso supra luteo-virescente levissime cinerascente, subtus albo. Tentacula, caput, et linea colli utrinque nigra. Mucus luteus. *Habitat* in sylvis inter folia putrescentia, humida, rarius."—*Nils. Hist. Moll. Suec.* 10.

FAM. HELICIDÆ, *Jeffreys.*

24. VITRINA, *Draparnaud.*

1. V. PELLUCIDA, *Müll.*

Vitrina pellucida, Gray Turt. Man. 120, t. 3, f. 21.

Among decayed leaves and under stones in woods, on old walls, and on the sea banks; frequent. Abundant in short grass, on and near St. Mary's Island, Hartley; where, in some states of the weather, it is difficult to walk without crushing numbers of them.

25. SUCCINEA, *Draparnaud.*

1. S. PUTRIS, *Linn.*

Succinea amphibia, Drap. Hist. Moll. 58, t. 3, f. 22, 23.

Succinea putris, Gray Turt. Man. 178, t. 6, f. 73.

Var. *Succinea gracilis,* Ald. in Newc. N. H. Trans. ii. 338.

Succinea Pfeifferi, Gray Turt. Man. 179, t. 6, f. 74*.

On aquatic plants in marshy places, and at the borders of rivulets, common.

This species is subject to very great variety. Further observation inclines us to unite with it the *S. gracilis* of our former Catalogue, though opinions are still very much divided upon that point. The *S. Pfeifferi* of Rossmassler does not appear to be exactly equivalent to our *S. gracilis,* though doubtless a nearly allied variety. Rossmassler describes it to be thick, and with a pearly lustre inside, which is not the case with ours. There is a very stunted and dwarf variety with the animal nearly black, not uncommon on plants and stones close to the edge of rivulets, and frequently on stones surrounded by the stream; which, if *S. gracilis* be retained as a species, seems entitled to a similar rank.

26. HELIX, *Linnæus.*

1. H. ASPERSA, *Müll.*

Helix aspersa, Gray Turt. Man. 128, t. 4, f. 35.

In gardens and on hedge sides, common. Very abundant on the sea banks on a limestone soil.

2. H. ARBUSTORUM, *Linn.*

Helix arbustorum, Gray Turt. Man. 137, t. 3, f. 25.

In woods and on sea banks, frequent.

3. H. NEMORALIS, *Linn.*

Helix nemoralis, Gray Turt. Man. 132, t. 3, f. 23.

On hedge sides and sea banks, common.

4. H. HORTENSIS, *Müll.*

Helix hortensis, Gray Turt. Man. 130, t. 3, f. 24.

Var. *Helix hybrida*, Gray Turt. Man. 132.

In woods and on hedge sides, frequent. The *H. hybrida* is found at Stella.

5. H. CANTIANA, *Mont.*

Helix carthusiana, Drap. Hist. Moll. 102, t. 6. f. 33.

Helix cantiana, Gray Turt. Man. 144, t. 3, f. 26.

On road sides and hedge banks, occasionally.

6. H. RUFESCENS, *Penn.*

Helix glabella, Drap. Hist. Moll. 102, t. 7, f. 6.

Helix rufescens, Gray Turt. Man. 156, t. 3, f. 28.

Under stones and on plants by hedge sides, &c. Not uncommon near Sunderland, and in other parts of the magnesian limestone district. It is not met with in the neighbourhood of Newcastle.

7. H. HISPIDA, *Müll.*

Helix hispida, Gray Turt. Man. 154, t. 4, f. 41.

On plants in woods and waste places, common.

Var. 1. *Helix concinna*, Jeff., Gray Turt. Man. 154, t. 12, f. 135.

Common on nettles and other plants by hedge sides, about Newcastle, where it takes the place of *H. rufescens.*

Var. 2. H. SERICEA *(Müll.?) Fér*, Ald. in Newc. N. H. Trans. ii. 340; Gray Turt. Man. 153, t. 12, f. 134.

In woods, rare: Cawsey Dean, Tanfield, and in the Bath Wood, Dinsdale.

The great difficulty in distinguishing these hispid shells by any permanent character, has induced us to consider them all varieties of the same species, of which *H. concinna* and *H. sericea* form the two extremes.

8. H. GRANULATA, *Alder.*

Helix hispida, Mont. Test. Brit. 423.

Helix granulata, Ald. in Newc. N. H. Trans. 1, 39; Gray, Turt. Man. 151, t. 3, f. 29.

In woods, rather local, but generally plentiful where it occurs. Stella and Walbottle Deans. Claxheugh, near Sunderland.—*Mr. R. Howse.*

This is much more permanent in its character than the last. It is generally paler, and always more globular, light, and hispid.

9. H. FUSCA, *Mont.*

Helix fusca, Gray, Turt. Man. 147, t. 4, f. 36.

On brambles, and other plants, in moist woods, frequent.

10. H. EXCAVATA *(Bean MS.)*, *Alder.*

Helix excavata, Ald. in Newc. N. H. Trans. i., 38.

Zonites excavatus, Gray, Turt. Man. 175, t. 12, *f.* 138.

Under decayed wood and timber that has lain awhile on the ground, rare. Stella Dean, where it was first observed by the Rev. Wm. Mark; also in Gibside Woods (whence we have got a white variety,) and in one or two of the adjoining deans, but sparingly.

11. H. LUCIDA, *Drap.*

Zonites lucidus, Gray, Turt. Man. 174, t. 4, f. 38.

In marshy places, rare. Heaton Dean, and near Dinsdale.—*J. A.*

12. H. RADIATULA, *Alder.*

Helix radiatula, Ald. in Newc. N. H. Trans. i. 38.

Zonites rad atulus, Gray, Turt. Man. 173, t. 12, f. 137.

Var. *Helix vitrina*, Fér. Tab. des Moll., No. 217.

In wet moss, not uncommon. The variety in Gibside woods.

13. H. NITIDULA, *Drap.*

Zonites nitidulus, Gray, Turt. Man. 172, t. 12, f. 136.

Under stones by hedge sides and in woods, common.

14. H. ALLIARIA, *Miller.*

Zonites alliarius, Gray, Turt. Man. 168, t. 4, f. 39.

Under stones, decayed leaves, and moss, in woods and on hedge banks, common.

15. H. CELLARIA, *Müll.*

Zonites cellarius, Gray, Turt. Man. 170, t. 4, f. 40.

In cellars and yards, also in gardens, and under stones in fields and woods, common. This species is found in the centre of Newcastle, and is the only shell-snail we are acquainted with inhabiting such situations.

16. H. PURA, *Alder.*

Helix pura, Ald. in Newc. N. H. Trans. i. 37.

Zonites purus, Gray, Turt. Man. 171, t. 4, f. 43.

Var. *Helix nitidosa*, Fér. Tab. des Moll., No. 214.

Under stones, decayed leaves, &c., in woods, not uncommon.

17. H. CRYSTALLINA, *Müll.*

Zonites crystallinus, Gray, Turt. Man. 176, t. 4, f. 42.

In moss and under dead leaves in woods, &c., common.

18. H. FULVA, *Müll.*

Helix trochiformis, Mont. Test. Brit. 427, t. 11, f. 9.

Helix fulva, Gray, Turt. Man. 148, t. 5, f. 47.

Var. *Helix Mortoni*, Jeff. in Linn. Trans. xvi. 332.

In moss and under stones in woods, frequent. The variety is found in a marshy spot in Heaton Dean.

19. H. LAMELLATA, *Jeff.*

Helix Scarburgensis, Ald. in Newc. N. H. Trans. i. 36.

Helix lamellata, Gray, Turt. Man. 150, t. 5, f. 48.

Under dead leaves in moist woods. Gibside woods, Walbottle Dean, and Tanfield.

20. H. ACULEATA, *Müll.*

Helix aculeata, Gray, Turt. Man. 149, t. 4, f. 33.

In moss and under stones in most of our woods, sparingly.

21. H. PULCHELLA, *Müll.*

Helix pulchella, Gray, Turt. Man. 141, t. 5, f. 49.

In moss and under stones, local,—generally on limestone. West Boldon, not uncommon; Marsden, and Castle Eden.—*J. A.* Cleadon, Ryhope, and Claxheugh (at the latter place abundant.)—*Mr. R. Howse.* We have found it very sparingly on St. Mary's Island, and on the sea banks, near Tynemouth; the only localities yet observed in this district, where it occurs off the limestone.

22. H. PYGMÆA, *Drap.*

Zonites pygmæus, Gray, Turt. Man. 167, t. 5, f. 46.

Under decayed leaves in woods, not uncommon.

23. H. RUPESTRIS, *Drap.*

Helix umbilicata, Mont. Test. Brit. 434, t. 13, f. 2.

Zonites umbilicatus, Gray, Turt. Man. 166, t. 5, f. 45.

In old quarries, and walls in exposed situations, local, and apparently confined to limestone. Very abundant in old limestone quarries at Marsden.

Mr. Gray has claimed priority for Montagu's names for this and some other species over those of Draparnaud, but we are informed by the Abbé Dupuy that the names of Draparnaud bear date from the publication of his "Tableau des Mollusques," in which this, along with other species, was described in 1801, two years prior to the appearance of Montagu's "Testacea Britannica." The "Tableau des Mollusques" being unknown, excepting by name, to British naturalists, they have been accustomed to consider Draparnaud's species to date from the publication of his "Histoire Naturelle des Mollusques, &c.," in 1805.

24. H. ROTUNDATA, *Müll.*

Zonites rotundatus, Gray, Turt. Man. 165, t. 5, f. 44.

Under stones by way sides, in woods, &c., common. We have found the beautiful greenish white variety in Benwell Lane and at Tanfield, but very rare.

25. H. CAPERATA, *Mont.*

Helix striata, Drap. Hist. Moll. 106, t. 6, f. 18-21 (not Müller).

Helix caperata, Gray, Turt. Man. 162, t. 4, f. 32.

On dry banks and in old quarries, common near the sea, especially on limestone; rarer inland. We once met with a considerable number of them after a shower, on the banks of the Tyne, near Benwell, studding the trunk of a tree as high up as we could reach.

26. H. VIRGATA, *Da Costa.*

Helix variabilis, Drap. Hist. Moll. 84, t. 5, f. 11, 12.

Helix virgata, Gray, Turt, Man. 160, t. 4, f. 31.

On plants in old quarries on road sides and sea banks, al-

ways on a limestone soil ; local, but generally abundant where it does occur ; plentiful near Sunderland, and at Bamborough.

27. H. ERICETORUM, *Linn.*

Helix ericetorum, Gray, Turt. Man. 163, t. 4, f. 37.

On banks and dry pastures near the sea, not uncommon. Most plentiful on limestone.

27. BULIMUS, *Bruguière.*

1. B. OBSCURUS, *Müll.*

Bulimus obscurus, Gray, Turt. Man. 183, t. 6, f. 63.

Under stones in old quarries and in woods, frequent, but more plentiful on a limestone soil.

28. ZUA, *Gray.*

1. Z. LUBRICA, *Müll.*

Bulimus lubricus, Drap. Hist. Moll. 75, t. 4, f. 24.

Zua lubrica, Gray, Turt. Man. 188, t. 6, f. 65.

In moss and under stones, common.

29. ACHATINA, *Lamarck.*

1. A. ACICULA, *Müll.*

Achatina acicula, Gray, Turt. Man. 191, t. 6, f. 71.

Rare. One specimen found alive in the gardens at Whitley House.—*J. H. F.* At the roots of an *Ornithogalum* in a garden at Darlington.—*Mr. W. Backhouse.* In the rejectments of the river Tyne at Bywell.—*Mr. Benjamin Johnson, Jun.* The shell occurs sometimes on the sands at Tynemouth, probably washed from the banks.

30. AZECA, *Fleming.*

1. A. TRIDENS, *Mont.*

Helix (Heliomanes) Goodalli, Fér. Tab. des Moll. No. 492, ter.

Azeca tridens, Gray, Turt. Man. 189, t. 5, f. 52.

On mossy banks in woods, rather local but generally plentiful where it does occur. Scotswood, Meldon, Stella, Tanfield, Castle Eden, and Middleton-one-Row. Tunstal Hope, Pallion.—*Mr. R. Howse*

31. CLAUSILIA, *Draparnaud.*

1. C. LAMINATA, *Mont.*

Clausilia bidens, Gray, Turt. Man. 212, t. 5, f. 53.

In woods, frequent. Mr. Hanley informs us that this is not the *Turbo bidens* of Linnæus, for which the name must be reserved.

2. C. DUBIA, *Drap.*

Clausilia dubia, Ald. in Newc. N. H. Trans. ii. 339 ; Gray, Turt. Man. 216, t. 12, f. 143.

On rocks at West Boldon and Castle Eden. Tunstall Hill and Ryhope Dean.—*Mr. R. Howse.*

3. C. RUGOSA, *Drap.*

Clausilia rugosa, Drap. Hist. Moll. 73, t. 4, f. 19, 20.

Clausilia nigricans, Gray, Turt. Man. 217, t. 5, f. 58.

Var. More slender, and nearly smooth.

Clausilia parvula, Turt. Man. 1st Ed. 74, f. 58 (not *C. parvula* of continental authors).

On stones, trees, &c., in woods and rocky places, not uncommon. The variety in Tanfield and Castle Eden Deans.

32. BALÆA, *Gray.*

1. B. PERVERSA, *Linn.*

Pupa fragilis, Drap. Hist. Moll. 68, t. 4, f. 4.

Balæa perversa, Gray, Turt. Man. 207, t. 6, f. 70.

In moss and on old walls, not common. Castle Eden.—*J. A.* Ryhope Dean.—*Mr. R. Howse.*

33. PUPA, *Draparnaud.*

1. P. MARGINATA, *Drap.*

Pupa marginata, Gray, Turt. Man. 196, t. 7, f. 79.

On the sea banks, frequent.

2. P. UMBILICATA, *Drap.*

Pupa umbilicata, Gray, Turt. Man. 193, t. 7, f. 78.

Under stones in old quarries, woods, &c., common.

3. P. ANGLICA, *Fér.*

Pupa Anglica, Gray, Turt. Man. 195, t. 7, f. 82.

In moss and under stones, rather rare. Walbottle Dean, Castle Eden, and sea banks at Cullercoats.—*J. A.* Near Ridley Hall.—*Mr. J. Thompson.* Sea banks near Ryhope.—*Mr. R. Howse.* "Near Twizell House."—*Brown's Illust. Rec. Conch.*

34. VERTIGO, *Müller.*

1. V. CYLINDRICA, *Fér.*

Pupa muscorum, Drap. Hist. Moll. 59, t. 3, f. 26, 27.

Vertigo cylindrica, Gray, Turt. Man. 200, t. 12, f. 140.

This rare species has lately been added to our local list by Mr. R. Howse, who has found several specimens at the roots of grass on a bank at Claxheugh, Bishop Wearmouth.

The animal is pale transparent gray, with two black lines along the back; in other respects agreeing with the character of the genus.

2. V. EDENTULA, *Drap.*

Vertigo edentula, Gray, Turt. Man. 199, t. 7, f. 80.

Among grass and under dead leaves in woods, frequent. We once met with this species in great abundance, by sweeping the long grass in Castle Eden Dean, with a hand net, after a shower of rain; in dry weather they lie under dead leaves and moss.

3. V. PYGMÆA, *Drap.*

Vertigo pygmæa, Gray, Turt. Man. 201, t. 7, f. 83.

Under stones and on old walls, generally in dry situations; not rare.

4. V. ALPESTRIS *(Fér. MS.)*, *Alder.*

Vertigo alpestris, Ald. in Newc. N. H. Trans. ii. 340; Gray, Turt. Man. 202, t. 12, f. 141.

On an old wall near Lipwood House.—*Mr. J. Thompson.*

5. V. PALUSTRIS *(Leach)*, *Jeff.*

Vertigo palustris, Gray, Turt. Man. 204, t. 7, f. 85.

In marshy places, rare. In a bog near Darlington.—*Mr. W. Backhouse.* Sea banks near Ryhope.—*Mr. R. Howse.* "Near Twizell House."—*Capt. Brown, Illust.*

6. V. SUBSTRIATA, *Jeff.*

Pupa sexdentata, Ald. in Newc. N. H. Trans. i. 34.

Vertigo substriata, Gray, Turt. Man. 202, t. 7, f. 84.

In wet moss in woods, rather rare. Heaton Dean, Tanfield, Ravensworth, Gibside, and Stella.

7. V. PUSILLA, *Müll.*

Vertigo pusilla, Gray, Turt. Man. 205, t. 7. f. 86.

In damp moss in woods, rather rare. Tanfield.—*A. H.* Near Crowhall Mill.—*Mr. J. Thompson.*

FAMILY. CYCLOSTOMIDÆ, *Gray.*

35. ACME, *Hartmann.*

1. A. LINEATA, *Drap.*

Auricula lineata, Drap. 57, t. 3, f. 20, 21.

Acme fusca, Gray, Turt. Man. 223, t. 6, f. 66.

In wet moss, Castle Eden Dean, rare.

The Abbé Dupuy informs us that this species has an extremely thin, transparent, subspiral operculum. This interesting discovery accounts for the very great resemblance of the animal to *Cyclostoma*, which we had previously remarked. The operculum must be very thin and inconspicuous, as it has hitherto been entirely overlooked.

This is probably the species of Walker, which Montagu calls *Turbo fuscus*, but as Walker does not use any specific name, that of *fuscus* can only date from Montagu, and consequently does not take precedence of Draparnaud's.

FAMILY. AURICULIDÆ, *Gray.*

36. CARYCHIUM, *Müller.*

1. C. MINIMUM, *Müll.*

Carychium minimum, Gray, Turt. Man. 221, t. 7, f. 77.

Among moss and decayed leaves in woods, &c., common.

37. CONOVULUS, *Lamarck.*

1. C. DENTICULATUS, *Mont.*

Conovulus denticulatus, Gray, Turt. Man. 225, t. 12, f. 144.

Var. *Voluta ringens*, Turt. Conch. Dict. 250.

Carychium personatum, Mich. Comp. Drap. 73, t. 15, f. 42, 43.

In crevices of the cliff a little above high-water mark at the south end of South Shields sands (the variety), rare.—*A. H.* Whitburn.—*Rev. G. C. Abbes.*

2. C. BIDENTATUS, *Mont.*

Conovulus bidentatus, Gray, Turt. Man. 227, t. 12, f. 145.

In sand at Tynemouth, rare.—*J. A.* We have not met with this species alive, but it will most likely be found to inhabit the crevices of rocks near high-water mark.

FAMILY. LIMNÆIDÆ, *Jeffreys.*

38. LIMNÆA, *Lamarck.*

1. L. STAGNALIS, *Linn.*

Limnæus stagnalis, Gray, Turt. Man. 236, t. 9, f. 104.

In ponds at Prestwick Car. It occurs in a pond in Mr. Sewell's grounds, Heaton Dean, but may possibly have been introduced.—*A. H.*

2. L. PALUSTRIS, *Linn.*

Limnæus pulustris, Gray, Turt. Man. 239, t. 9, f. 107.

In ditches and marshes, not uncommon.

In Prestwick Car, and in other marshes and still waters, they grow to a large size, but at the margins of rivers they are very much stunted in growth, and have the aspect of a distinct species. On the shores of the Tyne, where they are abundant, they are not larger than the common-sized *L. truncatula,* and might be taken for that species, but for the less ventricose whorls, and that the latter species is also found in the same situations in an equally dwarfed condition.

3. L. TRUNCATULA, *Müll.*

Limneus minutus, Drap. Hist. Moll. 53, t. 3, f. 5, 6, 7.

Limnæus truncatulus, Gray, Turt. Man. 240, t. 9, f. 108.

In ditches, common.

The variety γ of Draparnaud, found at the margins of rivers, has a very delicate and beautiful shell. The curious monstrosity mentioned by Dr. Turton, with the spire completely sunk into the body whorl, was found by us some years ago in Elswick Lane, and presented to Dr. Turton, who omitted to mention the locality.

4. L. GLABRA, *Müll.*

Limnæus glaber, Gray, Turt. Man. 242, t. 9, f. 106.

Limneus elongatus, Drap. Hist. Moll. 53, t. 3, f. 3, 4.

In ditches and ponds, not uncommon near Newcastle.

5. L. PEREGRA, *Müll.*

Limnæus pereger, Gray, Turt. Man. 233, t. 9, f. 101.

Var. *Limneus ovatus*, Drap. Hist. Moll. 50, t. 2, f. 30, 31.

In ponds, ditches, and slow streams, very common.

The numerous varieties of this common species, in form, size, and consistency, are very perplexing to the conchologist. We have got it with a rather strong shell, and the spire much produced, at Redheugh and on Holy Island ; and a curious variety in the opposite extreme has been sent us from Darlington, by Mr. Wm. Backhouse, with a very thin delicate shell, and scarcely any spire. The latter comes very near to the form got by Mr. Thompson in Lough Neagh, which is the *Gulnaria lacustris* of Leach.

6. L. AURICULARIA, *Linn.*

Limnæus auricularius, Gray, Turt. Man. 232, t. 9, f. 100.

At Prestwick Car (a small variety).—*A. H.* In ponds near Darlington.—*Mr. W. Backhouse*, from whom we have received very fine specimens.

39. PHYSA, *Draparnaud.*

1. P. FONTINALIS, *Linn.*

Physa fontinalis, Gray, Turt. Man. 251, t. 9, f. 110.

In ponds and ditches, not common. Preswick Car, Gosforth Lake, Mill Stream near Busy Cottage, Ryton, Marsden, and near Stockton.

2. P. HYPNORUM, *Linn.*

Aplexus hypnorum, Gray, Turt. Man. 255, t, 9, f. 113.

In ditches and ponds, frequent.

40. PLANORBIS, *Müller.*

1. P. CORNEUS, *Linn.*

Planorbis corneus, Gray, Turt. Man. 258, t. 8, f. 95.

In a pond in Mr. W. Backhouse's grounds at Darlington.

2. P. ALBUS, *Müll.*

Planorbis albus, Gray, Turt. Man. 259, t. 8, f. 97.

In ponds and slow streams, frequent.

3. P. LÆVIS, *Alder.*

Planorbis lævis, Ald. in Newc. Nat. Hist. Tran. ii. 337. Gray, Turt. Man. 261, t. 12, f. 148.

In ponds at Whitley Quarries, and on Holy Island.

4. P. NAUTILEUS, *Linn.*

Planorbis imbricatus, Gray, Turt. Man. 261, t. 8, f. 94.

In ponds, frequent.

5. P. CARINATUS, *Müll.*

Planorbis carinatus, Gray, Turt. Man. 262, t. 8, f. 89.

Rare. Near Stockton.—*Mr. W. Backhouse.*

6. P. UMBILICATUS, *Müll.*

Planorbis complanatus, Ald. in Newc. N. Hist. Trans. i. 31.

Planorbis marginatus, Gray, Turt. Man. 265, t. 8, f. 87, 88.

In ponds and ditches, not common. Prestwick Car, Ryton Haughs, and near Stockton.

7. P. SPIRORBIS, *Linn.*

Planorbis spirorbis, Gray, Turt. Man. 268, t. 8, f. 98.

In ditches, common.

8. P. NITIDUS, *Müll.*

Planorbis nitidus, Gray, Turt. Man. 268, t. 8, f. 93.

Rather rare. In ponds at Redheugh. Benwell engine pond. —*W. Sutton.* Near Middleton-one-Row and Stockton.—*J. A.*

9. P. CONTORTUS, *Linn.*

Planorbis contortus, Gray, Turt. Man. 270, t. 8, f. 96.

In ditches and ponds, not common. Prestwick Car, Gosforth Lake, Ryton Haughs, near Wooler, and near Stockton.

41. ANCYLUS, *Geoffroy.*

1. A. FLUVIATILIS, *Müll.*

Ancylus fluviatilis, Gray, Turt. Man. 249, t. 10, f. 125.

On stones in rivulets, common.

2. A. LACUSTRIS, *Müll.*

Velletia lacustris, Gray, Turt. Man. 250, t. 10, f. 126.

On aquatic plants in ponds and ditches, not common. Prest-

wick Car, Crag Lake, in ponds near Benwell, and at Middleton-one-Row.

Order. PECTINIBRANCHIATA, *Cuvier.*

Family. Paludinidæ, *Risso.*

42. BITHINIA, *Gray.*

1. B. tentaculata, *Linn.*

Paludina impura, Ald. in Newc. Nat. Hist. Trans. i. 29.

Bithinia tentaculata, Gray, Turt. Man. 93, t. 10, f. 120.

In ditches and ponds, not common. Prestwick Car, and mill stream in Jesmond Dean. "Abundant near Stockton."—*Mr. Hogg.*

Dead specimens of *Paludina achatina* are occasionally thrown up on our shores, but as the shell is frequently brought in ballast from the south of England, we attribute them to that source.

43. VALVATA, *Müller.*

1. V. piscinalis, *Müll.*

Valvata piscinalis, Gray, Turt. Man. 97, t. 10, f. 114.

In ponds and slow streams, rather rare. Mill streams in Jesmond Dean. "Common in streams about Stockton."—*Mr. Hogg.*

2. V. cristata, *Müll.*

Valvata cristata, Gray, Turt. Man. 98, t. 10, f. 115.

In ponds at Prestwick Car, rare.

Family ——.

44. STYLIFER, *Broderip.*

1. S. turtoni, *Brod.*

Phasianella stylifera, Turt. in Zool. Journ. ii. 367, t. 13, f. 11.

Stylifer globosus, Johns. in Berw. Club Proc. i. 275.

On the spines of *Echinus sphæra*, rare. Newbiggin and Cullercoats.—*J. A.* On an Echinus at Sunderland.—*Mr. R. Howse.*

We lately obtained a specimen of this species alive on the

spines of an Echinus at Cullercoats, but rather injured, and in a very sickly state. We placed it in a glass of fresh sea-water, hoping that it might recover, and display itself more distinctly; but in this we were disappointed, as it soon died, and being left unlooked at for a while had partially decayed. The animal was white, had a rather large foot, without operculum, and a rounded head with two cylindrical tentacles, and minute eyes at the (external or posterior) base. No portion of the shell was covered by the fleshy parts, but we are not prepared to say that, in a state of vigour, the animal has not the power of extending some part of the mantle or foot over it. In these particulars it does not differ much from the *Stylifer* described by Mr. A. Adams, from the coast of Borneo; but we cannot agree with Mr. Gray in placing this genus in the family *Naticidæ*, as the very large and peculiar disc in front of the head in *Natica* is entirely wanting here. The animal has much more the appearance of an *Eulima*.* The remains of the animal examined under a microscope did not show any denticulated tongue.

45. EULIMA, *Risso.*

1. E. DISTORTA, *Desh.*

Eulima distorta, Phil. Enum. Moll. Sic. ii. 135.

A beautiful fresh specimen of this interesting little shell was got at Whitburn by the Rev. G. C. Abbes.

The animal has two long subulate tentacles, with very large eyes at their posterior base; the foot is slender, much produced in front, and has a bilobed flap (the *mentum* of Lovén) on its upper surface. The body is yellow, beautifully variegated with carmine, which forms an irregular band on each side; the tentacles and foot, white. These are the prevailing colours of the genus, but the disposition of them is different in different species, and appears to be sufficiently permanent to be taken as a specific character. In *E. polita* the animal is white, excepting

* "*Eulima.* Animal proboscide longa præditum recondenda; lingua inermis?"—*Lovén, Index Moll. Scand.* Mr. Broderip states that Stylifer has a retractile proboscis, and the *Stylifer subulatus*, Brod., figured in Sowerby's Genera of Shells, greatly resembles an *Eulima*.

the tentacles and margin of the *mentum*, which are of a deep golden yellow. The liver, as seen through the shell, is green in *E. distorta*, and purplish in *E. polita*.

2. E. LINEATA, *Sow.*

Helix subulata, Mont. Test. Brit. Supp. 142 (small variety).

Rissoa subulata, Johns. in Berw. Club Proc. i. 272.

In shell-sand, rather rare, One specimen alive from the boats at Cullercoats.—*J. A.* One live and two dead specimens were dredged by Mr. R. Howse, off Whitburn.

The animal is white with two long subulate tentacles, approximating at the base, with the eyes immediately behind them. The foot extends a good deal before the head, and has a bilobed flap on the upper surface in front, which appears to be common to the genus, as we have observed it in all the British species. The head is seldom protruded beyond the shell, which, being transparent, the animal can easily see through.

Two species appear to be included under the name of *E. subulata*. The shell figured, and described by Donovan, which is much larger than this, and has several bands on the body whorl, is rare. It ought to retain the name of *E. subulata*, and is also the *Melania Cambessedesii* of Payraudeau. The smaller and much more common species has only two bands, placed close together in the centre of the body whorl, with occasionally a faint indication of another on the upper or lower margin. The shell is thinner and more transparent than in the larger species, the whorls less oblique, the lower one a little more ventricose, the aperture not so much contracted, and the columellar margin not quite so straight. This is probably the species called *E. lineata* by Mr. Sowerby, whose name we adopt, though we would gladly change it to *bilineata*, the better to express its distinguishing character. A species in the British Museum, from Madeira, comes very near to this, but has only one band.

46. SCALARIA, *Lamarck.*

1. S. COMMUNIS, *Lam.*

Turbo clathrus, Mont. Test. Brit. 296.

A single specimen was obtained from the fishing boats at Cullercoats.—*J. H. F.*

2. S. TURTONIS,* *Turt.*

Turbo Turtonis, Turt. Conch. Dict. 208, t. 27, f. 97.

One specimen found at Whitburn by the Rev. G. C. Abbes.

In order to form a correct judgment of the probability whether these two species were natives of our coast, or had come there by accident, we enquired of Mr. Bean if they had been found on the coast of Yorkshire. That gentleman informs us that he had never met with *Scalaria communis,* but that he had got several living specimens of *S. Turtonis* at Scarborough.

3. S. TREVELYANA, *Leach.*

Scalaria Trevelyana, Johns. in Berw. Club Proc. i. 263.

From deepest water (Coralline zone), rather rare.

This species was first published (but not described) by Mr. Winch in his list of the shells of Lindisfarne. *Annals of Phil., New Series,* 1822. It is the only *Scalaria* that has been found alive here; and though rare, has been occasionally got on most parts of the coast. The *Turbo clathrus* of Sir Cuthbert Sharp's list is most likely this shell.

47. CHEMNITZIA, *D'Orbigny.*

1. C. FULVOCINCTA, *Thomp.*

Turritella fulvocincta, Thomp. in Ann. Nat. Hist. v. 98.

Turbonilla rufa, " Phil." Lovén Ind. Moll. Scand. 18.

Two specimens have occurred in a worn state from the fishing boats.—*A. H.*

2. C. INDISTINCTA, *Mont ?*

Turbo indistinctus, Mont. Test. Brit. Supp. 129?

In shell-sand at Tynemouth, rather rare.

The *Turbo indistinctus* of Montagu has not been very satisfactorily made out. The present species is what we have been accustomed to consider agreed best with his description, but we

* We give this name as it is written by Dr. Turton. If it be considered desirable to change the termination, it ought to be rendered *Turtonæ*, and not *Turtoni*, as it was named by Dr. Turton after his daughter, Miss Turton, who first pointed out its specific differences.

have seen a specimen of a nearly allied species, kindly submitted to our inspection, with other minute shells, by Mr. Barlee, which has "much finer longitudinal ribs or striæ," and on this account agrees better with Montagu's description; our species having the ribs scarcely finer than in his *T. interstinctus*, with which he compares it. We leave the matter for further investigation. A shell in the British Museum named "*T. indistinctus*, Mont.," appears to be a worn specimen of *C. fulvocincta*.

3. C. UNICA, *Mont.*

Turbo unicus, Mont. Test. Brit. 299, t. 12, f. 2.

In shell sand, rare. Tynemouth, Whitley, and Cheswick.—*J. A.*

4. C. NITIDISSIMA, *Mont.*

Turbo nitidissimus, Mont. Test. Brit. 299, t. 12, f. 1.

We obtained a specimen of this exquisite little shell out of sand from Cheswick, sent us by our friend, Dr. Johnston.—Though always described as smooth, and even appearing so under a common magnifier, on closer inspection with the microscope, we find the vestiges of delicate spiral striæ. The species has never been obtained alive, but in that state we have no doubt that it will be found to be distinctly striated.

5. C. ACICULA, *Phil.*?

Shell turreted, slender, cylindrico-subulate, tapering to a rather obtuse point, of a semi-transparent white, with eight smooth whorls, rather flattish, but well defined by a deeply-impressed suture; the first whorl is placed at right angles to the rest; the last whorl is a good deal rounded at the base. Aperture about one-fifth the length of the shell, ovate, scarcely angulated by the projection of the body whorl; outer lip thin; pillar lip nearly straight, slightly arched outwards in the centre, and rounded below; behind it is a slight impression, but no umbilicus. Length scarcely $1\frac{3}{4}$ tenths; breadth about one-fourth the length.

Eulima acicula, Phil. Enum. Moll. Sic. ii. 135, t. 9, f. 6?

This species come very near to the *Eulimella gracilis*, Jeff. in Ann. Nat. Hist. xix. 311 (*Eulima affinis*, Phil ?), but it is rather smaller, flatter in the whorls, and the apex is not so much produced, in consequence of the first whorl being a little more sunk in

the second. It has been got in the south of England by Mr. Jeffreys, Professor E. Forbes, and Mr. M'Andrew, but some little difference of opinion appears to exist as to what species it ought to be referred to, or whether it is undescribed. We have, therefore, thought it neeessary to insert a description.

Two specimens of this interesting addition to our Fauna have been found at Whitburn by the Rev. G. C. Abbes, and one, much worn, was dredged off the same place by Mr. R. Howse.

6. C. MACANDREI, *Forbes.*

Eulima Macandrei, Forbes, in Ann. Nat. Hist. xiv. 412, t. 10, f. 2.

Two specimens have been got from the fishing boats at Whitburn, by the Rev. G. C. Abbes, and one by Mr. R. Howse, who has also dredged it alive in seventeen fathoms water at the same place.

This and the preceding species have been referred to *Eulima,* and Professor E. Forbes has more recently proposed for them the genus *Eulimella,* but we prefer considering them to belong to *Chemnitzia,* from which they only differ in the more polished surface of the shell. The apical nucleus, and the form of the aperture, indicate their place in this genus, independently of the animal, which, according to our observations, is essentially the same in each.

48. ODOSTOMIA, *Fleming.*

1. O. UNIDENTATA, *Mont.*

Turbo unidentatus, Mont. Test. Brit. 324.

Odostomia plicata, Flem. Brit. Anim. 310. Hanley in Thorpe's Brit. Mar. Conch. xxxv. f. 13.

In shell-sand, Tynemouth and Cullercoats, rather rare. At the roots of corallines from the boats at Cullercoats and Whitburn.—*A. H.*

Much misunderstanding exists with respect to this species and the *Turbo plicatus* of Montagu, which no two conchologists, excepting where one has copied the other, have described alike. The description of Montagu is sufficiently characteristic of our shell; but Dr. Fleming reverses the two, with the remark that

"the descriptions had, by some accident, been intermingled in the Testacea Britannica." Specimens sent by Dr. Turton, under the name of *T. unidentatus*, and now in the Newcastle Museum, we find to be *O. pallida*, though his description in the Conchological Dictionary is correct, being a copy of Montagu's. The species described by Mr. Hanley under this name, in the Zoological Proceedings, and in Thorpe's "British Marine Conchology," is, as he informs us, the *Auricula conoidea* of Philippi; his *Odostomia plicata* being our *O. unidentata*. The *O. unidentata* of Macgillivray, and the figures given by Capt. Brown of his *Jaminia unidentata*, do not appear to belong to this species.

A variety, if not a distinct species, is found on our coast, rather narrower and more rounded at the base, and with a larger umbilicus. As we have only met with two rather worn examples, we shall not attempt to decide upon it at present.

2. O. TURRITA, *Hanley*.

Odostomia turrita, Hanley in Zool. Proc., 1843. Thorpe's Brit. Mar. Conch. xxxvi. f. 10.

In shell-sand at Tynemouth, rare.—*J. A.*

3. O. ALBELLA, *Lovén*.

Turbonilla albella, Lovén Index Moll. Scand. 19. "T. turrito-conica, tenuis, anfr. 6 rotundatis, apertura fere $\frac{1}{2}$ t. t., ovata, vix effusa, plica parva, $\frac{3\cdot6}{1\cdot75}$m m."

In shell-sand, Tynemouth and Cullercoats, rare.—*J. A.*

Our shell agrees with the outline figure given by Professor Lovén in the "Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar," 1846, t. l. f. 11. It is broader and less turreted than the last. Both species have the tooth very small.

There is yet another shell, which we find at Tynemouth, nearly allied to these two, and to *O. plicata*, though apparently distinct. It is intermediate in form between *O. turrita* and *O. albella*, and has a stronger tooth. The species of this difficult genus are extremely perplexing, and require a careful study, to which their rarity, especially in a living state, presents a great obstacle.

4. O. PALLIDA, *Mont*.

Turbo pallidus, Mont. Test. Brit. 325, t. 21, f. 4.

In shell-sand at Tynemouth, rather rare.—*J. A.* At the roots of corallines brought in by the Cullercoats and Whitburn fishing boats.—*A. H*

The animal is of a pale yellowish colour.

5. O. NITIDA, *Alder*.

Odostomia nitida, Ald. in Ann. Nat. Hist. xiii. 326, t. 8, f. 5.

A single specimen was obtained in shell-sand from Tynemouth. It is perfectly distinct from any of the preceding.

6. O. INSCULPTA, *Mont.*

Turbo insculptus, Mont. Test. Brit. Supp. 129.

In shell-sand, Tynemouth and Cullercoats, rare.—*J. A.*

7. O. SPIRALIS, *Mont.*

Turbo spiralis, Mont. Test. Brit., 323, t. 12, f. 9.

In shell-sand, frequent. Occasionally found alive in pools among the rocks, and on corallines from the fishing boats.

This is the commonest species of *Odostomia* on our coast. The animal is white, and has the tentacles ear-shaped, or longitudinally folded, with the eyes at the internal base,—characters common to this as well as the preceding genus. The figure given in the Annals of Nat. Hist. xiii. t. 8, f. 13, is deficient in not displaying these characters. From the minuteness and transparency of the animal, the folds of the tentacles can only be seen in favourable lights.

8. O. INTERSTINCTA, *Mont.*

Turbo interstinctus, Mont. Test. Brit., 324, t. 12, f. 10.

In shell-sand, Tynemouth and Cullercoats, rather rare. On corallines from the fishing boats, Whitburn.—*Mr. R. Howse.*

In a fresh state the shell has the furrows between the ribs more deeply impressed at their termination towards the base of the body whorl, giving the appearance of a line of punctures, with sometimes a fainter one below it. This is not usually seen in sand specimens, and was consequently overlooked by Montagu. A variety is not unfrequently found in sand, which is more produced than the normal form, and may possibly turn out to be a distinct species, but the worn state of shells found in sand is unfavourable to the appreciation of minute characters.

Mr. Bean has distinguished it in his cabinet under the MS. name of *O. costata.*

9. O. OBLIQUA, *Alder.*

Odostomia? obliqua, Ald. in Ann. Nat. Hist. xiii. 327, t. 8, f. 12.

In shell-sand, Tynemouth, rare.—*J. A.*

[In the preceding family, to which we have not ventured to give a name, we have brought together, provisionally, those genera formerly considered to belong to the *Turbinidæ,* whose animals have a retractile proboscis. In the four following families, the animals have the head more or less proboscidiform, but there is no real proboscis.]

FAMILY. LITTORINIDÆ, *Gray.*

49. RISSOA, *Fréminville.*

1. R. COSTATA, *Adams.*

Turbo costatus, Mont. Test. Brit. 311, t. 10, f. 6.

Rissoa exigua, Mich. Desc. du Rissoa, 18, f. 29, 30.

In shell-sand, frequent. It has not been found alive here, but, like most of the small species found in sand, it probably inhabits the Laminarian zone beyond low-water mark.

2. R. STRIATA, *Adams.*

Turbo striatus, Mont. Test. Brit. 312.

Rissoa minutissima, Mich. Desc. du Rissoa, 20, t. 27, 28.

In pools among the rocks, frequent. This is one of the commonest of the shells thrown up in sand.

Pyramis candidus and *P. discors* of Brown are apparently only varieties of this very common and widely diffused species.

3. R. PARVA, *Da Costa.*

Turbo parvus, Mont. Test. Brit. 310.

In shell-sand, common; and alive beyond low-water mark. This species is found alive, though sparingly, on small sea-weeds among the rocks left bare by the tide. Its principal locality appears to be beyond low-water mark, and a small variety, with a thinner and more glossy shell, is not uncommon on corallines, from about twenty fathoms water.

When fresh, the shell is usually striated between the ribs on the lower portion, a character that has been overlooked in descriptions.

4. R. INCONSPICUA, *Alder.*

Rissoa inconspicua, Ald. in Ann. Nat. Hist. xiii. 323, t. 8, f. 6, 7.

On corallines from deepish water at Cullercoats, rather rare. Whitburn.—*Mr. R. Howse.*

5. R. PUNCTURA, *Mont.*

Turbo punctura, Mont. Test. Brit. 320, t. 12, f. 5.

On corallines from ten to twenty fathoms water, and in shell-sand; frequent.

6. R. SEMISTRIATA, *Mont.*

Turbo semistriatus, Mont. Test. Brit. Supp. 136.

Not uncommon in shell-sand, and occasionally found alive at the roots of corallines from the fishing boats.

7. R. INTERRUPTA, *Adams.*

Turbo interruptus, Mont. Test. Brit. 329, t. 20, f. 8.

On small sea-weeds in pools between tide-marks, abundant. The shell is common in sand.

8. R. CINGILLUS, *Mont.*

Turbo cingillus, Mont. Test. Brit. 328, t. 12, f. 7.

In shell-sand, rare.

9. R. UNIFASCIATA, *Mont.*

Turbo unifasciatus, Mont. Test. Brit. 327.

Rissoa fulva, Mich. Desc. du Rissoa 15, f. 17, 18.

Among sea-weeds, between tide-marks, at Whitley, rare.—*J. H. F.*

10. R. ULVÆ, *Penn.*

Turbo ulvæ, Mont. Test. Brit. 318.

In muddy estuaries, common. Holy Island, Budle Bay, Jarrow Slake, mouth of the Tees, &c.

11. R. VENTROSA, *Mont.*

Turbo ventrosus, Mont. Test. Brit. 317, t. 12, f. 13.

From sand and sea-weeds at Cullercoats, very rare.

The *Rissoa pulla,* Brown Conch. Illust. 13, t. 8, f. 25, "found on the sands at Holy Island," we have not been able to make out; from the figure it appears to be a distortion.

12. R. ? DIAPHANA, *Alder.*

Rissoa ? glabra, Ald. in Ann. Nat. Hist. xiii. 325, t. 8, f. 1-4.

On sea-weeds in pools among the rocks at Cullercoats, rare.—*J. A.*

When this species was published in the Annals of Natural History, it was referred to the *Rissoa glabra* of Brown's Illustrations, but, since that time, we have seen, through the favour of Mr. Barlee, an allied species from the south coast, that more nearly agrees with Captain Brown's figure, and we have, therefore, now given this the name of *diaphana.* It is not a true *Rissoa,* as we have already pointed out. The peculiar character of the animal requires that it should be raised to the rank of a genus.

50. LITTORINA, *Férussac.*

1. L. LITTOREA, *Linn.* (common periwinkle.)

Turbo littoreus, Mont. Test. Brit. 301.

In shallow pools and on stones within tide-marks, common, especially at and a little above half-tide level. A red variety is not uncommon on some parts of the coast.

2. L. RUDIS, *Maton.*

Turbo rudis, Mont. Test. Brit. 304.

On rocks and in pools near high-water mark, common. Beautifully banded varieties (*L. zonata,* Bean) occur at Newbiggin and Bamborough, as well as on some other parts of the coast.

3. L. RUDISSIMA, *Bean.*

Littorina rudissima, Bean in Thorpe's Brit. Mar. Conch. 266.

On rocks, bare of sea-weed, at and a little above high-water mark, abundant ; frequently found in crevices on the face of a cliff.

The species of this most difficult genus are so extremely variable, and approach each other so closely in the different varieties, that we are unwilling to speak very decidedly concerning them. The present, though very nearly resembling *L. rudis,* has the shell always thinner and smaller, and is distinguished from the young of that species by having the columella not so broad, nor so much produced and angulated at the base. It has also the spiral ridges generally very strong and conspicuous; but in this

respect it is extremely variable, and is sometimes quite smooth. It undergoes all the varieties of colour and banding found on the last species, besides which we have obtained, at Newbiggin, a black, and a tessellated variety, coming so near to *L. tenebrosa*, that we hesitate to call them distinct. The latter is generally found in mud, but we are inclined to think that the *Turbo tenebrosus*, and *T. jugosus* of Montagu are probably the two extreme limits that this very variable shell undergoes.

4. L. NEGLECTA, *Bean.*

Littorina saxatilis, "Bean," Johns. in Berw. C. Proc. i., 268.

Littorina neglecta, Bean, in Thorpe's Brit. Mar. Conch. 266.

On rocks near low-water mark, bare of sea-weed, but covered with *Balani* and muscles.

The habitat of this little species is different from that of the preceding, being always nearer low-water mark. This, with the difference of form and size, induces us to think it distinct.

We have taken from the body of this species, embryos, well developed and covered with a shell.—*A. H.*

It was first described by Dr. Johnston under the name of *saxatilis*, given it in manuscript by Mr. Bean. In consequence of this name having been used by Olivi for another species (probably the following), Mr. Bean subsequently changed it to *neglecta*, under which name he has described it among his new species in Thorpe's "Brit. Marine Conchology." Having omitted to mention that it had been described before, the species appears twice in that work :—viz., under the name of *L. saxatilis*, in the Addenda, and of *L. neglecta*, in the Supplement.

5. L. PETRÆA, *Mont.*

Helix petræa, Mont. Test. Brit. 403.

Turbo cærulescens, Lam. Anim. s. Vert. 2nd Ed. ix. 217.

On rocks at and above high-tide level, frequent, especially in crevices of the cliffs, where it nestles in company with *L. rudissima*, beyond the reach of the sea, excepting the dashing of the spray, and the high water of spring tides.

There can be little doubt that the *T. cærulescens* of Lamarck, of which we have specimens from two localities in the Mediterranean, is a variety of this species, though Philippi, in his description of the animal, does not mention the milk-white

band in front of the foot by which our species is distinguished, and his description altogether corresponds more nearly with that of *L. rudissima.*

Philippi enumerates seven synonyns of this species, without taking into account our English name, and the *Turbo neritoides* of Linnæus with which he is now inclined to indentify it.

The *Turbo ziczac* found by Lady Wilson near Sunderland, and stated to differ from the West Indian specimens in wanting the ziczac markings, is most likely only a variety of this species; at least a specimen so named in the cabinet at Wallington, which we had the opportunity of examining through the kindness of the late Sir John Trevelyan, Bart., certainly belongs to *L. petræa.*

6. L. RETUSA, *Lam.*

Nerita littoralis, Mont. Test. Brit. 467.

Littorina neritoides, Johns. in Berw. C. Proc. i. 269.

On sea-weeds, among the rocks near high-water mark, common.

The *Turbo retusus* and *T. neritoides* of Lamarck, are undoubtedly only different forms of the *Nerita littoralis* of Linnæus, as we have satisfied ourselves by an examination of the Lamarckian specimens. As *T. neritoides,* Linn., is not considered to belong to this species, we adopt the former name. *T. obtusatus,* Linn., we are assured by Mr. Hanley, is distinct.

The *Turbo aureus* of Brown (Conch. Illust. 2nd Ed. 17, t. 10, f. 23), found by Sir Walter C. Trevelyan, Bart., at Seaton, Northumberland (qu. Durham?), is referred in the appendix to the genus *Margarita,* and in the description of the plates is called a *Littorina.* We think it scarcely belongs to either of these genera.

51. LACUNA, *Turton.*

1. L. PALLIDULA, *Da Costa.*

Nerita pallidula, Mont. Test. Brit. 468.

On sea-weeds between tide-marks, not uncommon.

2. L. PUTEOLA, *Turt.*

Lacuna puteola, Turt. in Zool. Jour. iii. 191.

On sea-weeds and in shell-sand, rather rare.

The *Turbo puteolus* of Turton, in his "Conchological Dictionary," and the *Lacuna puteola* of the same author, in the "Zoological Journal," do not appear to be the same species. It is to the latter that we refer our shell.

3. L. VINCTA, *Mont.*

Turbo vinctus, Mont. Test. Brit. 307, t. 20, f. 3.

Var. 1. *Turbo quadrifasciatus*, Mont. Test. Brit. 328, t. 20, f. 7.

Var. 2. *Turbo canalis*, Mont. Test. Brit. 309, t. 12, f. 11.

On sea-weeds at and below low-water mark.

We cannot find any permanent character to distinguish these three supposed species of Montagu, and have therefore united them. The shell is extremely variable both in form and markings. The more elongated form, both banded and unbanded (*T. vinctus*, and *T. canalis*), is rare, but the short, banded variety (*T. quadrifasciatus*) is abundant on the fronds of *Laminaria digitata*, at and beyond low-water mark.

4. L. LABIOSA *Lovén ?*

Shell ovate-oblong, tapering, whitish, rather solid, with five whorls, very slightly convex, the last occupying rather more than half the shell, and rounded, or very slightly carinated below. Outer lip a little expanded, and thin at the edge, within which it is thickened by a callosity which extends round the base of the aperture uniting with the expanded columellar margin below. Umbilical groove small. Length $\frac{1}{4}$ inch, breadth $1\frac{1}{2}$ tenths.

Lacuna labiosa, Lovén Index Moll. Scand. 23 ?

One specimen of this new species has occurred in sand at Cullercoats. The shell is thicker and more slender than *L. vincta*, and is somewhat intermediate between it and *L. crassior*. It agrees very well with Professor Lovén's description, but is smaller, and, as we have not seen authentic specimens, we cannot speak with certainty of the species to which we have referred it. It appears, however. to be distinct from any of the other British *Lacunæ*.

5. L. CRASSIOR, *Mont.*

Turbo crassior, Mont. Test. Brit. 309, t. 20, f. 1.

In sand at Tynemouth, Cullercoats, and Whitburn, rare.—Alive in pools among the rocks at Cullercoats.—*A. H.*

52. SKENEA, *Fleming*.

1. S. PLANORBIS, *Fab.*

Helix depressa, Mont. Test. Brit. 439, t. 13, f. 5.

On small sea-weeds between tide-marks, common.

2. *S. divisa*, "*Adams?*" Flem.

Skenea divisa, Flem. Brit. Anim. 314.

On small sea-weeds between tide-marks, rare.—*J. A.*

FAMILY. TROCHIDÆ, *D'Orbigny*.

53. TROCHUS, *Linnæus*.

1. T. MAGUS, *Linn.*

Trochus magus, Mont. Test. Brit. 283.

Two or three specimens have been found on the beach at Seaton Carew by Miss Elizabeth Backhouse, and it is also in Sir Cuthbert Sharp's list of Hartlepool shells; but we have no record of its occurrence on any other part of the coast. It is a doubtful native of the north-eastern coast of Britain, and may have been introduced in ballast. Mr. Bean informs us that one dead shell has been found at Scarborough.

2. T. CINERARIUS, *Linn.*

Trochus cinerarius, Mont. Test. Brit. 284.

In pools among the rocks between tide-marks, common.

3. T. TUMIDUS, *Mont.*

Trochus tumidus, Mont. Test. Brit. 280, t. 10, f. 4.

From deepish water, frequent.

4. T. MILLEGRANUS, *Phil.*

Trochus Martini, Smith in Wern. Mem. viii. 51, t. 1, f. 26. Thorpe Brit. Mar. Conch. 164, f. 36.

Two or three specimens have been obtained from the deep-water fishing boats by Mr. W. King, and Mr. R. Howse. Mr. Embleton has also got it at Embleton.

5. T. ZIZYPHINUS, *Linn.*

Trochus zizyphinus, Mont. Test. Brit. 274.

Not uncommon in the Laminarian zone, especially in the north of Northumberland and south of Durham; less frequent in the intermediate district. Capt. Brown figures "a beautiful smooth variety dredged in deep water, off Sunderland, by Mr. Dixon of Bishop Wearmouth."

54. MARGARITA, *Leach.*

1. M. HELICINA, *Fab.*

Helix margarita, Mont. Test. Brit. Supp. 143.

On sea-weeds, and under stones, near low-water mark, frequent. Common on the northern parts of the coast.

FAMILY. NERITIDÆ, *D'Orbigny.*

Neritina fluviatilis, Linn., has been frequently met with on our coast, but as it is a common ballast shell, we attribute it to this source. Mr. Hogg states that he found it in the vicinity of Stockton, but he is not quite certain of its having been alive. It is found in the Ouse at York.

FAMILY. TURRITELLIDÆ.

55. TURRITELLA, *Lamarck.*

1. T. TEREBRA, *Linn.*

Turbo terebra, Mont. Test. Brit. 293.

On weedy ground in a few fathoms water, not uncommon, but seldom thrown upon the shore, excepting in a very young state, in which form it has been taken for a distinct species, and called *Turritella Lamarckii*. It is sometimes brought up pretty plentifully in the trawl-nets by the fishermen at Cullercoats.

The animal, from its broad proboscidiform head, and short lateral tentacles, bears a great resemblance to *Cerithium*. It is very shy and sluggish, and will lie for days together without shewing itself beyond the mouth of the shell, or attempting to crawl about.

FAMILY. CERITHIADÆ, *Fleming.*

Cerithium reticulatum, Da Costa, has been frequently found on

the shore near Sunderland and Whitburn, by the Rev. G. C. Abbes and Mr. Howse, but is supposed to have come from ballast. It has also been found by Miss E. Backhouse at Seaton.

Cerithium tuberculare, Mont. One specimen found on Whitley sands.—*J. H. F.* Perhaps from the same source as the last.

Cerithium fuscatum, Brown (*Turbo tuberculatus*, Penn. Brit. Zool. t. 82, f. 111), is stated by Mr. Pennant to be "from the coast of Northumberland." We think there must be some mistake in this, or it may be a foreign shell thrown by accident on the coast.

Cerithium cancellatum, Brown (Illust. Rec. Conch. 2d Ed. 9, t. 5, f. 64), is also stated to have been found "on the Northumberland coast at Holy Island." We do not know it, but are inclined to think that none of the *Cerithia* are indigenous to our coast.

The *Strombus costatus* of Sir C. Sharp's list is also a *Cerithium*, but it is now generally believed that this shell, common in foreign collections, has been introduced into the British Fauna by mistake. The shell found at Hartlepool was most likely *Cerithium reticulatum*.

56. APORRHAIS, (*Da Costa*) *Dillwyn*.

1. A. PES-PELECANI, *Linn.*

Strombus pes-pelecani, Mont. Test. Brit. 253.

From deepish water, not common.

FAMILY. MURICIDÆ, *Fleming*.

57. PLEUROTOMA, *Lamarck*.

1. P. TERES, *Forbes*.

Pleurotoma teres, Forbes in Ann. Nat. Hist. xiv. 412, t. 10, f. 3.

A specimen of this fine species was got at Whitburn by the Rev. G. C. Abbes, and Mr. R. Howse also dredged a young shell in seventeen fathoms off the same place.

2. P. COSTATA, *Penn*.

Murex costatus, Mont. Test. Brit. 255.

In shell-sand from different parts of the coast, not rare.

3. P. Boothii, *Smith.*

Fusus Boothii, Smith in Wern. Mem. viii. 50, t. 1, f, 1.

A single specimen has been obtained by the Rev. G. C. Abbes, at Whitburn.

4. P. linearis, *Mont.*

Murex linearis, Mont. Test. Brit. 261, t. 9, f. 4.

In shell-sand frequent, and occasionally on corallines from the fishing boats.

5. P. rufa, *Mont.*

Murex rufus, Mont. Test. Brit. 263.

In shell-sand, not rare. The Rev. G. C. Abbes and Mr. R. Howse have occasionally got it alive.

6. P. Trevelyana, *Turt.*

Pleurotoma Trevelyanum, Turt. in Mag. Nat. Hist. vii. 351.

From deepish water, rare. Cullercoats.—*J. A.* and *A. H.* Whitburn.—*Rev. G. C. Abbes.* One specimen was dredged in 17 fathoms off the latter place by Mr. R. Howse.

58. FUSUS, *Bruguière.*

1. F. turricula, *Mont.*

Murex turricula, Mont. Test. Brit. 262, t. 9, f. 1.

From the fishing boats, and in sand, not uncommon. Dredged by Mr. Howse, off Whitburn.

2. F. clathratus, *Linn.*

Murex Bamffius, Mont. Test. Brit. Supp. 117.

From deep water, not rare. Occasionally met with in the fishing boats at Cullercoats, as well as in the deep-water (or fivemen) boats. Mr. R. Howse dredged a few alive in 17 fathoms, off Whitburn. The shell (but generally of small size) is found in sand.

3. F. Barvicensis, *Johns.*

Fusus Barvicensis, Johns. in Edin. Phil. Journ. xiii. 225. Berw. Club Proc. l. 235.

Fusus asperrimus, Brown Illust. Rec. Conch. 8, t. 6, f. 2. ?

From deep water, rare. A fine specimen, nearly an inch long, was dredged in 60 fathoms water by Mr. R. Howse.

4. F. GRACILIS, *Da Costa.*

Murex corneus, Mont. Test. Brit. 258.

Fusus Islandicus, " Martini," King in Ann. Nat. Hist. xviii. 246.

In the coralline and deep-water zones, frequent. The variety from deep water is more ventricose than the common form, and has the epidermis thinner, smoother, and sometimes of a reddish colour. The shell figured by Captain Brown in his "Illustrations of the Recent Conchology of Great Britain," t. 6, f. 11, 12, found by Sir W. C. Trevelyan, Bart., at Seaton, appears to be an unusually short specimen of this variety.

Much confusion has arisen in the name of this species from the circumstance of Linnæus having included more than one shell in his *Murex corneus;* but as it is now agreed that the name should belong to the Mediterranean shell (*Fusus lignarius* of Lamarck), and being of opinion that our species is not the *Fusus Islandicus* of Chemnitz, to which it has lately been referred, we follow Professor Lovén in adopting Da Costa's name, the earliest undisputed appellation.

5. F. PROPINQUUS, *n. s.*

Shell fusiform, white, covered with a brown epidermis, striated spirally ; the striæ rather variable, but generally deep and distant on the upper whorls, more closely set on the lower, and often rising into ridges towards the base of the shell. Whorls 8, flattish, or very slightly convex, and a little tumid above at the suture ; they are broader in proportion to their height than in the last species, and consequently the spire is a little less produced. The nucleus, forming the apex of the shell, consists of two or three very small whorls, the first very little raised, and only to be seen from above ; the apex is rather slender, not mammillated, and generally stained of a ferruginous colour ; aperture oval, rather contracted, and ending in a short canal of moderate width, a little bent towards the left side ; outer lip thin ; pillar smooth, a little arched inwards in the centre, and produced in old shells into an obtuse rounded angle towards the entrance of the canal. Length 1½ in., breadth ½ in.

A variety from deep water is shorter in the spire, and more tumid in the body whorl, and has the canal very much twisted to the left side. The epidermis is thin, pale yellowish horn-coloured, and hispid. The apex is frequently incrusted with black. Animal white.

Found in the same situations with the last, but rare.

This species very much resembles *F. gracilis* but never grows to half the size, and may readily be distinguished from it by an examination of the apex. The nucleus of *F. propinquus* consists of two or three small compact whorls, while that of *F. gracilis* has only about a whorl and a half, which are large, and rather produced at the top, giving the apex a mammillated appearance. The embryos of these two species must, therefore, differ as much from each other as those of *F. Turtoni* and *F. Norvegicus*. The shell of *F. propinquus* is rather more tumid, and the whorls rather flatter in the middle, and more raised towards the suture than in *F. gracilis*: the striæ also are closer, the aperture more contracted towards the canal, and the latter a little more bent. The variety from deep water, dredged by Mr. Howse in sixty fathoms, has much the aspect of a distinct species, but a shell in that gentleman's possession seems to unite it with the normal form. Mr. Howse has figured the variety in the Ann. of Nat. Hist. vol. xix., t. 10, f. 5.

6. F. Islandicus, *Chemn.*

Fusus Berniciensis, King in Ann. Nat. Hist. xviii. 246.

Tritonium Islandicum, Lovén Ind. Moll. Scand. 11.

Var. *Buccinum Sabini*, Gray in Parry's 1st Voyage, 211 ?

Two specimens of this rare species have been obtained from the deep-water fishing boats by Mr. King.

Through the kindness of Mr. Gray we have had the opportunity of examining his specimens of *B. Sabini*, which appears to be a small variety of this, but the species of this group come so very near to each other, that we should not like to speak decidedly. Further investigation induces us to consider our species the true *Fusus Islandicus* of Chemnitz.

7. F. Turtoni, *Bean.*

Fusus Turtoni, Bean in Mag. Nat. Hist. vii. 493, f. 61. King in Ann. Nat. Hist. xviii. 245. Howse in Ann. Nat. Hist. xix. 162, t. 10, f. 6—10.

From deep water, rare. A few specimens of this fine species have been obtained from the fishermen by Mr. W. King and Mr. R. Howse. The ova capsules and young have also been got by the latter and are figured by him in the Annals of Natural History.

8. F. NORVEGICUS, *Chemn.*

Fusus Norvegicus, King in Ann. Nat. Hist. xviii. 244. Howse in Ann. Nat. Hist. xix. 162, t. 10, f. 1—3.

From deep water, rare. This, with the last, was first noticed to be an inhabitant of our coast by Mr. King, who has procured some beautiful specimens from the fishermen. Specimens have likewise been got by Mr. R. Howse, who dredged the ova capsules in sixty fathoms water, off the coast of Durham. *See* Ann. Nat. Hist., as above.

9. F. ANTIQUUS, *Linn.*

Murex antiquus, Mont. Test. Brit. 257.

Common in the coralline and deep-water regions on all parts of the coast. The deep-water variety is thinner and more ventricose than the other, and generally has the outer lip reflected. Our largest specimen from the coralline zone (got at Newbiggin), measures $7\frac{1}{4}$ inches in length, and $3\frac{1}{2}$ in breadth. Dr. Johnston, however, has a specimen, found by Miss I. Forster near Alemouth, which is 8 inches long, and $3\frac{1}{2}$ broad. (*Berw. Club. Proc. i.* 234.) The largest from deep water, as mentioned by Mr. King, is 7 inches long and nearly 5 broad. These specimens from our coast appear to be the largest that have been recorded.

10. F.? MINIMUS, *Mont.*

Buccinum minimum, Mont. Test. Brit. 247, t. 8, f. 2.

In shell-sand at Tynemouth and Cullercoats, rare.—*J. A.*

Fusus punctatus, Brown Illust. Rec. Conch. 7, t. 5, f. 56, 57, found by Capt. Brown at Holy Island, we have not been able to make out.

MUREX, *Linnæus.*

M. erinaceus, Linn. Two or three dead shells of this species have occurred, but we think they are probably from ballast.

FAMILY. BUCCINIDÆ, *Fleming.*

59. TRICHOTROPIS, *Broderip and Sowerby.*

1. T. BOREALIS, *Brod. and Sow.*

Trichotropis borealis, Brod. and Sow. in Zool. Jour. iv. 375.

Trichotropis umbilicatus, Thorpe Brit. Mar. Conch. 209, f. 54.

In deepish water, rare. We have got two or three shells of this species from haddocks, and some fine specimens have been obtained from the fishing boats at Whitburn by the Rev. G. C. Abbes. Mr. Howse also dredged it at that place in 17 fathoms.—Found alive in the fishing boats at Cullercoats.—*A. H.*

60. PURPURA, *Bruguière.*

1. P. LAPILLUS, *Linn.*

Buccinum lapillus, Mont. Test. Brit. 239.

On rocks between half-tide and high-water mark, common.

61. BUCCINUM, *Linnæus.*

1. B. UNDATUM, *Linn.* (common waved Whelk).

Buccinum undatum, Mont. Test. Brit. 237.

Common on all parts of the coast.

The varieties of this shell are numerous. Three principal ones occur on this coast, inhabiting different zones of depth, together with a few other forms of less importance.

Var. 1. Shell rather thin and slender, with the volutions rounded, and a strong hairy epidermis: inside white, occasionally yellowish or purple. From deep water, generally on a muddy bottom.

2. Shell thick and strong: whorls not much raised and strongly undulated: epidermis generally wanting: inside white or rarely yellowish. From the coralline zone on rocky ground.

3. Shell moderately strong, (or sometimes rather thin), short, and ovate: the whorls flattish, and the undulations obsolete: epidermis variable, sometimes wanting: inside deep purplish brown or yellow, rarely white. At low-water mark, generally among rocks.

Buccinum carinatum of Turton, an accidental variety of this species, has been found at Sunderland by the Rev. Mr. Law; as has also another accidental variety, or lusus, agreeing pretty nearly with the *Buccinum acuminatum* of Broderip. The specimens were presented by Mr. Law to the Newcastle Museum.

2. B. OVUM, *Turton.*

Buccinum ovum, Turt. in Zool. Journ. ii. 366, t. 13, f. 9.

A dead and rather worn specimen of this shell has been got from the fishing boats by Mr. W. King.

62. NASSA, *Lamarck.*

1. N. RETICULATA, *Linn.*

Buccinum reticulatum, Mont. Test. Brit. 240.

From the fishing boats, Cullercoats.—*J. H. F.* Whitburn.—*Rev. G. C. Abbes.* Sunderland.—*Mr. W. Backhouse.*

The fresh state of some of Mr. Abbes's specimens shew them to have been either living or recently dead shells; but as this species is common in ballast, it must be received with caution. It is in Sir C. Sharp's Hartlepool list.

2. N. INCRASSATA, *Müll.*

Buccinum macula, Mont. Test. Brit. 241, t. 8, f. 4.

On the rocky parts of the coast at and beyond low-water mark, common. The shell is abundant on most of our sandy shores.

FAMILY. CYPRÆIDÆ, *Gray.*

63. CYPRÆA, *Linnæus.*

1. C. EUROPÆA, *Mont.*

Cyprœa Europœa, Mont. Test. Brit. Supp. 88.

The shell of this species is thrown up very plentifully on our sands, and it is occasionally found alive, though rarely, among the rocks at spring tides. Its habitat appears to be a little

below low-water mark. The plain variety only is found on this coast, which is the *C. arctica* of Montagu in the "Testacea Britannica." He afterwards united it with *C. Europæa* in the Supplement.

Family. Naticidæ, *Gray.*

64. NATICA, *Adanson.*

1. N. catena, *Da Costa.*

Nerita glaucina, Mont. Test. Brit. 469.

Natica monilifera, Lam. Anim. s. Vert. 2nd Ed. viii. 638.

On sandy shores, not common. Embleton Bay, rare.—*Mr. R. Embleton.* Seaton Carew.—*Mr. W. Backhouse.* Whitburn.—*Rev. G. C. Abbes.*

2. N. Alderi, *Forbes.*

Nerita glaucina, var. B., Turt. Conch. Dict. 125.

Natica Alderi, Forbes Mal. Monen. 31, t. 2, f. 6, 7. Thorpe Brit. Mar. Conch. 148, f. 82.

From the coralline zone, common. Frequently met with in the stomachs of haddocks.

We have seldom, if ever, observed this species cast on shore. It seems to live in deepish water on our coast, though on the western coast of Scotland near Ardrossan it inhabits the sand near low water mark, and is thrown up plentifully on the beach along with *N. catena.* We have observed that several other mollusks inhabit shallower water on the western coast of Great Britain than they do with us.

The Rev. G. C. Abbes and Mr. R. Howse have met with the plain variety at Whitburn.

3. N. intricata, *Don.*

Nerita intricata, Don. Brit. Shells, t. 169.

From the fishing boats, Cullercoats.—*J. H. F.*

4. N. Montagui, *Forbes.*

Nerita rufa, Mont. Test. Brit. Supp. 150, t. 30, f. 3? (excl. var.)

Natica Montagui, Forbes Mal. Monen. 32, t. 2, f. 3-5.

From the coralline and deep-water zones, rather rare, occasionally met with in the fishing boats at Cullercoats and Whitburn. Mr. Howse dredged several living specimens in seventeen

fathoms at Whitburn, and has also got it in sixty fathoms by deep-water dredging off the Durham coast.

5. N. GRŒNLANDICA, *Beck.*

Natica Grœnlandica, "Beck," Möller Index Moll. Grœnl. 7.

Natica livida, Bean in Thorpe's Brit. Mar. Conch. 265, f. 55.

In deep water, rare. Obtained by Mr. W. King from the fishing boats, and afterwards dredged alive by him in fifty fathoms. Mr. R. Howse has also got a few specimens from the boats and by deep-water dredging.

6. N. HELICOIDES, *Johns.*

Natica helicoides, Johns. in Berw. Club Proc. i. 69.

Very rare. Two specimens have been met with by Mr. R. Howse from the fishing boats at Sunderland.

FAMILY. VELUTINIDÆ, *Gray.*

65. VELUTINA, *Fleming.*

1. V. LÆVIGATA, *Penn.*

Helix lævigata, Mont. Test. Brit. 382.

On large shells and stones from the coralline zone, frequent.

2. V. PLICATILIS, *Müll.*

Bulla flexilis, Mont. Test. Brit. Supp. 168. Laskey in Wern. Mem. i. 396, t. 8, f. 6.

In shallow water, rare. We have got two individuals from the stomachs of flat-fish, and one was obtained some years ago by Mr. Wm. Backhouse among the rocks at the "Bear's Back," Cullercoats. The Rev. G. C. Abbes and Mr. R. Howse have since got several specimens, at Whitburn.

3. V.? OTIS, *Turt.*

Helix otis, Turt. Conch. Dict. 70.

A number of specimens of this interesting little species were got several years ago on the rocks between tide marks on the Marsden coast, particularly on the sides of the great rock. Since that time we have frequently looked for it in vain. The animal is transparent white, and rather large for the shell, within which it can scarcely be withdrawn: the tentacles are very short and triangular; the eyes are immersed in the tentacles apparently towards the inner base, but, from the transparency of

the latter, are seen on either side. The muzzle is very large and broadly bilobed. This animal evidently is very different from that of *Velutina lævigata*, but the drawings we made are too imperfect to establish a generic character upon.*

66. LAMELLARIA, *Montagu.*

1. L. PERSPICUA, *Linn.*

Bulla haliotoidea, Mont. Test. Brit. 211, t. 7, f. 6.

In shallow water, rare. Several specimens have been got from the fishing boats at Whitburn, by the Rev. G. C. Abbes. The shell has also been found cast on shore at Whitley.—*J. H. F.*

2. L. TENTACULATA, *Mont.*

Lamellaria tentaculata, Mont. in Linn. Trans. xi. 186, t. 12, f. 5, 6.

Coriocella tentaculata, Johns. in Berw. Club Proc. i. 275.

Among rocks at low-water mark, Cullercoats. Rather rare.

ORDER. SCUTIBRANCHIATA, *Cuvier.*

FAMILY. FISSURELLIDÆ, *D'Orbigny.*

67. EMARGINULA, *Lamarck.*

1. E. FISSURA, *Linn.*

Patella fissura, Mont. Test. Brit. 490.

From the fishing boats, rare. The shell is occasionally found in sand.

68. PUNCTURELLA, *Lowe.*

1. P. NOACHINA, *Linn.*

Fissurella noachina, Thorpe Brit. Mar. Conch. 134, f. 78.

We got a living example of this species adhering to a *Fusus antiquus* brought in by the fishermen at Cullercoats in 1842. Mr. W. King subsequently dredged an individual "in 50 fathoms water 60 miles to the east of the north coast of Durham." One or two dead and worn shells have been got from the deep-water fishing boats.

* While these sheets are going through the press, we have received from Mr. Gray, of the British Museum, his valuable "List of the Genera of Recent Mollusca," in which we observe that the genus *Otina* is proposed for this species.

The animal scarcely differs from that of *Emarginula*, having similar short appendages on the sides between the foot and cloak. In our individual there were five on each side.

Captain Brown mentions the Northumberland coast as a habitat of *Fissurella Græca*, but we think this must be a mistake.

Family. Calyptræidæ, *Gray*.

69. CAPULUS, *Montfort*.

1. C. hungaricus, *Linn*.

Patella ungarica, Mont. Test. Brit. 486.

From deepish water, rather rare, and usually of small size.

Order. CYCLOBRANCHIATA, *Cuvier*.

Family. Patellidæ, *D'Orbigny*.

70. PATELLA, *Linnæus*.

1. P. vulgata, *Linn*. (common limpet).

Patella vulgata, Mont. Test. Brit. 475.

On the rocks between tide-marks, common.

In the neighbourhood of our fishing villages the limpet has become much less common than formerly, in consequence of the great numbers that are gathered for bait. Large-sized limpets are rarely now to be met with on the rocks at Tynemouth and Cullercoats. A very conical variety, with coarse ribs, is not uncommon at Holy Island, and other parts of the north of Northumberland; this is the "var. 4, conica" of Brown's Illust. t. 20, f. 5.

2. P. athletica, *Bean*.

Patella athletica, Bean in Thorpe's Mar. Conch. 264, f. 101.

Patella vulgata, var. 3, *albumina*, Brown Illust. Rec. Conch. 63, t. 20, f. 12-14.

On rocks close to low-water mark, rather rare.

"I first noticed this very beautiful variety on rocks at Cullercoats, near Tynemouth, Northumberland, in 1810.."—*Captain Brown*.

In some parts of England we have seen this limpet range much higher up between tide-marks than it does on our coast, where it is scarcely to be gathered but at spring tides. On the

southern coast, too, there is frequently an intermediate form between this and the last, which looks very like a hybrid, but with us they keep constantly distinct. The fishermen recognise the difference between them, and call this the *horse-limpet*, rejecting it as too tough for bait.

3. P. PELLUCIDA, *Linn.* (Blue-rayed Limpet.)

Patella pellucida, Mont. Test. Brit. 477.

On the fronds of *Laminaria digitata* at and beyond low-water mark, common.

4. P. LÆVIS, *Penn.*

Patella cærulea, Mont. Test. Brit. Supp. 152.

At the roots, and occasionally on the stems, of *Laminaria digitata*, common.

Great difference of opinion has always existed as to whether or not this is a distinct species from the last. As far as our observations go, we are inclined to think it is. Professor Lovén remarks that this is not found along with *P. pellucida* on the Scandinavian shores.

71. LOTTIA, *Gray.*

1. L. VIRGINEA, *Müll.*

Patella parva, Mont. Test. Brit. 480.

Under stones and on rocks, near low-water mark, frequent.

We are aware that we do some violence to an artificial arrangement by placing this species here, but it is so evidently one of the *Patellidæ*, that we should do much greater violence to the natural affinities by removing it to another order. We cannot, however, agree with Professor Lovén in considering it merely a section of the genus *Patella*.

FAMILY. CHITONIDÆ, *D'Orbigny.*

72. CHITON, *Linnæus.*

1. C. FASCICULARIS, *Linn.*

Chiton fascicularis, Mont. Test. Brit. 5.

Under stones near low-water mark, not uncommon.

2. C. HANLEYI, *Bean.*

Chiton Hanleyi, Bean in Thorpe's Brit. Mar. Conch. 263, f. 57.

Rare. Dredged in about 20 fathoms water at Cullercoats in 1837.—*J. A.* A specimen has also been got from the fishing boats at the same place.—*J. H. F.*

Mr. Bean's description was taken from young shells, and is in some respects imperfect. Our specimen is about half an inch long, and nearly black ; the granules are disposed in longitudinal beaded lines, which are small, and rather faint on the dorsal ridge, and become coarse and less regular at the sides. When alive, the spines of the marginal band are slightly fasciculated, a few of them standing erect near the junctions of the valves ; but these fall after the animal dies, and the margin then appears uniformly hispid.

3. C. MARGINATUS, *Penn.*

Chiton marginatus, Mont. Test. Brit. 1.

Common under stones between tide-marks, and very variable in colour and markings.

4. C. CINEREUS, *Linn.*

Chiton cinereus, Mont. Test. Brit. 3.

On stones and old shells from deepish water, frequent. Occasionally found on stones at low-water mark.—*A. H.*

The variety found on our coast is rather small, grey, and usually freckled ; but is seldom covered with the black incrustation so common on some of the large varieties of the Scottish coast.

5. C. RUBER, *Linn.*

Chiton ruber, Flem. Brit. Anim. 289.

Under stones near low-water mark, and at the roots of *Laminaria digitata,* frequent.

6. C. LÆVIS, "*Penn.*" *Mont.*

Chiton lævis, Mont. Test. Brit. 2.

Under stones at low-water mark, rare.

7. C. LÆVIGATUS, *Flem.*

Chiton lævigatus, Flem. Brit. Anim. 290.

Among the rocks below Dunstanborough Castle, very rare.—*Mr. R. Embleton.* A single living specimen was also got at Cullercoats.—*A. H.* The disunited valves are sometimes thrown on Whitley sands.—*J. H. F.*

ORDER. CIRRHOBRANCHIATA, *Blainville.*

FAMILY. DENTALIADÆ, *Gray.*

73. DENTALIUM, *Linn.*

1. D. ENTALIS, *Linn.*

Dentalium entalis, Mont. Test. Brit. 494.

From deep water, not common.

Capt. Brown states that he met with a specimen of *Dentalium octangulatum* at Holy Island.—*Illust. Rec. Conch.* 117.

74. CÆCUM, *Fleming.*

1. C. TRACHEA, *Mont.*

Dentalium trachea, Mont. Test. Brit. 497, t. 14, f. 10.

Rare. One specimen found in sand at Tynemouth.—*J. A.*

2. C. GLABRUM, *Mont.*

Dentalium glabrum, Mont. Test. Brit. 497.

In sand from Cheswick and Fern Islands, rare.—*J. A.*

Though aware of Mr. Clarke's interesting unpublished researches on the animal of this genus, we are unwilling to remove it from the vicinity of *Dentalium,* until its true place shall be more accurately made out. No genus has had more various places assigned to it; and, having no personal knowledge of the subject, we do not wish to be the first to give it another.

** ACEPHALA.

CLASS. CONCHIFERA, *Lamarck.*

ORDER. PALLIOBRANCHIATA, *Blainville.*

FAMILY. TEREBRATULIDÆ, *Gray.*

75. TEREBRATULA, *Müller.*

1. T. PSITTACEA, *Gmelin.*

Terebratula psittacea, Turt. Brit. Biv. 236.

Hypothyris psittacea, King in Ann. Nat. Hist. xviii. 238.

One perfect and a broken specimen of this species have been

obtained from the deep-water fishing boats by Mr. King. They were found attached to the byssus of a *Modiola valgaris* brought up from a depth of forty fathoms, twenty-five miles from the coast of Northumberland. As this is the third time that this species, a well-known inhabitant of the north seas, has been found between the Tyne and the Frith of Forth, there can be little doubt that it inhabits the deep water of our coast.

Order. LAMELLIBRANCHIATA, *Blainville.*

Sub-Order. Monomyaria, *Lamarck.*

Family. Ostreidæ, *Guilding.*

76. ANOMIA, *Linnæus.*

1. A. ephippium, *Linn.*

Anomia ephippium, Mont. Test. Brit. 155.

On most parts of the coast, but not common.

The *Anomia electrica* of Brown, found at Cullercoats, is most likely a variety of this species.

2. A. squamula, *Linn.*

Anomia squamula, Mont. Test. Brit. 156.

On oysters, pectens, and other shells, frequent.

3. A. patelliformis, *Linn.*

Anomia undulata, Mont. Test. Brit. 157, t. 4, f. 6.

On the under sides of rocks and stones between tide-marks, frequent.

The *Ostrea striata* of British authors, first noticed by Lister as common upon the sands at the mouth of the Tees, we take to be this species, the upper valve of which is frequently thrown up on our shores, and has the inside green, with a white muscular impression as described by Lister. The under valve (which would have shewn it to be an *Anomia*) is very thin and fragile, and, in such cases, always absent.

4. A. aculeata, *Mull.*

Anomia aculeata, Mont. Test. Brit. 157, t. 4, f. 5.

On sea weeds between tide-marks, frequent.

5. A. cylindrica, *Gmel.*

Anomia cymbiformis, Mont. Test. Brit. Supp. 64.

Anomia cylindrica, Turt. Brit. Biv. 232.

On the stems of sea-weeds, not uncommon.

77. OSTREA, *Linnæus.*

1. O. EDULIS, *Linn* (common oyster).

Ostrea edulis, Mont. Test. Brit. 151.

Not common. Frequently found on the shells of crabs. The only oyster-bed on the coast is at Holy Island.

The following remarks on this oyster-bed are from our friend Dr. Johnston's "Catalogue of the Bivalved Shells of Berwickshire and North Durham" :—

"In the inventory of the Priory of Holy Island for 1381-2, we find expended for 'a sloop *(navicula)*, bought of a certain Scotchman *(de quodam Skoto)*, with the oysters and other goods contained in it, 100*s*.' From the nature of the purchases, Mr. Raine thinks it may be inferred 'that there were at that period no oysters to be procured at home'; and suggests that the oysters of this very cargo were the founders of the present valuable colony.—(*Hist. N. Durham*, p. 110.) The conjecture is, I believe, unfounded; for not many years since, the oysters being exposed by the unusually great recess of a spring tide during the night to a severe frost, were all killed, and the bed had to be renewed from Preston Pans; and if my information is correct, a similar accident has occurred more than once during the last half century."—*Johns. in Berw. Club. Proc.* i. 80.

FAMILY. PECTINIDÆ, *Broderip.*

78. PECTEN, *Müller.*

1. P. MAXIMUS, *Linn.*

Pecten maximus, Mont. Test. Brit. 143.

In deepish water, rather rare. Cullercoats. Hartlepool. Frequent in the north of Northumberland.—*Mr. R. Embleton.*

2. P. OPERCULARIS, *Linn.*

Pecten opercularis, Mont. Test. Brit. 145.

In shallowish water, frequent.

The depth at which this species lives appear to vary considerably, as we have a white variety presented to us by Mr. Richard

Howse, which was got in fifty fathoms off the coast of Northumberland; and Mr. King got the dead valves in abundance in fifty fathoms off the edge of the Dogger Bank. We are not aware of any large scallop beds near the coast.

3. P. STRIATUS, *Müll.*

Pecten Landsburgi, Smith in Wern. Mem. viii. 58.

Dredged in thirty fathoms water off the Northumberland coast. —*Mr. W. King.* Also obtained in fifty fathoms by Mr. R. Howse. Whitburn.—*Rev. G. C. Abbes.* Newton.—*Mr. R. Embleton.* We think Dr. Johnston's *Pecten spinosus* may be this species. Mr. King's specimen, which is nearly an inch long, is the largest we have seen.

4. P. TIGRINUS, *Müll.*

Pecten obsoletus, Mont. Test. Brit. 149.

In shallowish water, frequent. A small variety is the most common, and is often found in the stomachs of flat-fish. The larger kind is generally from deeper water. The varieties of colour and markings are almost endless.

5. P. SIMILIS, *Laskey.*

Pecten similis, Laskey in Wern. Mem. i. 387, t. 8, f. 8.

Pecten tumidus, Turt. Brit. Biv. 212, t. 17, f. 3.

Rare. Taken from the roots of corallines brought in by the Whitburn fishermen.—*A. H.* Several dead valves were dredged by Mr. R. Howse off Whitburn, and we have once or twice found it in the stomachs of flat-fish.

6. P. VARIUS, *Linn.*

Pecten varius, Mont. Test. Brit. 146.

On most parts of the coast, but not common.

7. P. DISTORTUS, *Da Costa.*

Pecten destortus, Mont. Test. Brit. 148.

Hinnites sinuosus, Desh. in Lam. Anim. s. Vert. 2nd. Ed. vii. 149.

In the cavities of stones and among the roots of sea-weeds at various depths, frequent.

In its adult state it is often found attached by the under valve, in the manner of an oyster, and when confined in cavities, becomes very irregular; under favourable circumstances, however, and generally in its young state, it is perfectly regular and un-

attached excepting by a bissus. In this state we take it to be the *Pecten spinosus* of Capt. Brown, which he says he "first found on the Herd Sands at South Shields.

A specimen of *Pecten septemradiatus*, Müll.,* was presented to the Newcastle Museum by the Rev. Josh. Law, who thinks he obtained it from the fishermen at Sunderland, and that it was probably got off our coast. It is similar to Swedish specimens sent to us by Professor Lovén, and we have also seen a similar variety from the west of Scotland. There is therefore no improbability of its occurring here, but the present instance is scarcely sufficient to warrant its admission.

79. LIMA, *Bruguière*.

1. L. LOSCOMBI, *Sow.*

Pecten fragilis, Mont. Test. Brit. Supp. 62.

From deep water, rare. Holy Island and Cullercoats.—*J. A.* Whitburn.—*Rev. G. C. Abbes.*

2. L. SUBAURICULATA, *Mont.*

Pecten subauriculata, Mont. Test. Brit. Supp. 63, t. 29, f. 2?

Var.? *Lima sulculus*, Lovén Index Moll. Scand. 32.

A single valve was dredged by Mr. R. Howse off Whitburn, agreeing with a specimen of *L. sulculus* we have received from Professor Lovén. It is rather more slender, and has the ribs stronger than the usual form of *L. subauriculata*, Mont., but we are not sufficiently acquainted with the latter to decide concerning their specific distinction.

SUB-ORDER. DIMYARIA, *Lamarck.*

FAMILY. ARCIDÆ, *Gray.*

80. PECTUNCULUS, *Lamarck.*

1. P. PILOSUS, *Linn.*

Arca pilosa, Mont. Test. Brit. 136.

Embleton Bay, rare.—*Mr. R. Embleton.*

Mr. Embleton informs us that he got this from a number of *Artemis exoleta* and *Tellina crassa* brought from deep water by

* *Pecten nebulosus*, Brown, mentioned in our prefatory remarks as not unommon in the west of Scotland, may be a variety of this.

the boats engaged in the brat fishing. It is in Mr. R. Maclaurin's list of Bivalved Shells, found in Coldingham Bay, where it is stated that dead shells are not rare. We are not aware of its having been got on other parts of the coast.

81. ARCA, *Linnæus.*

1. A. CARDISSA, *Lam.*

Arca fusca, Mont. Test. Brit. Supp. 51.

In cavities of stones and old shells from deep water. Frequent in the north of Northumberland.—*Mr. R. Embleton.* Cullercoats.—*J. H. F.* St. Mary's Island.—*A. H.*

82. LEDA, *Schumacher.*

1. L. CAUDATA, *Don.*

Arca minuta, Mont. Test. Brit. 140.

From deepish water, frequent. Several living individuals were dredged in seventeen fathoms off Whitburn, by Mr. R. Howse.

The *Arca minuta* of Fabricius appears to be distinct from this.

Capt. Brown mentions having found a single valve of "*Nucula rostrata*" at Holy Island. May it not have been a large variety of this, which has sometimes the posterior part much incurved in old shells?

83. NUCULA, *Lamarck.*

1. N. NUCLEUS, *Linn.*

Arca nucleus, Mont. Test. Brit. 141.

Not uncommon. Mr. R. Howse dredged it in great abundance off Whitburn, along with the last.

2. N. NITIDA, *Sow.*

Nucula nitida, Sow. Conch. Illust. f. 20; Thorpe Brit. Mar. Conch. 248, f. 31.

In deepish water, and thrown up in sand, rather rare. Cullercoats. A rayed variety has been got at Whitburn by the Rev. G. C. Abbes.

3. N. TENUIS, *Mont.*

Arca tenuis, Mont. Test. Brit. Supp. 56, t. 29, f. 1.

Frequent in the coralline zone. Not uncommon in the stomachs of haddocks.

Family. Mytilidæ, *Fleming.*

84. MYTILUS, *Linnæus.*

1. M. edulis, *Linn.* (common Mussel.)

Mytilus edulis, Mont. Test. Brit. 159.

Var. 1. Thin, with coloured rays.

Mytilus pellucidus, Mont. Test. Brit. 160.

Var. 2. Thick and incurved.

Mytilus incurvatus, Mont. Test. Brit. 160.

Var. 3. Thick, flattened and subangular.

Mytilus subsaxatilis, Williamson in Mag. Nat. Hist.* vii. 354.

Var. 4. Small, and sometimes rather hispid.

Within tide-marks, or a little beyond, on a hard or stony bottom, and among rocks, very common.

No species undergoes a greater degree of variation from locality than the common Mussel. For its full development a mixture of fresh with salt water appears to be necessary; it is, therefore, met with in the greatest perfection at the mouths of rivers. In such localities the typical form of the species is to be found, and, when left undisturbed, it usually forms large beds. On the more rocky and exposed parts of the coast it assumes a stunted appearance, running into the varieties of form mentioned above; always small on the exposed surface of rocks, but attaining a larger size in hollows and crevices, where it generally takes the form called *Mytilus incurvatus.* A more flattened variety is found at the roots of tangle.

Mussels are much used for bait in this neighbourhood. The Cullercoats fishermen make an annual excursion to the mouth of the Tees for the purpose of collecting them, the beds at the

* "I first noticed this variety in 1810, in company with my late valued friend Mr. Hancock, of Newcastle, at the mouth of the Tyne, below Tynemouth, adhering to stones left dry by the tide, in small groups."—*Captain Brown.* (Illust. Rec. Conch. 77.)

Lowlights being found insufficient for their supply. The Mussels got on these occasions are kept alive in pools among the rocks, built round with loose stones.

85. MODIOLA, *Lamarck.*

* Smooth.

1. M. VULGARIS, *Flem.*

Mytilus modiolus, Mont. Test. Brit. 163.

Var. *Mytilus barbatus,* Mont. Test. Brit. 161.

From deep water, common. The variety is frequently found on rocky ground, near low-water mark.

It is remarkable that the large form of *M. vulgaris* is always found with us in deep water, never approaching the shore, and even rare in a depth of 20 or 30 fathoms, while on the western coasts it is found frequently in shallow water, and even close to low-water mark.

** Ribbed at each end (*Lanistina*, Gray).

2. M. NIGRA, *Gray.*

Mytilus descrepans, large var., Mont. Test. Brit. Supp. 65, t. 26, f. 4.

Modiola nigra, Thorpe Brit. Mar. Conch. 249, f. 58.

From deep water, rare. Cullercoats.—*J. A.* Whitburn.—*Rev. G. C. Abbes.* Mr. Howse dredged it alive in 17 fathoms. Mr. King has also got it from the fishing boats.

The animal of this species is transparent white, with the margin of the cloak and siphon speckled with brown and opake white.

3. M. DESCREPANS, *Mont.*

Mytilus descrepans, Mont. Test. Brit. 169.

At the roots of sea-weeds between tide-marks, common. Also in corallines from deeper water, where it attains a much larger size.

The animal is white, and, assisted by its long strap-shaped foot, can move about pretty quickly; but it generally prefers a stationary life, and forms for itself a kind of nest or case by stitching together the small sea-weeds or corallines with its byssal threads; here it remains attached by its byssus awaiting the food that may come within its reach.

When viewed in a living state there appear to be two siphons at the longer end of the shell, but only the posterior of these has the walls complete; the other has its anterior side open, formed by a fold in the cloak as in the siphons of the zoophagous gasteropods. The animal has consequently only two pallial apertures.

4. M. MARMARATA, *Forbes.*

Mytilus descors, Mont. Test. Brit. 167.

Imbedded in the skin of *Ascidia tuberosa* and *A. sordida,* (especially the former) from deepish water, common.

86. CRENELLA, *Brown.*

1. C. DISCUSSATA, *Mont.*

Mytilus decussatus, Mont. Test. Brit. Supp. 69.

Crenella elliptica, Brown's Illust. Rec. Conch. 75, t. 23, f. 12-14.

In shell-sand at Tynemouth, and the Fern Islands, rare. A specimen was got by Mr. King in a cavity of a small stone from deep water, brought in by the fishermen. Dredged alive in seventeen fathoms off Whitburn, by Mr. R. Howse.

This genus undoubtedly comes very near to the costated division of the last; the crenulated hinge plate, and the deep-seated internal ligament appear to be the chief distinguishing characteristics.

Family. UNIONIDÆ, *Fleming.*

87. ANODON, *Cuvier.*

1. A. ANATINUS, *Linn.*

Anodon cygneus, var. 8, *anatinus,* Gray, Turt. Man. 292.

In ponds, frequent.

Captain Brown figures a specimen from Prestwick Car, which is about six inches in breadth. It has not occurred to us of so large a size.

88. UNIO, *Retzius.*

1. U. PICTORUM, *Linn.*

Unio pictorum, Gray, Turt. Man. 295, t. 2, f. 11.

Mr. Hogg states that this has been found in the ponds at Wynyard, on the authority of Sir W. C. Trevelyan, Bart. It has not been met with further north.

2. U. MARGARITIFERA, *Linn.*

Alasmodon margaritiferus, Gray, Turt. Man. 293, t. 2, f. 9.

In mountain streams, and rivers in the early and more precipitous part of their course. Very fine in the Reed above Otterburn.

FAMILY. CARDIADÆ, *Fleming.*

89. CARDIUM, *Linnæus.*

1. C. ECHINATUM, *Linn.*

Cardium echinatum, Mont. Test. Brit. 78.

In deep water, frequent.

The *Cardium aculeatum* of Sir C. Sharp's list is probably a variety of this.

2. C. EDULE, *Linn.* (common cockle.)

Cardium edule, Mont. Test. Brit. 76.

On some of our sandy shores, abundant. The cockles of Budle Bay are celebrated for their large size.

3. C. FASCIATUM, *Mont.*

Cardium fasciatum, Mont. Test. Brit. Supp. 30 ; Lovén, Ind. Moll. Scand. 35.

Cardium exiguum, Hogg, Nat. Hist. Stock. 28 ?

In fifteen or twenty fathoms, and perhaps also in shallow water, not uncommon.

Our shell agrees perfectly with Montagu's description, with the addition of spines on the posterior margin, which are very liable to be worn off. Montagu's figure appears to have been taken from the young of *C. edule ;* hence the difficulty there has been in ascertaining the species. The *C. elongatum* of Turton's "Bivalves" is a variety of this.

4. C. NODOSUM, *Mont.*

Cardium nodosum, Mont. Test. Brit. 81.

At the roots of corallines from the fishing boats, Whitburn, rare.—*Mr. R. Howse.*

5. C. NORVEGICUM, *Spengler.*

Cardium lævigatum, Mont. Test. Brit. 80.

In deep water, not rare.

Cardium medium was introduced as a British species by

Donovan, who figures it from a specimen "found near Hartlepool, on the coast of Durham." The shell had most likely got there by some accident, as the species is not known to inhabit our coast, and is scarcely British.

Family. Veneridæ, *Fleming.*

90. ARTEMIS, *Poli.*

1. A. exoleta, *Linn.*

Venus exoleta, Mont. Test. Brit. 116.

From deep water, frequent; more especially towards the north of Northumberland.

2. A. lincta, *Pult.*

Cytherea lincta, Flem. Brit. Anim. 445.

Var. *Artemis comta,* Lovén Index Moll. Scand. 39.

At different depths, on most parts of the coast, not uncommon.

A specimen of his *Artemis comta,* sent to us by Professor Lovén, enables us to state that it is similar to what we consider a variety of *Artemis lincta,* found on our coast.

3. A. undata.

Venus undata, Mont. Test. Brit. 117.

From deepish water, not common.

We place this species provisionally here, though scarcely a true *Artemis,* as there is some difficulty in assigning it a generic appellation. The name of *Mysia,* given to it by Dr. Leach, has been appropriated by Capt. Brown to a different shell, *Tellina rotundata,* Mont. (Conchologists' Text Book, 150), and is consequently synonymous with *Diplodonta,* Bronn.

91. VENUS, *Linnæus.*

1. V. verrucosa, *Linn.*

Venus verrucosa, Mont. Test. Brit. 112.

Seaton Carew, single valves.—*Miss Elizabeth Backhouse.* It is also in Sir C. Sharp's Hartlepool list, and Capt. Brown says that it is found on the Northumberland coast. We have never been so fortunate as to meet with it, and suspect it may have been derived from ballast.

2. V. CASINA, *Linn.*

Venus casina, Mont. Test. Brit. Supp. 47.

From deep water, rather rare. "Holy Island."—*Mr. Winch.* Newton.—*Mr. R. Embleton.* Whitburn.—*Rev. G. C. Abbes.* "Seaton, W. C. Trevelyan, Esq."—*Hogg's Nat. Hist. of Stockton.*

3. V. FASCIATA, *Da Costa.*

Venus paphia, Mont. Test. Brit. 110.

In deep water, rather rare.

4. V. GALLINA, *Linn.*

Venus striatula, Mont. Test. Brit. 113.

Var. 1. Without rays, ridges sharper and closer.

Venus rugosa, Penn. Brit. Zool. iv. 95, t. 56, f. 50.

Var. 2. Shell more compressed, and produced transversely; striæ sharp and distant.

Venus Prideauxiana, Leach, Macg. Moll. Aberd. 266.

This species is subject to very great varieties. The normal form, *Venus gallina* of authors, is plentiful on some of our sandy shores, living at a little distance below low-water mark. The first variety, *Venus rugosa* of Pennant, and perhaps also *V. laminosa* of Laskey and Montagu, is very rare on our coast and its habitat unknown to us. The second variety, *V. Prideauxiana*, Leach, is always found in deep water, and is not uncommon; sometimes plain, but generally with about three brown rays. The plain kind appears to be the *V. laminosa* of Turton's "British Bivalves," and his *V. pallida* looks like a variety of the littoral form with the ridges obsolete. The *V. costata* of Brown (Illust. Rec. Conch. 90, t. 36, f. 13), "found at Seaton, Northumberland," we take to be a short variety of the deep-water form.

5. V. OVATA, *Penn.*

Venus ovata, Mont. Test. Brit. 120.

From deep water, rather rare.

Venus triangularis of Mr. Hogg's list is more likely *Astarte compressa*. There is also a *Venus triangulus*, Brown, MSS., in the same list, with which we are unacquainted. Mr. W. Backhouse has suggested to us that the *Venus chione* of Sir C. Sharp's "History of Hartlepool," may be a variety of *Cyprina Islandica*,

which we think probable. The range of *Cytherea Chione* in Britain does not extend much beyond the Cornish coast.

92. PULLASTRA, *Sowerby*.

1. P. AUREA, *Gmel.*

Venus aurea, Mont. Test. Brit. 129.

From the fishing boats, Cullercoats, rare.—*J. H. F.* Whitburn.—*Rev. G. C. Abbes.*

2. P. VIRGINEA, *Linn.*

Venus virginea, Mont. Test. Brit. 128.

On most parts of the coast, but not common.

3. P. DECUSSATA, *Linn.*

Venus decussata, Mont. Test. Brit. 124.

In shallowish water, not common. Low Lights. South Shields sands.—*A. H.* Alnmouth Bay, rare.—*Mr. Embleton.* Holy Island, and Hartlepool.

4. P. VULGARIS, *Sow.*

Venus pullastra, Mont. Test. Brit. 125.

On sandy shores mixed with stones, not uncommon.

5. P. PERFORANS, *Mont.*

Venus perforans, Mont. Test. Brit. 127.

In the shale rocks of our coast, common.

This species does not appear to excavate its own habitation, but merely to occupy the holes bored by the *Pholades*. It is also often found in crevices of the rocks.

FAMILY. CYPRINIDÆ, *Forbes*.

93. CYPRINA, *Lamarck*.

1. C. ISLANDICA, *Linn.*

Venus Islandica, Mont. Test. Brit. 114.

In deep water, common.

94. ASTARTE, *Sowerby*.

1. A. DANMONIÆ, *Mont.*

Venus Danmonia, Mont. Test. Brit. Supp. 45, t. 29, f. 4.

In deep water, not uncommon. Mr. R. Howse dredged it in

great abundance in sixty fathoms, about fifty miles from the shore.

2. A. SCOTICA, *Maton and Rackett.*

Venus Scotica, Mont. Test. Brit. Supp. 44.

In deep water, rather rare. Cullercoats.—*J. A.* Mr. Howse dredged a few of this species along with the last. Mr. King mentions having got a specimen "with the basal margins plain, but whose posterior and anterior margins are crenulated."

3. A. ELLIPTICA, *Brown.*

Crassina elliptica (and ovata), Brown Illust. Rec. Conch. 96, t. 38, f. 3, 12, 13.

From deep water, rare. Mr. King procured specimens of this shell from the fishing boats, which he considered to be sub-fossil, and concludes that it is not living on our coast at the present day. The Rev. G. C. Abbes, however, has met with it evidently in a recent state.

4. A. COMPRESSA, *Mont.*

Venus compressa, Mont. Test. Brit. Supp. 43, t. 26, f. 1 (exc. large var.).

Astarte striata, Lovén Index Moll. Scand. 37.

From about twenty fathoms water, frequent. Mr. Howse dredged it alive in seventeen fathoms.

5. A. TRIANGULARIS, *Mont.*

Mactra triangularis, Mont. Test. Brit. 99, t. 3, f. 5.

Goodallia triangularis, Turt. Brit. Biv. 77, t. 6, f. 14.

In shell-sand, rare. Fern Islands.

We cannot find any good character to distinguish the genus *Goodallia* of Turton from *Astarte*. Dr. Turton says the ligament is internal, but in this he is certainly mistaken.

FAMILY. TELLINIDÆ, *D'Orbigny.*

95. DONAX, *Linnæus.*

1. D. ANATINA, *Lam.*

Donax trunculus, Mont. Test. Brit. 103.

On most of our sands, not uncommon.

We have received specimens of this shell from Mr. Damon, of Weymouth, dredged up alive by his brother in eighteen fathoms

water, ten miles from the coast, off Shields. This is a curious locality for a species usually found living in the sand close to low-water mark. The specimens are more brightly coloured, and rather smoother than usual.

96. TELLINA, *Linnæus.*

1. T. TENUIS, *Da Costa.*

Tellina tenuis, Mont. Test. Brit. 59.

On many of our sandy shores, common. Newbiggin, Holy Island, Hartlepool, and Seaton.

2. T. FABULA, *Gmelin.*

Tellina fabula, Mont. Test. Brit. 61.

Not uncommon on all our sands.

It is not so local as the last, but less plentiful in particular spots. Like most of the other bivalves, it has now become rare on Tynemouth and Whitley sands.

3. T. DONACINA, *Linn.*

Tellina donacina, Mont. Test. Brit. 58.

On sandy shores, rare. Warkworth sands (a single specimen). —*Mr. R. Embleton.* Hartlepool.—*Mr. Septimus Peacock.*

4. T. PYGMÆA, *Lovén.*

Shell ovate oblong, very finely striated, much produced anteriorly; and very short, subtruncated, and obtusely angulated posteriorly, without perceptible flexure; colour reddish, yellow, or white, with sometimes a few interrupted rose-coloured rays. Length rather more than two-tenths of an inch; breadth, four-tenths.

Tellina pygmæa, Lovén, Ind. Moll. Scand. 42.

We found a few specimens of this species on the sands at Holy Island in 1837, but from its great similarity to *T. donacina,* we had not ventured to characterise it as distinct from the young of that shell, until Dr. Lovén's description drew our attention to it, and a more careful examination of its characters has convinced us that it is distinct. The shell is a little more produced in front, and shorter and more truncated at the posterior end than in *T. donacina*; the umbones are consequently more lateral, which becomes very obvious when the shell is laid open. The

anterior lateral tooth is also more remote, and the sinus of the pallial impression proportionately smaller than in *T. donacina*, as pointed out by Dr. Lovén. A specimen sent us by that distinguished naturalist enables us to speak with confidence as to the identity of the species.

5. T. SOLIDULA, *Pult.*

Tellina solidula, Mont. Test. Brit. 63.

Not uncommon on many of our sandy shores.

6. T. CRASSA, *Penn.*

Tellina crassa, Mont. Test. Brit. 65.

At Holy Island and some other parts of the north of Northumberland, not uncommon. Embleton Bay, plentiful.—*Mr. Embleton.* Cullercoats, rare. We take the *Arcopagia ovata* of Brown (found at Newbiggin) to be a variety of the young of this species, which is much more ovate in its early stages.

Tellina punicea. "We met with dead shells with the valves united, by dredging off Holy Island."—*Capt. Brown, Ill. Rec. Conch.* 100.

Tellina pellucida, Brown Illust. Rec. Conch. 101, t. 40, f. 22, "found at Seaton, county of Durham," by Sir W. C. Trevelyan, we are unacquainted with, but, judging from the description and figure, it does not appear to belong to this genus.

Tellina squalida of Sir C. Sharp's list we have reason to believe is only a large variety of *T. tenuis.*

Tellina carnaria has probably been introduced into Mr. Winch's list by some mistake. It is not a British species.

97. PSAMMOBIA, *Lamarck.*

1. P. FEROENSIS, *Gmel.*

Tellina Feroensis, Mont. Test. Brit. 55.

From deep water, frequent.

2. P. VESPERTINA, *Gmel.*

Solen vespertinus, Mont. Test. Brit. 54.

From the fishing boats, Cullercoats, rare.—*J. H. F.*, and *Mr. Chas. M. Adamson.* Whitburn.—*Rev. G. C. Abbes.*

3. P. TELLINELLA, *Lam.*

Psammobia florida, Turt. Brit. Biv. 86, t. 6, f. 9.

From deepish water, rather rare. Cullercoats. Newbiggin. Fern Islands.—*A. H.* Seaton Carew.—*Mr. W. Backhouse.*

98. SYNDOSMYA, *Recluz.*

1. S. ALBA, *Wood.*

Mactra Boysii, Mont. Test. Brit. 98, t. 3, f. 7.

On sandy shores, not uncommon. Plentiful at Whitburn.

2. S. PRISMATICA, *Mont.*

Ligula prismatica, Mont. Test. Brit. Supp. 23, t. 26, f. 3.

In deepish water, frequent. Often found in the stomachs of haddocks.

3. S. TENUIS, *Mont.*

Mactra tenuis, Mont. Test. Brit. 572, t. 17, f. 7.

Rare, "Seaton. Mr. J. Backhouse."—*Hogg Nat. Hist. Stock.* From the stomach of a duck shot at Holy Island.—*Mr. Chas. M. Adamson.*

FAMILY. MACTRIDÆ, *Fleming.*

99. SCROBICULARIA, *Schumacher.*

1. S. PLANA, *Da Costa.*

Mactra compressa, Mont. Test. Brit. 96.

Within tide-marks, or a little beyond, on a muddy bottom, generally at the mouths of rivers, not rare. Jarrow Slake, &c.

100. MACTRA, *Linnæus.*

1. M. SOLIDA, *Linn.*

Mactra solida, Mont. Test. Brit. 92.

Var. *Mactra truncata,* Mont. Test. Brit. Supp. 34.

On sandy shores, not common. The truncated variety, *M. truncata,* Mont., is frequent in the north of Northumberland.

2. M. ELLIPTICA, *Brown.*

Mactra elliptica, Brown Illust. Rec. Conch. 108, t. 41, f. 6.

From deepish water, not uncommon.

3. M. SUBTRUNCATA, *Da Costa.*

Mactra subtruncata, Mont. Test. Brit. 93.

On sandy beaches, frequent. Two varieties occur. The more usual kind is thick, solid, and strongly wrinkled, but there is a

thinner variety from deeper water, which is smoother and more produced at the posterior end. The latter is rather rare.

4. M. STULTORUM, *Linn.*

Mactra stultorum, Mont. Test. Brit. 94.

Var. *Mactra cinerea*, Mont. Test. Brit. Supp. 35.

Common on most of our shores, living just beyond low-water mark. The plain variety (*M. cinerea*, Mont.) is rather rare.

FAMILY. LUCINIDÆ, *D'Orbigny.*

101. LUCINA, *Bruguière.*

1. L. BOREALIS, *Linn.*

Tellina radula, Mont. Test. Brit. 68, t. 2, f. 1, 2.

Embleton Bay, near low-water mark, plentiful.—*Mr. R. Embleton.* Not common on other parts of the coast. Whitburn.—*Rev. G. C. Abbes.* Cullercoats.—*J. A.*

L. spinifera, Mont., is stated in Mr. Hogg's Natural History of Stockton to have been found at Seaton by Sir W. C. Trevelyan, Bart.

L. lactea, Mont., has been got at the same place by Mr. Hogg.

L. rotundata, Mont., also got at Seaton by Sir W. C. Trevelyan, and a single valve has occurred to the Rev. G. C. Abbes at Whitburn; but we suspect that this and the last, which are south country species, have been derived from ballast.

102. CRYPTODON, *Turton.*

1. C. FLEXUOSUS, *Mont.*

Tellina flexuosa, Mont. Test. Brit. 72.

Axinus flexuosus, King in Ann. Nat. Hist. xviii. 242.

Rare. Two or three specimens have been found at different times at Whitburn by the Rev. G. C. Abbes, where it has also been got by Mr. Howse, who afterwards dredged it in seventeen fathoms off that place. Mr. King has met with one specimen from the fishing-boats, which he states "came up on the lines after they had been down in thirty fathoms water, twenty-five miles east of the Fern Islands."

FAMILY. CYCLADIDÆ, *Fleming.*

103. CYCLAS, *Bruguière.*

1. C. CORNEA, *Linn.*

Cyclas cornea, Gray, Turt. Man. 280, t. 1, f. 2.

In ditches and ponds, common.

2. C. CALYCULATA, *Drap.*

Cyclas lacustris, Gray, Turt. Man. 281, t. 1, f. 3.

Cyclas calyculata and *lacustris,* Ald. in Newc. Nat. Hist. Trans. i. 40, 41.

In ponds, not common. Carr's Hill, Newcastle Town Moor, Tynemouth, &c. This may possibly be the *Tellina lacustris* of Müller, but as continental authors consider it distinct, we have adopted Draparnaud's name.

104. PISIDIUM, *Pfeiffer.*

1. P. OBTUSALE, *Pfeiffer.*

Pisidium obtusale, Gray, Turt. Man. 282, t. 12, f. 149.

In a pond near Darlington.—*Mr. W. Backhouse.*

2. P. PUSILLUM, *Turt.*

Pisidium pusillum, Gray, Turt. Man. 283, t. 1, f. 7.

In ditches and ponds, frequent.

3. P. NITIDUM, *Jenyns.*

Pisidium nitidum, Gray, Turt. Man. 283, t. 12, f. 150.

In ponds at Prestwick Car.—*A. H.* Near Darlington.—*Mr. W. Backhouse.*

4. P. PULCHELLUM, *Jenyns.*

Pisidium pulchellum, Gray, Turt. Man. 284, t. 12, f. 152.

In ponds and ditches, not uncommon. Var. *β* Jen. is found in ponds on Ryton Haughs.

5. P. CINEREUM, *Alder.*

Pisidium cinereum, Ald. in Newc. Nat. Hist. Trans. ii., 341; Gray, Turt. Man. 286, t. 12, f. 152.

Plentiful in a pond at the bottom of Castle Eden Dean. A more ventricose variety is found in ditches near Brandling Place, Newcastle.

6. P. AMNICUM, *Müll.*

Pisidium amnicum, Gray, Turt. Man. 285, t. 1, f. 5.

In slow streams, rather rare. Mill Race, Jesmond Dean. Near Stockton.—*Mr. Hogg.*

Family. Kelliadæ, *Forbes.*

105. LEPTON, *Turton.*

1. L. convexum, *n. s.*

Shell rather convex, transversely ovate, white; covered with minute transversely oblong punctures; hinge with the central tooth rather large, and the lateral laminæ small.

A single valve of a minute shell with these characters has occurred to us at Cullercoats. It is evidently a *Lepton*, and differs from *L. squamosum* in being rather more convex, in having the punctures of the surface oblong instead of circular, and in the greater proportional size of the tooth. These seem to indicate a specific distinction, but as the specimen is scarcely a line in diameter, and probably young, we cannot speak very confidently. The nucleus on the umbo is, however, so much smaller than that of *L. squamosum*, that we conclude it never attains the same size.

106. KELLIA, *Turton.*

1. K. suborbicularis, *Mont.*

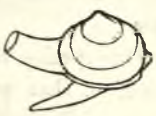
Mya suborbicularis, Mont. Test. Brit. 39, t. 26, f. 6.

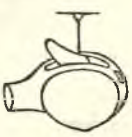
At the roots of *Laminaria digitata*, and other sea-weeds, under stones, and in the cavities of stones and old shells; not rare.

This species is subject to great variety of size and form; so much so, that we have thought more than one species might be confounded under the name, but we have failed to obtain any distinguishing character that can be depended upon as permanent. Two varieties may be mentioned; the one thin, transparent, and with a delicate play of iridescent colours on the surface. This is generally found at the roots of tangle. The other, which is more common among rocks between tide-marks, is smaller, more orbicular, more strongly striated, and covered with an ochreous crust near the umbones. Intermediate forms occur.

The animal of *Kellia* is very remarkable, and constitutes a new

form among the *Conchefera*. All the bivalves hitherto known have the siphons, when there are any, at the posterior end of the shell : the peculiarity of this genus is—that it has a large siphonal tube in front, as well as a short one behind. The animal of *Kellia suborbicularis* is white and semi-transparent; the mantle has three openings ;—the first is in front, and is produced into the siphonal tube above mentioned, which is very broad, and can be extended to a length equalling the diameter of the shell. This tube is not divided inside, and the margin of its aperture is plain. The second opening, which is at the base of the shell, is the largest of the three, and gives egress to a longish strap-shaped foot. The third opening is posterior, and forms a very short siphon, seldom protruded beyond the shell. The margins of these apertures are smooth, but there is a very delicate fringe of small and distant filaments, close within the margin of the shell, which can only be seen when the animal is fully extended. With a good magnifier, a current of water may be observed to pass in at the anterior siphon, and to be expelled at intervals by the posterior one. The animal moves about freely by means of its strap-shaped foot, which is frequently protruded in all directions. Its progress is usually forwards, but, sometimes, it crawls backwards or sidewise, especially when it is ascending a perpendicular surface, which it frequently does for the purpose of suspending itself by its byssus. The byssal aperture is about halfway up the foot on the posterior surface, from which the animal produces a very delicate thread, and suspends itself freely by a single, almost inconspicuous, fibre, strengthened by a double attachment at the top. The accompanying figures represent the animal (a little magnified) in a state of activity, and also suspended by its byssus in a state of rest.





2. K. RUBRA, *Mont.*

Cardium rubrum, Mont. Test. Brit. 83, t. 27, f. 4.

Among small sea-weeds near low-water mark, Whitley.—*J. H. F.* At the roots of *Lichina pygmæa*, on the rocks below amborough Castle.—*Mr. W. Thompson, of Belfast.*

The animal of this species has the same large anterior siphonal tube as the last; the foot, too, is long and strap-shaped, but a little more robust than that of *K. suborbicularis.*

M. Récluz has separated this species from *Kellia*, and has formed of it, and some other small shells, the genus *Peronia*. We have carefully read over M. Récluz's very elaborate description, with our British specimens before us, and cannot perceive any difference between this and the last species that can be considered more than specific. The ligament, upon which M. Récluz founds a part of his distinction, appears to us to occupy the same situation in each, with the exception that it is longer and more deeply seated in *K. rubra* than in *K. suborbicularis.* The teeth, too, are pretty nearly alike in number and position, though a little different in form. Taking, therefore, into consideration the similarity of the animals, we see no good reason for dividing them. The characters of the animal of *Peronia* given by M. Récluz are indeed very different from ours, but he does not appear to have met with it in a living state, and has consequently taken them from the *Peron* of Adanson, which from its external ligament and two posterior tubes, appear to be a distinct genus.

107. TURTONIA, *Hanley.*

1. T. MINUTA, *Fab.*

Venus minuta, Fab. Fau. Grœnl. 412.

Mya purpurea, Mont. Test. Brit. Supp. 21.

On small sea-weeds, in pools within tide-marks, common.

The animal of this species differs very considerably from that of Kellia. The mantle is widely open anteriorly, giving passage to a strong foot, broad towards the body, and angulate at the posterior base. There is only a single siphon, which is very small and slender, and is placed at the posterior or elongated end of the shell.

108. MONTACUTA, *Turton.*

1. M. BIDENTATA, *Mont.*

Mya bidentata, Mont. Test. Brit. 44, t. 26, f. 5.

From the fishing boats, and in sand, not uncommon.

The foot is large, subtriangular, and strongly kneed or angulated behind. It is protruded from the longer end of the shell, which in this genus is anterior. We have not been able to detect any siphons. Professor Lovén was the first to notice that this species, which is the *Mesodesma exiguum* of his "Index," has an ossicle. By carefully opening some of our specimens we have also observed it. It appears to be a calcification of the lower part of the ligament, which is very easily detached, and is generally wanting in dead shells. We have not found the same process in the following species.

2. M. SUBSTRIATA, *Mont.*

Ligula substriata, Mont. Test. Brit. Supp. 25.

Taken abundantly by Mr. R. Howse, on the spines of *Spatangus purpureus,* from 60 fathoms water, 50 miles off the coast of Durham.

Mr. Howse's observations on the animal of this species agree with ours on *M. bidentata,* as to the shape and position of the foot, and the apparent absence of siphons. All the animals of this family appear to attach themselves by a byssus.

3. M. FERRUGINOSA, *Mont.*

Mya ferruginosa, Mont. Test. Brit. Supp. 22, t. 26, f. 2.

Under stones among the rocks at Cullercoats, and in sand, rare.

FAMILY. ANATINIDÆ, *Gray.*

109. NEÆRA, *Gray.*

1. N. CUSPIDATA, *Olivi.*

Thracia brevirostra, Brown Illust. Rec. Conch. 110, t. 44, f. 11—14.

First noticed on this coast by the Rev. W. Mark, who got two individuals from the stomachs of haddocks. From a fishing boat, Cullercoats (one specimen).—*A. H.* Mr. R. Howse has got one or two specimens from haddocks at Whitburn.

110. CORBULA, *Bruguière.*

1. C. GIBBA, *Olivi.*

Mya inæquivalvis, Mont. Test. Brit. 38.

Corbula nucleus, Lam. Anim. s. Vert, 2nd Ed., vi. 139.

From deepish water, not rare. Dredged in seventeen fathoms by Mr. R. Howse.

111. THRACIA, *Leach.*

1. T. CONVEXA, *Wood.*

Anatina convexa, Turt. Brit. Biv. 44, t. 4, f. 1, 2.

From the fishing boats, Cullercoats, rare.—*A. H.* Whitburn. —*Rev. G. C. Abbes.* Only single valves have occurred.

2. T. PHASEOLINA, *Lam.*

Mya pubescens, small variety, Mont. Test. Brit. 40.

Thracia phaseolina, Kiener. 7, t. 2, f. 4.

On sandy beaches, not uncommon.

3. T. VILLOSIUSCULA, *Macg.*

Anatina villosiuscula, Macg. in Edinb. New Ph. Journ. ii. 370, t. 1, f. 10, 11.

Thracia ovata, Brown, Illust. Rec. Conch. 110, t. 44, f. 4.

From deeper water than the last, rather rare.

This is rather a doubtful species, but we think may prove distinct. It is shorter posteriorly than the last, and has the lower angle of the pallial sinus much more obtuse. The ligamental plate of the hinge is also a little less produced. The *Thracia ovata* of Capt. Brown, founded on a specimen got on Cullercoats sands, we take to be synonymous with *A. villosiuscula*, Macg., though Capt. B. refers the latter to his *T. pubescens* (our *T. phaseolina*).

112. ANATINA, *Lamarck.*

1. A. PRÆTENUIS, *Petiver.*

Mya prætenuis, Mont. Test. Brit. 41, t. 1, f. 2.

On sandy beaches, rare. Newbiggin.—*J. A.* South Shields sand.—*A. H.*

2. A. DISTORTA, *Mont.*

Mya distorta, Mont. Test. Brit. 42, t. 1, f. 1.

Cullercoats, rare. In a piece of limestone from deep water.—*J. H. F.*

113. LYONSIA, *Turton.*

1. L. NORVEGICA, *Chemn.*

Lyonsia striata, Turt. Brit. Biv. 35, t. 3, f. 6, 7.

From the fishing boats, Cullercoats, rare. Seaton Carew.—*Miss E. Backhouse.* Whitburn.—*Rev. G. C. Abbes,* and *Mr. R. Howse.*

FAMILY. MYADÆ, *Fleming.*

114. LUTRARIA, *Lamarck.*

1. L. ELLIPTICA, *Lam.*

Mactra lutraria, Mont. Test. Brit. 99.

On sandy beaches near and below low-water mark, rather local, but abundant in some places. Blyth sands. Embleton.—*Mr. R. Embleton.* Hartlepool and Seaton. "Ad ostium fluminis *Tees* copiosissimè reperiunter."—*Lister Anim. Angl.* 171, *Anno* 1678.

A thick and rather more elongated variety is found on this coast, which has been sometimes taken for *L. oblonga.* It is figured by Capt. Brown (Illust. Rec. Conch. t. 43, f. 3), from a specimen in the cabinet at Wallington.

115. MYA, *Linnæus.*

1. M. TRUNCATA, *Linn.*

Mya truncata, Mont. Test. Brit. 32.

Within tide marks on a stony bottom mixed with sand and mud, where it lives buried just deep enough to reach the surface with its long tube when the tide is up : mostly at the mouths of rivers. Low Lights, where it was first observed by the Rev. W. Mark. It was noticed by Lister at the mouth of the Tees. It occurs also in deeper water, and Mr. King dredged dead shells in 50 fathoms, not far from the edge of the Dogger-bank, and about sixty miles east of Sunderland.

Mya Uddevallensis, Forbes. Two or three dead valves of this species have been got from the deep-water fishing boats. Mr. King supposes them to be fossil, and that the shell-bank from which they were obtained may be a Pleistocene stratum, existing

beneath the sea. We see no good reason for this conclusion, as the shells got from it are all varieties of existing species. That *Mya Uddevallensis* has not been brought up alive on the fishermen's lines, may be accounted for from its habit of living buried in the sand. The specimens obtained appear to have been attached to the byssus of *Modiola vulgaris*, a not unusual mode of getting shells from deep water, but such are generally in a bad state.

2. M. ARENARIA, *Linn.*

Mya arenaria, Mont. Test. Brit. 30.

On stony ground within tide marks, with the last. Low Lights. "Hartlepool."—*Sir C. Sharp.* "Holy Island."—*Mr. Winch.*

116. PANOPÆA, *Lamarck.*

1. P. NORVEGICA, *Spengler.*

Panopœa glycimeris, Bean in Mag. Nat. Hist. viii. 563, f. 51.

Panopœa arctica, King in Ann. Nat. Hist. xviii., 243.

Two or three specimens of this rare species have been obtained from the deep-water fishermen by Mr. W. King, and Mr. R. Howse.

FAMILY. SOLENIDÆ, *Fleming.*

117. SOLEN, *Linnœus.*

1. S. SILIQUA, *Linn.*

Solen siliqua, Mont. Test. Brit. 46.

Common on some of our sandy beaches, where it lives in the sand near low-water mark. It is plentiful at Newbiggin and in the north of Northumberland, as well as at Hartlepool and Seaton; but it is not found on Cullercoats or Whitley sands, and rarely in the north of Durham. Capt. Brown found a specimen at Holy Island measuring twelve inches.

2. S. ENSIS, *Linn.*

Solen ensis, Mont. Test. Brit. 48.

On sandy shores, frequent; generally in the same places as the last.

3. S. PELLUCIDUS, *Penn.*

Solen pellucidus, Mont. Test. Brit. 49.

Cullercoats, rare. South Shields sands.—*A. H.* Dredged in 60 fathoms off the Durham coast by Mr. R. Howse, who has also got it at Whitburn. "Hartlepool."—*Sir C. Sharp.*

Solen legumen is in Sir C. Sharp's list of Hartlepool shells, and Mr. Winch's for Lindisfarne. We have not heard of its being recently met with.

Family. Gastrochænidæ, *Forbes.*

118. SAXICAVA, *Lamarck.*

1. S. rugosa, *Penn.*

Mytilus rugosus, Mont. Test. Brit. 164.

Solen minutus, Mont. Test. Brit. 53, t. 1, f. 4.

In limestone rocks, frequent. We have never found it boring into any other description of rock in this neighbourhood. It is often met with, attached by the byssus, at the roots of tangle (*Laminaria digitata*), and other large sea-weeds; as well as among zoophytes and old shells from deeper water. The varieties of form and size are very numerous, but we have not been able to make out more than one species.

Family. Pholadidæ, *Gray.*

119. PHOLAS, *Linnæus.*

1. P. crispata, *Linn.*

Pholas crispatus, Mont. Test. Brit. 23.

In shale rocks, and occasionally in limestone, and the softer sandstones, on different parts of the coast, common. Mr. Hogg informs us that he found this and the following species living in decayed wood, below the sand, at Seaton.

2. P. candida, *Linn.*

Pholas candidus, Mont. Test. Brit. 24.

In shale, &c., along with the last, frequent.

The mode by which the *Pholades* perforate rocks has long been a subject of dispute, but from recent observations there can be little doubt that it is principally, if not entirely, mechanical; and that it is effected by the soft parts of the animal, namely, the foot and mantle, which appear to have minute crystalline particles, probably siliceous, imbedded in their surface.

Pholas dactylus is included in Mr. Winch's list of Lindisfarne shells, and also in Mr. Hogg's "Natural History of the Vicinity of Stockton," on Mr. Winch's authority. In both cases we think *Pholas candida* has been mistaken for this species. The *Pholas parva* of Donovan, mentioned in the latter work, is the young of *P. crispata*.

120. XYLOPHAGA, *Turton.*

1. X. DORSALIS, *Turt.*

Xylophaga dorsalis, Turt. Brit. Biv. 253, t. 2, f. 4, 5.

From an old piece of oak, apparently part of a root, washed up at the mouth of the Tees.—*Mr. W. Backhouse.* Whitburn.—*Rev. G. C. Abbes.*

121. TEREDO, *Linnæus.*

1. T. NORVEGICA, *Spengler.*

Teredo navalis, Mont. Test. Brit. 527.

This species is occasionally met with in the timbers of old ships, but is scarcely native.

CLASS. TUNICATA, *Lamarck.**

ORDER.—(LES ASCIDIES SIMPLES, *Milne Edwards.*)

FAMILY. PELONAIADÆ, *Forbes.*

122. PELONAIA, *Forbes and Goodsir.*

1. P. CORRUGATA, *Forb. and Goods.*

Pelonaia corrugata, Forb. and Hanl. Brit. Moll. i., 43, t. E., f. 4.

From the fishing boats, Cullercoats, occasionally.—*J. A.*

FAMILY. ASCIDIADÆ, *Forbes.*

123. CYNTHIA, *Savigny.*

C. TUBEROSA, *Macg.* ?

Body irregularly ovate or roundish, pale brown, attached to shells or other marine substances by a broad base: branchial aperture terminal, tubular, much produced and broadly conical

* By J. Alder and A. Hancock.

towards the lower part, where it gradually unites with the outline of the body; anal aperture tubular and prominent, situated about one-third down the side; both are quadripartite and of a deep red colour. Outer tunic very thick, tough, and rugose, tuberculated and furrowed in an irregular manner; inside smooth and shining. Inner tunic bluish white, streaked with rose-colour at the apertures, and tinged with red in the centre from the ovaries shining through; these last are round granulated protuberances of a red colour, studding the inside of the tunic in longitudinal rows. Branchial sac, with about twelve strong longitudinal folds, and finely reticulated, without papillæ at the intersections. Tentacular filaments, round the entrance to the branchial cavity, simple and linear. Length, two inches; breadth, an inch and a half.

Cynthia tuberosa, Macg. Moll. Aberd. 311; Forb. and Hanl. Brit. Moll. i. 37.

From the fishing boats at Cullercoats, not uncommon.

The characters here given agree pretty well with the *Cynthia tuberosa*, Macg., and we therefore follow the opinion of Professor E. Forbes in considering ours to be a larger state of that species. We have never, however, seen the tubercles so prominent as Professor Macgillivray describes; and the tubular apertures are very conspicuous when the animal is expanded in sea-water: when removed from that element, they, as well as the whole body, contract greatly, in which state they agree better with Professor Macgillivray's description. This species is often covered with corallines and other small marine bodies, and the *Modiola marmorata* is usually found imbedded in its skin.

2. C. CORIACEA, *Ald. and Hanc.*

Body elongated and cylindrical when extended, nearly hemispherical when contracted, of a pale brownish colour, attached to shells, &c., by a broad base, equalling the diameter of the body. Apertures, terminal, approximating, tubular, nearly equal in size, pale, with a faint line of red round the margins. Outer tunic rough, coriaceous, transversely wrinkled and longitudinally furrowed, covered with minute granules. Inner tunic thin, white, sometimes spotted with brown. Ovaries large and white, lining

the tunic with cylindrical convolutions. Branchial sac thin, with about ten longitudinal folds, and finely reticulated; the longitudinal fibres strongest. Length nearly an inch; breadth half an inch.

From the fishing boats at Cullercoats, with the last but less common.—*J. A.*

This species differs from the preceding in having both the apertures terminal, and placed near together, as well as in the minute granulations of the surface. It is capable of greater contraction and elongation than most of the other species, and in the two states might be taken for different animals. It has sometimes small corallines attached, but we have not observed any *Modiolæ* imbedded in its skin.

3. C. AMPULLA, *Brug.*

Cynthia ampulla, Forb. and Hanl. Brit. Moll. i. 40.

Brought in on the fishemen's lines at Cullercoats.—*J. A.*

This species which has hitherto been overlooked as British, is not uncommon with us. It is unattached and cased in a thick coat of sand, held together by the long slender hairs of its tunic, assisted by a glutinous secretion. Its proper characters cannot be observed without removing the sand, which is sometimes equal in bulk to the whole of the animal. The long cylindrical tubes are often beautifully streaked and spotted with carmine.

4. C. RUSTICA, *Linn.*

Cynthia rustica, Forb. and Hanl. Brit. Moll. i. 39.

Common on stones, and at the roots of the larger sea-weeds, between tide-marks, and a little beyond.

A small, lenticular, red *Cynthia*, which we have always taken for the young of this species, is common in similar situations. This, we believe, is the *C. grossularia* of Van Beneden (Forb. and Hanl. Brit. Moll. i. 40).

124. MOLGULA, *Forbes.*

1. M. ARENOSA, *Ald. and Hanc.*

Body nearly globular, hyaline, rather glossy, smooth to the naked eye, but appearing very slightly rugose under a magnifier; unattached. Apertures very close together, sublateral, tubular, or

conical, but not much produced, and when retracted, so completely on a level with the surface, as to be imperceptible. Outer tunic soft, transparent, and colourless, shewing the viscera and branchiæ very distinctly within : the intestine is seen forming a yellowish brown coil ; a bright reddish spot indicates the stomach ; and the ovaries form an opake white central mass on each side. The inner tunic is very thin, soft, and colourless. The branchial sac has about twelve deep and broad longitudinal folds, which are divided by transverse bars into small cells, opening externally towards the tunic, and, when viewed through its transparent walls, appearing like rows of chains or festoons ; the intermediate reticulations are small. The aperture to the branchial sac is fringed internally with a circle of beautifully branched yellow tentacles. Diameter about three-quarters of an inch.

Molgula tubulosa, Forb. and Hanl. i. 36, t. C, f. 5.

Brought up plentifully on the fishermen's lines at Cullercoats. It is always encrusted with sand, but not so deeply as *Cynthia ampulla*, and there is often a transparent spot, free of sand, at one side, which gives to these little balls somewhat the appearance of detached *eyes*. They are so abundant in some parts of the fishing grounds that they are caught by the hooks in considerable numbers, to the great annoyance of the fishermen.

We cannot find any description agreeing with this species. It appears to us to come nearest to the *Ascidia punum* of Müller, but our friend, Professor E. Forbes, who has seen our drawings of it, refers it to *Ascidia tubularis* of the "Zoologia Danica." That species, however, is described to be greenish, opake, and verrucose,—while ours is hyaline, transparent, and smooth. It is also stated to be attached by its base to the roots of Fuci : ours is always free. We have thought it best, therefore, to consider it as undescribed, and to give such details of it as may serve for its recognition in future.

M. CITRINA, *Ald. and Hanc.*

Body convex, ovate, attached to stones in a diagonal direction by a broad base; nearly smooth, yellowish and semi-transparent, with a deep yellow or orange-coloured patch at the lower end from the viscera appearing through. Branchial aperture sub-

terminal slightly tubular, tuberculated or echinated, and divided at the top into six pointed segments. Anal aperture about one-third down the body on the upper side, sub-tubular, slightly tuberculated and divided into four segments, shorter than those of the branchial aperture. Length three-eighths of an inch.

On the under side of stones between tide-marks, Cullercoats and Whitley, not common.

125. ASCIDIA, *Linnæus.*

*** Cylindrical or rounded, and partially attached.**

1. A. INTESTINALIS, *Linn.*

Ascidia intestinalis, Forb. and Hanl. Brit. Moll. i. 31.

Not uncommon between tide-marks; laterally attached to stones at its posterior extremity. It inhabits various depths, and is occasionally brought in on the fishing lines. Those from deep water are larger than the shore variety, and of a greenish yellow colour. This species is flaccid, when out of water, and very contractile.

2. A. SORDIDA, *Ald. and Hanc.*

Body ovate, of a dull semi-transparent yellowish white, nearly smooth, but coarse and with an uneven surface; attached by a narrow base. Apertures terminal and not far apart, papillose or very slightly tubular, more or less echinated or tuberculated; the branchial aperture eight-cleft, the anal six-cleft, with a red eye-spot at the base of each division. Outer tunic transparent, vitreous, and colourless, rather tough, with very little power of contraction or expansion. Inner tunic about one-third less than the outer one, soft, yellowish, and generally very much blotched and spotted with crimson, towards the upper end. Branchial sac, with small even reticulations a little thickened at the intersections. Circle of tentacular filaments simple and slender. Length about two inches; breadth an inch and a quarter; but very variable in size.

This is one of the commonest *Ascidiæ* brought in on the fishing lines at Cullercoats. It is usually attached to corallines; occasionally to shells and other substances. In its young state it is gregarious, and is found in clusters on *Gemellaria loriculata*,

and sometimes inside dead bivalve shells. It is then very transparent and hyaline. *Modiola marmorata* is occasionally found imbedded in the older individuals. This species may be the *Ascidia prunum* of Macgillivray but not of Müller.

3. A. VIRGINEA, *Müll.*

Ascidia opalina, Macg. Moll. Aberd. 312.

Ascidia virginea, Forb. and Hanl. Brit. Moll. i. 33, t. C, f. 4.

From the fishing boats at Cullercoats, rare.

The hyaline transparency of the outer tunic, and the bright yellow and red markings of the inner, render this one of the most attractive of our *Ascidiæ*. The anal tube is much the longest; an unusual circumstance in this family.

4. A. VITREA, *Van Beneden ?*

Ascidia vitrea, Forb. and Hanl. Brit. Moll. i. 35.

On small sea-weeds brought in by the trawl-boats from a few fathoms water.—*J. A.*

We have not had the opportunity of seeing Professor Van Beneden's figures of *Ascidia vitrea*, but our specimens agree very well with the description of it in the "History of British Mollusca," with the addition that the inner tunic is spotted with yellow, and there is a yellow ring near the entrance to the branchial sac. We had at first thought that this might possibly be the young of the last, but it differs in being more ovate, and in having the anal aperture small and little prominent, as well as in the absence of red markings on the inner tunic.

5. A. ALBIDA, *Ald. and Hanc.*

Body ovate, white, transparent, and slightly tuberculated; attached laterally by a narrow base to small sea-weeds. Branchial aperture lateral or subterminal, large but not very prominent, the margin divided into eight points with intermediate red ocelli. Anal aperture a little distant from the other, and nearly half way down the body on the upper side; largish, and little prominent, with six red ocelli. Outer tunic hyaline and colourless, covered with distant small tubercles. Inner tunic, transparent white with bluish lines on the upper part; below, opake white slightly spotted with yellow. There is a large opake white spot on the ganglionic prominence between the

apertures, near which are a few small reddish marks. Length, half an inch ; breadth, one-third less.

On small sea-weeds brought in by the trawl-boats, with the last, not uncommon.—*J. A.*

Professor E. Forbes thinks this species may be a variety of *Ascidia scabra*, Müll., but the latter has the apertures terminal and rather prominent, the inner tunic of a uniform red, and the outer tunic closely covered with small granules ; characters which do not agree with our animal. The opake white spot between the apertures appears to be permanent, and a good distinctive character in this species.

** Depressed, and attached through their whole length.

6. A. DEPRESSA, *Ald. and Hanc.*

Body oblong ovate, very much depressed, pale green ; attached laterally through its entire extent by a distinct expansion or disc, surrounding the whole. Apertures distant : the branchial one terminal, not much produced, and divided into eight points, with intermediate red ocelli ; anal aperture about two-thirds down the body on the left side, with six segments and intermediate ocelli. Outer tunic transparent, granulated or tuberculated on the upper surface, the granules sometimes a little incrusted with brown ; under or attached side, smooth and very thin. Inner tunic one-third less than the outer, yellowish green, of a deeper colour and sometimes inclining to orange in the lower part. The intestine is often very conspicuous, forming a dark sigmoid coil, but this is more or less the case in all the transparent species. Branchial sac finely reticulated with tubercles at the intersections. Length, nearly an inch.

Common; attached to the underside of stones among the rocks at Cullercoats and Whitley.

This species comes very near to the *Ascidia orbicularis* of Müller (Zool. Dan. t. 79, f. 1, 2), but differs in the position of the apertures, which in that species are represented to be rather near together at the anterior end, while in ours they are widely separated.

7. A. ELLIPTICA, *Ald. and Hanc.*

Body elliptical, a little convex on the upper side, and flat beneath, of a dull and sub-opake brownish or yellowish white;

attached through its whole length by a rather inconspicuous disc. Branchial aperture not quite terminal, at the anterior end, papillose, very little elevated, and divided into eight tubercular segments. Anal aperture situated a little below the branchial one on the left side, not prominent, with six tubercles. Outer tunic tough, sub-opake, nearly smooth but rather coarse ; inner tunic opake white or flesh-coloured with a few spots of red between the apertures. The red ocelli of the apertures, which are scarcely visible outside, are distinct in the inner tunic. Branchial sac reticulated, with slender papillæ at the intersections of the larger meshes. Length three-quarters of an inch; breadth about one-third less.

Attached to the underside of stones, within tide-marks, Cullercoats, not common.—*A. H.*

Professor E. Forbes has referred our drawings of this species to *Ascidia prunum* of Müller, but in this opinion we cannot agree. *A. prunum* is described as rounded, lax, hyaline, and very pellucid, and is a free or slightly attached species dwelling in mud. It consequently does not belong to this division of the genus.

8. A. PELLUCIDA, *Ald. and Hanc.*

Body depressed, hyaline, subtriangular, attached laterally by a broad disc. Branchial aperture terminal, wide and tubular, divided into eight segments with red ocelli. Anal aperture situated a little below it on the left side, tubular and curved inwards towards the upper surface, with six ocellated segments. Outer tunic smooth, coriaceous, colourless and perfectly transparent. Inner tunic not above one-half the size of the outer one, opake yellowish white, inclined to red on the lower part. Length half an inch.

Under stones within tide-marks, Cullercoats, rare,—*A. H.*

ORDER.—(LES ASCIDIES SOCIALES, *Milne Edwards.*)

FAMILY. CLAVELLINIDÆ, *Forbes.*

126. CLAVELLINA, *Savigny.*

1. C. LEPADIFORMIS, *Müll.*

Clavellina lepadiformis, Forb. and Hanl. Brit. Moll. i. 26, t. E, f. 1.

Under stones at low-water mark, rare. St. Mary's Island.—*A. H.*

ORDER.—(LES ASCIDIES COMPOSÉES, *Milne Edwards.*)

FAMILY. BOTRYLLIDÆ, *McLeay.*

127. APLIDIUM, *Savigny.*

1. A. FICUS, *Linn.?*

Aplidium ficus, Forb. and Hanl. Brit. Moll. i. 11?

Under stones among the rocks at Cullercoats, rare.—*A. H.*

The specimen we refer, with doubt, to this species, formed an irregular lobed mass of a brownish colour, with the animals thickly disposed through it, without apparent pattern. Longest diameter nearly two inches.

2. A. FALLAX, *Johns.*

Aplidium fallax, Johns. in Loud. Mag. Nat. Hist. vii. 15, f. 4; Forb. and Hanl. Brit. Moll. i. 11.

On sea-weeds, in pools between tide-marks, at Cullercoats, rare.—*J. A.*

128. SIDNYUM, *Savigny.*

1. S. TURBINATUM, *Sav.?*

Sydneum turbinatum, Flem. Brit. Anim. 469?

A species, which we had always taken to be this, is not rare on our coast, but it differs from that figured in Forbes and Hanley's "British Mollusca." It is inversely conical, sometimes adhering by a narrow base, and is of an orange-red colour, with the animals vertically and concentrically arranged: their branchial apertures are eight-cleft. The masses are of different sizes, from a quarter to half an inch high, erect, and frequently clustered.

129. POLYCLINUM, *Savigny.*

1. P. AURANTIUM, *M. Edw.?*

Polyclinum aurantium, Forb. and Hanl. Brit. Moll. 14, t. A, f. 3.

On the under side of stones between tide-marks at Cullercoats, rather rare.—*A. H*

Our specimens are paler than those described by M. Milne Edwards, being of an ochreous yellow, with only a tinge of orange at the sides. The mass frequently forms a cluster of different sized flattened balls. The general apertures, irregularly disposed over the surface, are large and prominent.

130. LEPTOCLINUM, *Milne Edwards.*

1. L. PUNCTATUM, *Forbes.*

Leptoclinum punctatum, Forb. and Hanl. Brit. Moll. i. 18.

On the under side of stones between tide-marks, Cullercoats and Whitley, not uncommon.

131. BOTRYLLUS, *Gœrtner.*

1. B. SCHLOSSERI, *Pallas.*

Botryllus Schlosseri, Forb. and Hanl. Brit. Moll. i. 19, t. A, f. 7.

Incrusting the under side of stones, and on the stems of the larger Fuci, between tide-marks and a little beyond, common.

This species may usually be known by a red spot on the thorax of each individual composing the stars, though in one or two instances within our knowledge it has been wanting. The general envelope is thick and rather tough.

2. B. RUBENS, *Ald. and Hanc.*

General envelope thin and transparent, dull brown, with numerous opake yellow granules. Individuals forming circles, or stars, of from four to fifteen, generally averaging seven or eight; their colour is various shades of red, from reddish-yellow to dark brick-red: there is usually a circle of dark red round the branchial aperture, and at a little distance from it, and a streak of the same down the centre of the thorax; the remainder of the body is pale red or yellowish, thickly sprinkled with opake yellowish-white spots. General aperture of each system, rather small. The stars are smaller, and not so closely set as in the last species.

On the under side of stones between tide-marks, Cullercoats, frequent.

We have occasionally seen the central red line of the body so

much diminished that it leaves little more than a spot, and in that case the species might be taken for the last; but it may always be known from it by the thinness of the general envelope and the more variegated reddish colour of the inclosed animals.

3. B. VIRESCENS, *Ald. and Hanc.*

General envelope moderately thick, olive-brown coloured, sprinkled with yellow spots. Individuals forming circles of from six to twelve. Colour grass-green, varying to greenish yellow, and occasionally to pale grey; the colour is in most cases confined to the lower part of the animal, the upper portion being so nearly the colour of the envelope as to be with difficulty distinguished from it. Branchial apertures large, with a faint red margin; the tentacular filaments very conspicuous within them, of a pale yellowish colour. When magnified, the colour of the body is shown to be formed of a copious sprinkling of opake spots, mostly confined, as before stated, to the lower part of the animal, but sometimes extending round the disc. Common central apertures largish, margined with red.

Not uncommon on the under side of stones within tide-marks, along with the last. The arrangement of the markings distinguishes it from the *B. smaragdus* of Milne Edwards.

4. B. POLYCYCLUS, *Sav.*?

General envelope thin, dull greenish brown. Individuals forming circles of from 4 to 9 each, generally of a purplish hue, occasioned by a spotting of claret-colour and blue intermixed with spots of opake white; the white usually forming one or two large blotches in the centre of the body on a dark blue ground and there is also a circle of white, or sometimes reddish, spots round the disc. General apertures rather small; the edges thickly sprinkled with white and blue.

Botryllus polycyclus, Forb. and Hanl. Brit. Moll. i. 21.

On the under side of stones within tide-marks, not rare, but less frequent than the three preceding.

5. B. CASTANEUS, *Ald. and Hanc.*

General envelope very thin and pellucid, with a few scattered brown marks and black punctures on the margin. Individuals large, placed in irregular circles of from 6 to 8, of a chesnut

colour, irregularly blotched with purple-brown, and minutely sprinkled with opake white. Branchial aperture small, general aperture moderate. Stars rather far apart, and surrounded with a few large opake yellowish white globular bodies.

On the under side of stones in pools between tide-marks, Cullercoats, rare.—*A. H.*

The envelope of this species is thinner than in any other we are acquainted with, and, when removed from the stone, is extremely flaccid. The patches are large, being sometimes 5 inches across.

132. BOTRYLLOIDES, *Milne Edwards.*

1. B. Leachii, *Sav. ?*

Botrylloides Leachii, Forb. and Hanl. Brit. Moll. i. 23 ?

The species we now refer, though with considerable doubt, to *Botryllus Leachii* of Savigny, is common among the rocks at Cullercoats and Whitley, encrusting the under side of stones in largish patches. The general envelope is brownish, and the individuals are usually of a nearly uniform ochreous yellow, forming large brain-like folds. The colour occasionally varies to brick-red, and even to a purplish hue. There may possibly be more than one species included in this, but, hitherto, we have not been able to detect any difference among them excepting in colour.

2. B. radiata, *Ald. and Hanc.*

General envelope yellowish olive, with yellow granules.—Individuals rather small, broadly pear-shaped, pale ochreous yellow or straw colour, spotted with white, and having a paler rim round the branchial aperture, with rays diverging from it and uniting into a disc beyond, giving a petaloid or wheel-like appearance to it. A darkish line runs down the thorax. The systems are arranged in much shorter and more compact folds then in the last; some parts occasionally assuming the appearance of a circular arrangement. The common apertures are usually situated at no great distance from each other.

On the under side of stones, among the rocks at Cullercoats and Whitley, frequent.

The smaller size more varied markings, and shorter and more rounded convolutions, distinguish this species from the last.—The wheel-like markings ally it to the *B. rotifera* of Milne-Edwards, but the colour never approaches to red, and the folds of *B. rotifera* appear more elongated than in ours. In this respect our species approaches more nearly to the arrangement of *B. albicans.*

3. B. ALBICANS, *M. Edw.*

Botrylloides albicans, Forb. and Hanl. Brit. Moll. i. 24, t. A, f. 8.

On the under side of stones between tide-marks, St. Mary's Island.—*A. H.*

4. B. RAMULOSA, *Ald. and Hanc.*

General envelope colourless, pellucid, with a few pale yellow spots on the margin. Systems of individuals winding, much involved; and having a broad cream-coloured belt down the centre, following the sinuations. Animals of an obscure brownish yellow, with the lower half pale opake yellow.

On the under side of stones in pools between tide-marks at Cullercoats, rare.—*A. H.*

This species, which is in patches of upwards of an inch and a quarter across, is at once distinguished from *B. Leachii* by the opake belt of cream-colour that passes along the centre of the various systems of animals.

The above attempt to describe the TUNICATA of our coast, imperfect as it is, may serve as a ground-work for future investigations. Some other forms are known to us which we have not ventured to describe, though we have seen sufficient to convince us that many species yet remain to reward the labours of future enquirers. The compound species are extremely difficult to make out, both on account of their great similarity, and because the same species, and even the same individual, is very apt to vary under different circumstances.

INDEX TO THE GENERA.

ABBREVIATIONS OF AUTHORS' NAMES.

Ald. and Hanc., Alder and Hancock.
Bouch. Chant., Bouchard Chantereaux.
Brod., Broderip.
Brug., Bruguière.
Chemn., Chemnitz.
Cuv., Cuvier.
Desh., Deshayes.
Dillw., Dillwyn.
Don., Donovan.
D'Orb., D'Orbigny.
Ewd. (M.), Milne Edwards.
Fab., O. Fabricius.
Fér., Férussac.
Flem., Fleming.
Forb. and Hanl., Forbes and Hanley.
Gmel., Gmelin.
Jeff., Jeffreys.
Johns., Johnston.
Lam., Lamark.
Leuck., Leuckart.
Linn., Linnæus.
Macg., Macgillivray.
Mich., Michaud.
Mont., Montagu.
Müll., Müller.
Penn., Pennant.
Phil., Philippi.
Pult., Pulteney.
Sow., Sowerby.
Thomp., Thompson.
Turt., Turton.

THE

PRESIDENT'S ADDRESS

AT

THE SECOND ANNUAL MEETING,

MARCH 30, 1848.

Gentlemen,—It falls to my lot, as President of this Society, and before resigning my not very arduous duties, to read to you the proceedings of the Club during our wanderings last year, which I shall preface by one or two observations, according to the example of my predecessor.

Our Society has now existed two years, and I think we may fairly congratulate ourselves on its success; we have been steadily adding to our numbers, and our body now consists of above a hundred members, but I observe with regret that the number of those who take the field does not increase in proportion. I was in hopes that as our force increased, so would the numbers at our meetings, and I will observe in passing that there would be one among the many advantages connected with a larger attendance of our members, which is, that we should be thus compelled, as it were, when the weather permitted, to dine "*sub Jove*," which is, to my taste, and I believe to that of many of our body, far more agreeable than passing a large portion of the day in the close, damp atmosphere of a public-house, and especially as any long written contributions from members are now only read at the Meetings held in this town.

It is hardly possible, I should imagine, to select any locality near Newcastle for our rambles which has not been thoroughly ransacked by our more experienced botanists and geologists, and it is to be feared that some do not attend our meetings because they are so well acquainted with the country that they

cannot hope to find any thing new. I may be wrong in my supposition, but should this be the case, it will have a bad effect upon us younger naturalists; there are many amongst us who require to be instructed and encouraged in these delightful studies to make themselves acquainted with the best geological districts, and with the habitats of our wild plants, which they can only do thoroughly with the assistance of more experienced members.

There is another subject which, as a Botanist, occurs to my mind at each of our Field Meetings; when gathering any rare plant on its native soil, I regret that our Society cannot be made more useful than it now is to those who cannot, as we do, see the plant growing in its own locality; the specimen goes to my herbarium, part of it to my garden at Stamfordham, and becomes, as it were, lost to the world. Now, I believe, there are many people extremely fond of Botany, who, owing to unavoidable circumstances, cannot find time to gratify their taste or to improve their knowledge. Now, could no piece of ground be found near this large and healthy town, where we might bring any contributions collected in our rambles, and thus give people an opportunity of seeing their native plants growing? This would tend greatly, I am sure, towards promoting the science amongst us, and might, in time, form the nucleus of a Botanical Garden in or near Newcastle. I was in Belgium last spring, where I observed that nearly every town of any pretensions has a Botanical Garden, but then the foreigners go to work on a totally different plan from us in this country, they begin at the bottom of the ladder and go gradually up increasing their works in proportion to their funds. Now, it strikes me, that our fault in England is to undertake too much at once; instead of beginning in a small way, our ambition leads us to aim at once at perfection; hothouses, conservatories, &c., are built, which cannot be kept up without a great annual outlay, as has been found, I understand, to be the case at Liverpool.

I do not think that our proceedings last year have been marked by anything of importance, but we have passed some very pleasant days in rambling about the country; besides the

pleasure our meetings have afforded us, there is another still more important object gained by them, which is, that in learning accurately to observe the works of nature, we are insensibly led to remember the God who made them.

Before reading the report of our meetings I beg to resign the office of President, to which you so kindly elected me last year, and trust that my successor will discharge his duties more ably and with more benefit to the Society than I have done.

The first Field Meeting for 1847 was held on the 21st of May, in Morpeth and its vicinity. The party, in consequence of the uncertainty of the weather, was small. An exceedingly pleasant day, however, was spent on the banks of the Wansbeck, from Morpeth, to a little way below Bothal. The banks of the river are lofty and thickly wooded, and many of the views are extremely picturesque. The party visited the lofty viaduct now in progress, 132 feet in height, over the Wansbeck, and such other points as were considered of most interest, and to which they were conducted by Mr. Creighton, of Morpeth. The day, notwithstanding the previous bad weather, was exceedingly fine, and thus added to the charms of the delightful scenery through which their course was directed. The members breakfasted and dined at the Queen's Head Inn, Morpeth. After dinner, the only business transacted was the election of Mr. Creighton as a member of the Club, and the fixing of the day of the next Meeting, which it was determined should be held at Castle Eden, on Wednesday, the 16th of June, and the passing of the following resolution. Moved by Mr. R. R. Dees, and seconded by Mr. Loftus, "That all papers, &c., presented for printing in the Transactions of the Club, be first submitted to the Committee, who shall have the power of accepting or rejecting them, or of printing only such portions of them as they may deem of sufficient importance. In the latter case, the author to have the power of withdrawing the paper if he should think fit."

The Second Field Meeting was held on Wednesday, the 16th June, at Castle Eden Dene, and notwithstanding the unsettled state of the weather both previous to and after the meeting

the party had a day most delightful for their excursion, thus affording an illustration of the frequently local nature of falls of rain; for on the 16th it rained heavily a few miles up the Tyne, whilst it was fair at Castle Eden; and on the 17th it rained heavily at Castle Eden and was fair up the Tyne. It is unnecessary to dwell long upon the attractions of a place so well known for its picturesque beauty and for the number and rarity of the plants it produces. It is sufficient to say that all the scarce plants were observed by one or other of the party, more especially the rare and conspicuous Lady's Slipper (*Cypripedium Calceolus*). Four plants, bearing two flowers, of this pride of our Northern Flora, were seen, but as great treasures and with a due regard to that excellent rule of the Club, which pledges itself to prevent as far as possible the extirpation of rare species—they were left undisturbed.

In the other departments of natural history but little was done, arising in a measure from the floral attractions being so great, and from the peculiar and beautiful scenery of the Dene being new to many of the party. A species of Saw Fly, which had not before been taken by any of the party, was caught, but this was the only insect taken worth notice, although the locality, as might be expected, affords several rare species. The party was entirely a pic-nic one, for, from the great distance, it was impossible for those present to dine together as usual, without being too late to return home that day.

The Third Meeting took place on Monday, July 12th, in a range of country extending from Haydon Bridge to Walltown and Haltwhistle; a district highly interesting to the geologist and botanist, and also to the antiquarian, from its possessing the most extensive remains of the Roman Wall now in existence. The face of the country is very much broken by irregular hills of limestone and sandstone; and at Walltown, and from thence towards the North, the edge of the great whin sill shews itself, after having been thrown up by the great Stublic Dyke. In the hollows are numerous hags or mosses, and here and there a small lake. As might be expected, many of the plants peculiar to such districts are found here in abundance, some of them

rare British species. Several scarce species of Carex occur, especially *Carex irrigua,* which was first noticed as a British Plant by Mr. John Thompson, then of Crowhall Mill; and who has added many species observed in the neighbourhood alluded to, to the Northumberland Flora. Amongst them may be enumerated *Hieracium prenanthoides* and *Crepis succisæfolia. Allium schœnoprasum* was found in full blow, in which state it does not often occur, *Geranium columbinum,* was abundant on the Walltown Crag, and in a pond to the south-east of it, *Nymphœa alba,* and *Nuphar lutea,* were flowering in great profusion, and *Ranunculus lingua* grew at a short distance from its edge. The day was remarkaby fine, and the party, after a pleasant, though long wander, reached Haltwhistle just in time for a hasty dinner, and to return home by the last train from Carlisle.

The Fourth Meeting was held, August 12, at Prestwick Car, near Ponteland, a space of flat, marshy and boggy land, about two miles across, with a considerable pool of rather shallow water communicating with the little river Pont by a deep ditch of about one-third water and the remaining two-thirds of filthy mud. It is difficult to account for this flat expanse of bog, marsh, and water. That it has once been more elevated is evident, as the stumps of trees blackened, as is usual in bog wood, are scattered over its whole surface. When the lake is low, they may be seen in considerable numbers just showing themselves above the water. Two kinds of trees may be distinguished; a species of fir, probably the Common Scotch Fir, as the wood, when sliced and put under the microscope, sppears to belong to that plant. The other tree is the Common Birch; in this the bark in many cases is almost quite sound, whilst the wood is soft or altogether gone: thus furnishing us with the means of accounting for the fact, that in most of the larger fossil plants of our coal mines, we have the impression of the bark only, the place of the wood being usually occupied by mud or sand. How the trees at Prestwick Car have got into their present situation it is difficult to say: the appearance of the place, an extensive flat, like the bottom of a large dish, rising ground on nearly every sides forming the edge, would suggest the idea of subsidence of the

land at this particular spot, more especially as the Car itself is no so low a level, that the waters of the Pont frequently flow into it.

As might be expected, numerous water and bog plants are to be met with, for some of which it is the only convenient station near Newcastle. In the ditches as well as in the lake, *Callitriche autumnalis, Chara aspera*, and *C. hispida*, are abundant.—Amongst the other plants may be mentioned—*Ranunculus lingua, Listera cordata, Œnanthe phellandrium, Triglochin palustre, Alisma ranunculoides, Hippuris vulgaris, Utricularia vulgaris*, and *U. intermedia, Carex pauciflora, Potamogeton lucens* and *P. heterophyllum, Anagallis tenella, Parnassia palustris, Nuphar lutea, Eleocharis multicaulis, Andromeda polifolia, Habenaria bifolia, Gymnadenia conopsea, Globularia pilulifera, Lycopodium selago*, and *L. selaginoides;* and most of the common North of England heath and bog plants, both cryptogamic and flowering. Many fresh-water shells are found in the lake and the ditches which run into it, but they do not appear to be so numerous as they were a few years ago. At one time the Car was not preserved, and the water birds were driven away, and the shells on which they fed were abundant; but now that the place is strictly preserved, the birds abound and the shells have evidently become scarcer. Water birds, as might be expected, have resorted in greater numbers to the Car since they have been less disturbed, and this year they appear to be more numerous than usual. Several species also have bred in greater numbers this season than usual, and some have bred which had not been previously noticed at the Car in the breeding season. Several broods of the Redshank were brought out; the Water Crake, bred there this season, and a Ruff and a Reeve were seen by Mr. R. Reay, of Berwick Hill. Mr. John Hancock, from whom this information is furnished, obtained the egg of the Redshank. Amongst the other birds observed was a flock of about thirty Ring Dottrels, a number unusually large to be seen together at Prestwick Car. The only business transacted at the meeting was the election of four new members; and the presentation, by Mr. J. Hancock, of a notice of the capture of the Thrush Nightingale *(Sylvia turdoides major)*, the largest European warbler, near the village of Swalwell, three

or four miles west of Newcastle. The attention of Mr. Thomas Robson, of Swalwell, a gentleman perfectly acquainted with the notes of our different warblers, was, towards the end of May, attracted by a note which he did not recognise. After some trouble he succeeded in seeing and afterwards obtaining the bird, which proved to be the male of the above-named species. Although this was the only specimen obtained, yet, from the time of year, and other circumstances, there is little doubt that this fine warbler is a regular visitant, its peculiarly retired habits having hitherto concealed it from observation. Mr. Hancock has in his possession an egg obtained in Northamptonshire, which agrees exactly with the description of that of the Thrush Nightingale. But from not supposing the bird to be a native of England, Mr. Hancock was unwilling to assign the egg to this species : now, however, that the bird has been obtained here in the breeding season, there seems no reason to doubt that the egg got from Northamptonshire was that of this warbler.

The Fifth and concluding Field Meeting, in accordance with an invitation of the Berwickshire Naturalists' Club, was held at Alnwick, on Wednesday, September 22. In conjunction with the former Society, a few members also of the Durham Botanical Society joined the party. The members present breakfasted with Mr. Dickson, Clerk of the Peace for Northumberland, after which they proceeded to Alnwick Castle, where they spent a short time, and then assembled at the Swan Inn for the transaction of business. It being the anniversary meeting of the Berwickshire Club, the annual address of the President of that body, on his retirement from office, was read, and his successor was elected. There were no long papers read or presented by either Society. Mr. Selby, of Twizel House, read a short notice of the occurrence of some birds and insects in greater abundance than usual during the last year. Amongst other insects he mentioned the Death's Head Hawk Moth, and the Convolvulus Hawk Moth. Of the former he had procured several caterpillars, but had not been able to rear any moths. He mentioned that when he was unable to procure potato leaves, on which plant the Death's Head Moth is usually found in this country, he had substituted

those of a plant of the same genus, the common nightshade or bittersweet of the hedges *(Solanum dulcamara)*, and found that the moth fed as freely on it as on the potato. Mr. Selby described a caterpillar as large as that of the Death's Head Moth, but differing from it in colour and in the shape of its markings, which he had also found on the potato. This caterpillar, he thought, might be a variety of that of the Death's Head Moth, but he had not been able to meet with any account of that species in which such a variety was described, nor was he aware of any other species to which it could be assigned. Mr. Alder, of Newcastle, read an account of the peculiar character of the animal, of *Kellia suborbicularis*, a bivalve mollusk not uncommon on our shores, shewing it to be a new type of form among the bivalves, differing from the others in having a large anterior tube. He also exhibited a drawing, and read a description, of the animal of *Lepton squamosum*, an allied genus, likewise very peculiar in its characters. He took the opportunity of Dr. Johnston being present to draw his attention to a curious new British Zoophyte, of very anomalous characters, found by Mr. Cocks, at Falmouth, and examined by Mr. Alder, in conjunction with that gentleman, during a recent visit to Cornwall. A drawing of the animal was exhibited to the meeting, and a verbal description given. Some account of its mode of development was also communicated. Dr. Johnston considered it quite distinct from anything with which he was acquainted. Mr. Tate, of Alnwick, exhibited several specimens of mountain Limestone Fossils, remarkable for their perfection and beauty. This gentleman possesses one of the best collections of the fossils of this formation in the kingdom. After the business matters were concluded, and the rain had ceased, which fell heavily during the middle of the day, some of the party returned to the castle where they had spent a portion of the morning, and where, by the courtesy of the noble owner every facility was given for the examination, both of its feudal remains and of its modern decorations. There is a small museum, containing objects of antiquity, as well as specimens of most departments of Natural History: amongst the latter are some very interesting fossil remains.

The most remarkable part of the collection, however, is that containing the Egyptian Antiquities, obtained by the noble duke himself when in Egypt. On leaving the castle the party had a short walk through the park and returned to the White Swan Inn, where they sat down to an excellent dinner, to which the thoughtful courtesy of the duchess had added a splendid dessert. The only business transacted after dinner was the election of three new members to the Berwickshire Club; and the proposal of a vote of thanks on the part of the three clubs to the Duke and Duchess of Northumberland for the attention they had shewn to the meeting. The invitation from the Berwickshire Club was made for "the promotion of friendly feeling" between the clubs; and when the party broke up, which it did at an early hour, every one present felt that the intended object had been attained.

VI.—*A Catalogue of the Fossils of the Permian System of the Counties of Northumberland and Durham, drawn up at the request of the Tyneside Naturalists' Field Club. By* Richard Howse.

The earliest notices of the fossil remains of the Magnesian-limestone of this district are those made by Mr. N. J. Winch, in a paper entitled "Observations on the Geology of Northumberland and Durham," published in the Geological Transactions, 1st ser., Vol. IV. In this paper nine species only are mentioned as occurring in the Magnesian-limestone of the neighbourhood of Sunderland. As they are rather vaguely described, it is very difficult to say what species are intended. About the same time that Mr. Winch's paper was read before the Geological Society, several less important communications, on the same subject, were made to the Annals of Philosophy, and the Philosohical Magazine. Ten years later, Professor Sedgwick gave a much longer list of these fossils, in his valuable paper "On the geological relations and internal structure of the Magnesian-limestone,' etc., in the Geological Transactions, 2nd ser., Vol. III.—More than thirty species from our district are included in this list, but, unfortunately, some of them are so slightly noticed that the species cannot now be recognised. The last and by far the most complete list, is the one given in the Geology of Russia. The fifty-eight species mentioned in it from the Magnesian-limestone of Northumberland and Durham are included in the tabular list of the Fauna of the Permian System of Europe, and form about one-third of the total number of species peculiar to these rocks. Within the last few years, additional species have been discovered in our limestone, some few of which have been before noticed in the equivalent rocks on the continent; the others appear to be entirely new.

The Permian System includes all those rocks which are situated between the Carboniferous and Triassic Systems. Its principal

members in the ascending order are—the Lower-new-red-sandstone, Marl-slate, Magnesian-limestone, and Upper-new-red-sandstone. These rocks occupy the whole of the eastern part of the county of Durham, from a line drawn through the following places, *viz.* :—Westoe, Harton, Cleadon, West Boldon, Hylton Castle, Pallion, Clack's Heugh, Painshaw, West Herrington, Houghton-le-Spring, Moorsley, Pittington, Sherburn, Quarrington, Coxhoe, Cornforth, Thrislington, Ferry hill, Merrington, Westerton, Coundon Grange, Eldon, East Thickley, Midderidge Grange, West Thickley, Newbiggen, Shackerton Hill, Whitehouse, Houghton-le-Side, Langton, Ingleton, Morton-Tinmouth, and Pierce Bridge, where it crosses the Tees. The greatest width of the Magnesian-limestone is about fourteen miles, between Cornforth on the west and Hartlepool on the coast. In the south-eastern part of the county, the whole of the surface is so much covered with alluvium that the nature of the subjacent rock cannot be easily ascertained. Three remarkable outliers belonging to this system are situated in Northumberland. The largest of these is near Whitley, the second is near Cullercoats, and the third forms the cap of the cliff on which Tynemouth Priory is situated. At a former period these outliers must have been connected with each other, and with the general mass of Magnesian-limestone which is seen on the coast at the south end of Shields sands.

As the Lower-new-red-sandstone and Marl-slate are generally seen only in the escarpment they do not occasion any material change in the outward appearance of the country, but the external features of the Magnesian-limestone are well marked, and peculiar. The escarpment on the west is rather abrupt, and forms an undulating line of more or less elevated eminences. In the interior the surface is broken by numerous, low, rounded hills, which are separated from each other by shortened vallies or "hopes." Towards the coast, extensive "denes" occur, which afford a passage for the small streams or burns which run from the escarpment towards the sea. Some of these denes are extremely picturesque and beautiful. In the first part of their course they are open and shallow, but as they

approach towards the sea they become deep and narrow, with precipitous masses of rock on either side, covered with foliage of luxuriant growth. Occasionally they are widened out into large amphitheatres, with sloping banks covered with trees and rare and peculiar plants, and afford shelter and food for many interesting animals. The coast-line is rather varied, and the cliffs generally low, but in a few instances where hills occur on the coast, the cliffs are high and precipitous. In several places along the coast, large picturesque masses of wave-worn rock, natural arches, and islets, which have been separated from the general mass of limestone, break the uniformity of the coast scene. Except in the south of the county of Durham very few sands occar, and these happen only where the limestone has been formerly denuded to the sea level.

All the above appearances, perhaps, are referrible to the variable nature of the limestone, some parts of which are very earthy and rubbly, and easily worn by the action of water, whereas other portions are hard and compact, and able to withstand the strongest denuding force.

In many localities between Boldon Hill and Midderidge Grange, at the base of the escarpment before mentioned, a bed of coarse incoherent sandstone of very variable thickness, and generally of a yellow colour, is situated. Beds of a reddish micaceous sandstone, more coherent than the former, and bands of red or dark coloured marls are oftentimes associated with it. These beds are at the base of the formation in this district, and rest more or less unconformably on the coal measures. They are the "Lower-new-red-sandstone" of English Geology, and from their relative position, are considered equivalent to the "*Rothe-todte-liegende*" of Germany. In Northumberland, the former of these beds is seen in the cliff at Cullercoats Bay, and the latter is well exposed near Tynemouth Haven. Fragments of a *Lepidodendron* and a *Calamite* have occasionally been found in the sandstone quarries between South Shields and Westoe, where the last mentioned bed is of great thickness.

A small deposit of "Marl-slate," equivalent to the "*Kupferschiefer*" of Germany, generally succeeds. It very rarely ex-

ceeds a yard in thickness, and sometimes is either entirely absent or represented by a few thin yellowish bands, which alternate with the compact lime-stone. It is generally of a dark-grey colour, graduating into yellow or buff, in several localities. When first quarried it is very close and refractory, but after a short exposure to the weather, it easily splits into thin laminæ or plates. This bed is exceedingly interesting on account of the numerous remains of fishes which are preserved in it. They are found, pressed quite flat between the laminæ of which this bed is composed, in the following localities:—Whitley Quarries and Cullercoats Bay, Northumberland; Boldon Hill, Houghton-le-Spring, Quarrington Hill, Thrislington Gap, East Thickley, Middridge, Aycliffe, and a few other localities in the county of Durham. A few marine plants and a shell or two also occur in this bed.

All the fishes of this formation belong to the Ganoid order, and have the vertebral column continued into the upper lobe of the tail. They are covered with stout, rhomboidal, highly enamelled scales, which are strongly articulated together, and so placed that one row overlaps another in a manner similar to the arrangement of tiles or slates on the roof of a house. This may account for the external covering being oftentimes so perfectly preserved, though the internal structure has, in most cases, entirely disappeared. In a few instances, however, traces of a vertebral column and spinous processes extending to the fins are distinctly visible. Very few fishes belonging to the Ganoid order now exist, and these few are very rare, and confined almost to the inter-tropical rivers of Africa and America. This circumstance taken in connection with the fact that the older *Palæonisci*, and several other genera, are found in fresh-water limestones and shales, containing land plants, is a strong presumptive proof that these fishes also inhabited rivers, which, probably, at this period, flowed through the coal-measures. It has been conjectured from the contorted forms of many of the specimens that they were suddenly destroyed by an infusion of sulphuret of copper into the waters they inhabited.* The great quantity of copper ore con-

* Agassiz, Poiss. Foss. II., p. 70.

tained in the equivalent bed in Germany, has, without doubt, given rise to this supposition; but if this had been the case, would not the bony covering have been considerably eroded, if not entirely destroyed? and might not considerable quantities of metallic sulphurets be expected to occur in this bed in connection with the fishes? In the marl-slate of this district, however, such metals are rarely found, and no signs of erosion are observable on the scales. In whatsoever way they were destroyed, it is most probable that they floated in the water till the internal parts were destroyed, and that they were driven towards the sea by sudden floods along with the sediment in which they were finally embedded. The preservation of a Lingula and a few fucoid plants, the stems of some of which are nearly upright, clearly prove that this bed was deposited along some coast and its similarity in appearance and mineral composition to some of the coal-measure shales probably indicates the sources from which it was derived.

In a few localities, as at Clack's Heugh on the Wear, the Marl-slate is entirely absent, and the lowest bed of limestone, which is seen in one part of the section resting on the sandstone, is very thin and earthy. In most localities, however, this lowest bed of limestone is very hard, compact, pure, of great thickness, and strong-bedded. On this account it is extensively quarried in many parts of the escarpment, where it is generally well exposed, as it is also in the well-known outlier near Whitley, in Northumberland. It contains a few fossils identical with species which are found in some of the higher beds of the formation. This bed has been identified with the German "*Zechstein*," to which it is related both in position and fossil contents; and it is succeeded by a large series of beds of limestone and yellow marl, which it is not possible to separate from it either by a natural line of demarcation, or fossil remains; it might therefore, perhaps, be more correctly grouped with the following extensive series of beds of limestone and yellow marls which are well known by the distinctive term "Magnesian-limestone," as many of them contain a considerable portion of carbonate of magnesia

in their composition. No other series of rocks are so complicated and variable in structure and appearance as these, so that it is almost impossible to give a description of a particular bed that will apply to every appearance of it. The following beds, which occur on the coast, are, perhaps, some of the most common and instructive forms presented by these rocks.

At the end of South Shields' sands a bed of coarse, irregularly-formed limestone is seen resting on, and passing into, the upper part of the compact bed before mentioned. It is of considerable thickness, and extends along the coast, nearly to Marsden Bay. This limestone is not sub-divided into smaller beds, but forms an irregular mass of a coarse concretionary structure, filled with shapeless cavities after exposure to the weather, and rent into large blocks by cracks and fissures, which cross it in almost every direction. In consequence of this fracturage, large masses are frequently disengaged from the upper part of this bed and are spread about at the base of the cliff. On entering Marsden Bay the appearance of the coast is slightly changed, and large piles of rock, which have for many years resisted the unceasing action of the tides, stand isolated among the waves. The cliff is here of great height, and is composed of an extensive series of compact and earthy laminated beds, among which irregular brecciated masses are situated. Some of the laminated beds are very hard, and of a yellowish-brown colour, emitting a fœtid smell when forcibly struck. These are intermixed with others, which are of an earthy texture, and yellowish colour, and which are often so finely laminated that they may be easily split into sheets not thicker than common pasteboard. This variety is slightly flexible. The brecciated masses associated with these appear to have been formed by the breaking up of some of the hard laminated beds into innumerable, different sized, angular pieces. These pieces are confusedly mixed, and connected together by a yellowish limestone, which serves as a cement to the whole mass. Leaving Marsden Bay, the cliff is composed of beds of an earthy appearance, intermixed with others which are slaty, hard, and very compact. Between Souter Point and Whitburn

the cliff is rather low, and composed of numerous beds which are hard, strong-bedded, and flag-like, associated with others which are more earthy in structure. At Byers' Quarry, a thin, crystalline bed occurs, in which a few shells are preserved. The same kinds are also found in some of the earthy beds further to the south. To the north of Whitburn, a bed of limestone, of small concretionary structure, appears in the cliff. This is followed by another, which is very strong-bedded and earthy, but before reaching Whitburn Sands, a bed, composed of globular masses, is seen at the base of the cliff. For about two miles along the coast the limestone disappears, but near Roker the last-mentioned bed occupies the whole of the cliff, which is here not very high. The globular concretions in this part of the bed vary from the size of a pea to more than a foot in diameter. At Fulwell, a short distance from the coast, this bed occurs with others of a more complicated structure. A piece of this rock, when the concretions are of a small size, very much resembles a bunch of grapes, and hence has been termed botryoidal limestone. It is called cannon-ball limestone when the concretions are very large. Many of the concretions in these beds are not solid, but are formed of laminæ, partly united, leaving numerous regularly arranged cavities, filled with a powdery substance between the harder parts. When cleaned from this powder, pieces of this rock slightly resemble a portion of honey-comb, and consequently this variety has been termed honey-comb limestone. Beds identical with these occur in much the same form at Building Hill, near Sunderland, and slightly modified in the cliff between Hendon and Ryhope, and in an adjoining quarry. The limestone here resembles masses of coral compressed together, and might be termed coralliform limestone, if a distinctive name were required. At Roker the globular masses sink for a short distance beneath the surface, and a thick bed of light-coloured, earthy limestone rests on it. This bed is composed of numerous thin layers which have a grooved appearance on the face of the cliff. The beds between Ryhope and Castle Eden are either of a laminated or of a coarse concretionary structure, resembling those which occur near Shields; but near Black Halls, a short

distance south of Castle Eden Dene the cliff presents the same laminated and brecciated beds as are seen at Marsden. At Black Halls the limestone sinks below the surface, and is not seen again on the coast, but in the mass on which Hartlepool is situated, several beds occur in the cliff-section, which are composed of concretions so small and regular that they perfectly resemble true oolitic rocks. In the south-eastern part of the county the beds of Magnesian-limestone are succeeded by a deposit of reddish sandstone and marl, which are supposed to belong to the "Upper-new-red-sandstone." These are generally concealed beneath heaps of alluvial clay and rubbish, and can only be examined in a section or two on the banks of the Tees, and another on the coast near Seaton.

The bed of limestone in which most of the marine remains peculiar to this system are found, and which by way of eminence may be styled the fossiliferous, is first seen capping the low-rounded hill, Humbleton, on the south side of the Durham and Sunderland road. It is here of considerable thickness, very hard, and somewhat crystalline, though some portions of it are earthy and rubbly. More or less changed in appearance in each of the following localities, it is present in the series of low hills which range from Humbleton Hill by Silksworth, and Tunstall Hill to Ryhope, Dalton-le-Dale, and Hawthorne Hive, where the line is broken by the coast. It must be observed that the fossils are not equally distributed throughout this bed. In some parts of it there are no traces of them, but other parts are entirely composed of shells, broken corals, and encrinital stems matted together. In Humbleton quarry, when the shell is preserved, the outer surface is nearly obscured by a thin coating of lime, but most frequently the casts only remain, the shell falling to pieces immediately the stone which contains it is broken. In this case a cast of the outer surface of the shell is contained in the matrix. At Tunstall Hill the limestone is very hard and crystalline. The outer surface of the shells imbedded in it are generally well preserved, and they are either filled or lined internally with crystals of carbonate of lime. At Silksworth and Dalton they are either in casts or with the shell well preserved. In the lat-

ter locality and at Tunstall they occasionally are found in a powdery substance, which fills the cavities between the harder portions of the rock. In this situation they are often finely preserved, and can frequently be so entirely extricated from the enveloping matter as to shew both the external appearance and internal structure.

In some of the specimens from the thin crystalline bed at Byers' Quarry and in some of those from Tunstall-hill, the original structure of the shells has become crystalline. This change must have taken place at the time when the rocks in which they are imbedded, assumed their present appearance, for they possess the same cleavage and are oftentimes the nucleus of a radiated crystalline mass. Though this renders it extremely difficult to extricate the shell from its matrix, yet the original form of the shell has not been in the least injured nor the markings on the outer surface obliterated.

It has been supposed, from the comparative scarcity of marine remains found in these rocks, that many species of mollusca, fishes, etc. existed during this period and were afterwards imbedded in the sediment, of which the different beds are formed, but owing to the earthy nature of the surrounding matrix and to the crystalline movements which took place after their deposition, have entirely disappeared.* From the observations which have just been made on the state of these fossils, it appears that they are found in some parts of this deposit, which are quite earthy and pulverulent as well as in those of a concretionary and highly crystalline structure. Indeed shells are preserved in some of these rocks under conditions apparently so unfavourable to their preservation as entirely to prevent a conclusion being drawn that any have wholly disappeared for want of a proper matrix to secure them.

It is worthy of remark that most of the species which are found in the compact limestone of Whitley, etc., occur also in some of the thin crystalline beds along the coast, in the concretionary beds of Marsden Hill, and in the fossiliferous bed at Humbleton, etc., from the lowest to the highest fossiliferous beds of the

* Sedgwick, Geol. Trans. 2nd ser. iii., p. 99 . Ansted's Geology, i., p. 236.

formation. It would appear from this that no material change in the marine fauna took place during the whole time the limestone was being deposited, and further, perhaps, it may be safely concluded that a very correct representation of the marine fauna that actually existed during this period, is still preserved in these rocks.

The greater part of the shells found in the fossiliferous bed are of full sized individuals, and from the circumstance of a Serpula and a Spirorbis having grown to the internal surface of many of them, they must have been some time dead before they were finally embedded. Generally, the bivalves are either entirely separate or slightly opened, and the plates of a Chiton are found at considerable distances from each other. Some of the corals are broken into small pieces and much spread about; and the joints of an Encrinite are strewn all through the bed. The shells, however, do not appear to have been in the least broken, and very few of them have been worn by the action of water. A conclusion from these appearances may be safely drawn that this bed was quietly and gradually deposited.

If the shells enumerated in the list are carefully examined it will be found that most of them are referrible to genera which live either on the coast or in water of moderate depth, and, therefore, as the most common and characteristic forms bear a decidedly littoral aspect, it seems only right to infer that this bed, at least, was deposited in comparatively shallow water, and at no great distance from land.

It was long since asserted by several eminent Geologists, that the fauna of this formation bore a greater resemblance to those of the Carboniferous and the older rocks generally, than to others of more recent date.* This opinion has lately been fully established by a careful comparison of the faunas of these rocks in different parts of Europe with each other, and with those of the older and of the more recent systems.† In this examination several allied species are supposed to occur in all the older rocks from the Silurian up to the Permian system inclu-

* Sedgwick, Geol. Tr. 2nd ser., iii., p. 99; Phillips, Palæoz. Foss. p. 165.

† Geology of Russia, Vol. I., p. 199.

sive, and a few are said to be common to the Carboniferous and the Permian rocks. The most conspicuous of these are *Pleurotomaria (H.) carinata*, Sow., *Spirifer (T.) cristata*, Schloth., *Terebratula elongata*, Schloth. and *Fenestella (Gorg.) antiqua*, Goldf. After carefully examining the specimens from the Magnesian-limestone, and comparing them with the descriptions and figures of those with which they have been united, it appears from characters that will be stated under each species, that *Pleurotomaria carinata* does not occur in the Magnesian-limestone, that *Spirifer cristata* is quite distinct from *Spirifer octoplicata*, Sow., that the *Terebratula elongata* is very different from *T. hastata*, Sow., and that the *Fenestella (G.) antiqua*, Goldf. is not identical with the species referred to it by Mr. M'Coy, Prof. Phillips, and Prof. Lonsdale. This reference, however, by such distinguished authors of species peculiar to one system to those peculiar to another, though not satisfactory as it regards species, is yet the strongest proof that can be given of the close relations of the faunas of these two systems.

Many of the genera which occurred and were common in the Carboniferous rocks did not ascend into the Permian system. Of these the most remarkable are the genera Orthoceras, Bellerophon and Goniatites among the *Cephalopoda;* Euomphalus, Cirrus and Loxonema among the *Gasteropoda;* Posidonia and Pleurorhynchus among the *Conchifera;* Leptæna and Chonetes among the *Brachiopoda;* the whole family of Trilobites among the *Crustacea;* and many families and genera among the *Echinodermata* and *Zoophyta*. This loss of families and genera is attended with a diminution in the number of species, and in the size of the individuals of those genera which have survived. Though the *Brachiopoda* are sufficiently numerous in the Permian system, and are still large enough to be considered the most characteristic group, yet some of them occur in these rocks for the last time, as the genus Orthis; and several genera, as Productus and Spirifer, which are found again in more recent systems, are so dwindled in size and are so few in number as to be easily overlooked. For the sake of comparison and in proof of the great diminution of species, the number of fossils which occur

in the Carboniferous rocks of the North of England is included in the following table :—

Classes.	*No. of Genera and Species peculiar to the Permian System, mentioned*								*No. of Genera & Species found in the Mountain-limestone of the North of England.*	
	In Prof. Sedgwick's List.	*In Prof. Phillips's List.*	*In the List of Geol. Russ.*		*In the present List.*		*As occurring in all Europe.*			
Reptilia,	—	—	—	—	—	—	4	5	—	—
Pisces,	7	10	5	11	6	13	16	43	—	few.
Cephalopoda,	1	2	1	1	1	1	1	3	6	89
Gasteropoda,	3	4	6	8	7	12	11	22	14?	100
Conchifera, Lamellibranchiata	12	15	9	16	12	20	15	42	17?	60
———, Palliobranchiata,	4	15	4	12	7	16	7	30	6?	120
Annelida,	—	—	1	1	2	3	1	2	—	few.
Crustacea,	—	—	—	—	—	—	2	2	1	8
Echinodermata Echinidæ,	—	—	1	1	1	1	1	1	1	2
——— Crinoidea,	1	1	1	1	1	1	1	1	8	40
Zoophyta,	2	3	5	7	4	9	7	15	13	41
Miscellaneous,	3	1	—	—	—	7	—	—	—	3
Total,	33	51	33	58	41	83	66	166	66	463

Besides our own collection, we have had an opportunity, while drawing up the following Catalogue, of examining the fine collection of fishes from the Marl-slate in the Museum of the Natural History Society of Newcastle, and the collections of fossils from the Magnesian-limestone in the possession of Mr. W. K. Loftus of Newcastle, Mr. G. Tate of Alnwick, and Mr. T. E. Backhouse of Sunderland.

VERTEBRATA.

Class. PISCES, *Linnæus.*

Order GANOÏDES, *Agassiz.*

Family Lepidoides, *Ag.*

1. PALÆONISCUS, *Ag.*

1. P. comtus, *Ag.*

Palæoniscus comtus, Ag., Poiss. Foss. ii., p. 97, pl. 10 b, f. 1-3.

Palæothryssum magnum, Blainv., Geol. Tr. 2nd ser., iii., p. 117, pl. 8, f. 1.

Palæothryssum macrocephalum, Blainv., Geol. Tr. 2nd ser., iii., p. 117, pl. 9, f. 2.

In the Marl-slate; not uncommon. Whitley, Cullercoats, Boldon Hill, Quarrington Hill, Ferryhill, East Thickley.

Of all the fishes which occur in the Marl-slate, the *P. comtus* is the most common and characteristic species. "The head is about one-fourth of the whole length of the body; all its bones have the outer surface marked with points disposed in irregular rows. The pectoral fins are of a moderate size, but proportionally larger than the ventrals, the anal, and the dorsal. The tail is large, but its rays are less slender and more bifurcated than in the following species. The transverse articulations of the rays of this fin are also more distant, but those of the dorsal and anal are less than in *P. elegans*. The scales vary considerably in size and form, according to the part of the body which they occupy. Those of the flank are largest, they are higher than wide, and all their surface is ornamented with furrows and very close punctures, which are nearly parallel, and which terminate on the posterior side in a finely serrated margin. The superior side of the scales is concave, and the inferior convex. The scales of the upper lobe of the tail become more elongated as they approach towards the extremity. In addition to these characters, it will be easy to distinguish this species by its

general form."—*Ag.* It is frequently found in the before mentioned localities.

Last summer, while working some Marl-slate in Cullercoats Bay, to which our attention was directed by Mr. A. Hancock, we obtained two specimens of a Palæoniscus which differ in a few particulars from the ordinary appearance of *P. comtus.* The body, fins, and scales, are rather larger and stouter than we have seen in the above species. The scales are nearly square, very closely punctured, and the posterior margin is finely and closely serrated. Without a more complete specimen we cannot be certain that it is distinct.

2. P. ELEGANS, *Sedgw.*

Palæoniscus elegans, Ag., Poiss. Foss. ii., p. 95, pl. 10 b, f. 4, 5.

Palæothryssum elegans, Sedgw., Geol. Tr. 2nd ser., iii., p. 117, pl. 9, f. 1.

In the Marl-slate; rather rare. Ferryhill, Thickley, Midderidge, Whitley, Cullercoats Bay.

"The *P. elegans* is distinguished from the other species of this genus by its more elegant form and well-proportioned dimensions. Its head equals about one-fifth of the whole length of the body. The surface of all the head bones is ornamented with diverging rays in the direction of their growth. The pectorals, ventrals, dorsal, and anal, are proportionally small. The transverse articulations of the dorsal and anal are always very distant, but they do not appear to be so, because these divisions alternate from one ray to another. The tail has exactly the same form as that of the *P. Frieslebeni* of Germany, but the superior lobe is narrower, and the inferior is longer, than in that species. It is this appearance which has caused Professor Sedgwick to remark that the lobes of this fin were less unequal than in the other species. Its rays are also very slender, and as they are continually bifurcated almost from their base, they appear yet more fine and slender. The transverse articulations of the rays of the superior lobe are so close that they appear but little longer than wide, but those of the inferior are more distant. The scales are nearly of the same form on all parts of the body,

but they are a little larger on the anterior part, and about as high as wide. Their surface is nearly smooth, only a few striæ are seen near the anterior side. The posterior margin is denticulated. Near the end of the tail the striæ and denticulations gradually disappear, and completely fail on the little elongated scales which cover the upper lobe. It is to be remarked that the superior and inferior sides of the scales, especially those of the tail are straighter than their posterior side, while in the *P. comtus* they are sensibly arched."—*Ag.*

3. P. GLAPHYRUS, *Ag.*

Palæoniscus glaphyrus, Ag., Poiss. Foss. ii., p. 98, pl. 10 c, f. 1, 2.

In the Marl-slate; rare. Ferryhill, Thickley.

"The head of this fish is proportionally very small. It equals about one-fifth of the total length of the body, and is of less width than the trunk. The rays of the fins are more distant, and the bifurcations are less numerous than in the other species belonging to this genus, but they are very much jointed. The scales are proportionally very large on all the surface of the body. Their exterior surface is quite smooth, and their sides are straight; the posterior side is distinguished by very distinct notchings. All the scales are very thin. The most characteristic features of this fish are its great scales and its short body."—*Ag.*

We have seen a fragment of a fish found by J. H. Fryer, Esq., in a laminated nodule of Magnesian-limestone, from Marsden Bay, which appears to belong to this species.

4. P. LONGISSIMUS, *Ag.*

Palæoniscus longissimus, Ag., Poiss. Foss. ii., p. 100, pl. 10 c., f. 4.

In Marl-slate; rare. Ferryhill.

"This fish may be distinguished from all others of the genus, by its great length. The head equals about one-sixth of the whole length of the body. The fins are proportionally small, and owing to the great length of the body, they are very distant; the dorsal is opposed to the ventrals, and occupies the middle of the back. The anal fin is nearer to the tail than to the ventrals; the fins are bifurcated about one-third of their length, and as

their transverse articulations are rather distant, the joints are longer than wide. The rays of the inferior lobe of the tail are larger than those of the superior, and more bifurcated towards their extremity. The scales are of a middling size; their surface is marked with irregular striæ, and punctures which are most numerous on the anterior scales."—*Ag.*

This species, with the preceding, must be considered as comparatively rare.

5 P. MACROPTHALMUS, *Ag.*

Palæoniscus macropthalmus, Ag., Poiss. Foss. ii., p. 99, pl. 10 c, f. 3.

In the Marl-slate; rather rare. Cullercoats Bay.

"The head of this fish is larger in proportion to the rest of the body than in the other species. It is rather more than one-fourth of the length of the body. The fins are very small, and their rays are very thin, and bifurcated nearly to their extremity. The transverse articulations are very distant. The scales are very small, and of nearly the same size on all parts of the body. The surface of the scales is furrowed with many irregular striæ. The posterior side of the scale is not serrated."—*Ag.*

2. PLATYSOMUS, *Ag.*

1. P. MACRURUS, *Ag.*

Platysomus macrurus, Ag., Poiss. Foss. ii., p. 170, pl. 18, f. 1, 2.—Sedgw., Geol. Tr. 2nd ser., iii., pl. 12, f. 1, 2.

In Marl-slate; rather rare. East Thickley, Thrislington Gap.

This is by much the largest species of Platysomus found in the Marl-slate. It may be easily distinguished from the other species by its large tail, and the great width of the anterior part of the body. A specimen in the Newcastle Museum has the teeth finely preserved. They are of a tubercular form, and very much polished.

2. P. STRIATUS, *Ag.*

Platysomus striatus, Ag., Poiss. Foss. ii., p. 168, pl. 17, f. 1—4.—Sedgw., Geol. Tr., 2nd. ser. iii., pl. 12, f. 3, 4.

In the Marl-slate; rather rare. Whitley, Thrislington Gap.

The body of this fish is rounder than in the other species. Its

greatest width is near the middle of the back. The scales are of a moderate size, much larger in the middle than on the upper and lower portion of the body. All the scales are covered with fine, wrinkled striæ, which are disposed obliquely over the surface.

3. P. PARVUS, *Ag.*

Platysomus parvus, Ag., Poiss. Foss. ii., p. 170, pl. 18, f. 3.

Chætodon, Winch, Geol. Tr. 1st ser., iv., pl. 2.; Clanny, Ann. Phil. vi., p. 115.

In Magnesian-limestone; very rare. Pallion, near Sunderland.

The unique specimen, from which the following characters are taken, is at present preserved in the Sunderland Museum. It is exceedingly interesting, as well for its fine state of preservation as for being the first fish noticed in the Magnesian-limestone. It was first made known to geologists by Mr. N. J. Winch, who published a reduced figure of it, in the Geological Transactions. The figure given by M. Agassiz is only a copy of this, and as he has named it *parvus*, a name quite inapplicable to this fine species, it is probable that he supposed the figure to be of the natural size. It is also figured by Dr. Clanny in the Annals of Philosophy.

The general form is sub-rhomboidal, broadest near the posterior extremity. The head is rather angulated, and about one-third the whole length of the body. The fins are arranged, as in the preceding species, from the middle of the dorsal and ventral margins to the tail. The pectorals are rather small, and finely rayed, and the joints of the rays are rather distant, and longer than wide. The rays of the dorsal and ventral are rather distant, and strong; and the joints are short, and of the same width. The tail is comparatively very small, and only a small portion of the body is continued into its upper lobe. The rays of this lobe are very fine, but in the lower they are much stronger and closely articulated. The scales are rather large, rhomboidal or square, and arranged in curved rows from the anterior of the body to the tail. The scales are largest in the middle, and gradually decrease in size towards the upper and lower portions of the body. They are covered, as in the former species, with obliquely-arranged, finely-

wrinkled striæ. This fish measures about eight inches and a half in length, and the greatest width is about five and a half.

FAMILY. SAUROIDES, *Ag.*

3. ACROLEPIS, *Ag.*

1. A. SEDGWICKII, *Ag.*

Acrolepis Sedgwickii, Ag., Poiss. Foss. ii., p. 80, 2e ptie., pl. 52.—Sedgw., Geol. Tr. 2nd ser., iii., pl. 8.

In Marl-slate; rare. Ferryhill.

"The finest specimen of this rare species was in the possession of the late H. T. M. Witham, Esq. Fragments are also in the possession of Lord Enniskillen and Sir Philip Egerton."—*Ag.*

4. PYGOPTERUS, *Ag.*

1. P. MANDIBULARIS, *Ag.*

Pygopterus mandibularis, Ag., Poiss. Foss. ii., p. 76, 2e ptie., pl. 53, 53 a.—Sedg., Geol. Tr. 2nd ser., iii., pl. 10, 11.

In Marl-slate; rather rare. Whitley, Cullercoats, Ferry-hill.

"This fish is of a great size, lanceolate form and remarkable for the extraordinary development of the fins. The tail is very large, widened, and composed of a considerable number of rays, which are very much subdivided in the middle. The upper lobe is covered with scales, nearly to its extremity. The scales are of an uniform size on all parts of the body. The surface is finely dotted, but the dots are so small that they cannot be seen without a lens. The posterior sides of the scales are not serrated."—*Ag.*

2. P. SCULPTUS, *Ag.*

Pygopterus sculptus, Ag.. Poiss. Foss. ii., 2e ptie., p. 77.

M. Agassiz who has indicated but not yet described this species, says "It comes from the same bed as the *P. mandibularis,* but differs from it in the ornaments of the scales, which are sculptured. Its form is short and thick."

FAMILY CŒLACANTHES, *Ag.*

5. CŒLACANTHUS, *Ag.*

1. C. GRANULATUS, *Ag.*

Cœlacanthus granulatus, Ag., Poiss. Foss. ii., pl. 172, 2e ptie. pl. 62.

In Marl-slate; rare. Ferryhill. This species has been found only in the above locality. The only fragments known were in the possession of the late H. T. M. Witham, Esq.

ORDER. PLACOÏDES, *Ag.*

FAMILY. ICHTHYODORULITHES, *Ag.*

6. GYRACANTHUS, *Ag.*

A cast of a spine evidently belonging to a fish of this genus was found a few years ago in the quarries of Lower-new-red-sandstone, between South Shields and Westoe. It is preserved in the Newcastle Museum.

MOLLUSCA.

CLASS. CEPHALOPODA, *Cuvier.*

ORDER. TETRABRANCHIATA, *Owen.*

FAMILY. NAUTILIDÆ, *Gray.*

7. NAUTILUS, *Linnæus.*

1. *N.* FRIESLEBENI, *Geinitz.*

Nautilus Frieslebeni, Gein., N. Jahrb., p. 637, pl. 11, f. 1.

Ammonites ? Sedgw., Geol. Tr. 2nd ser., iii., p. 118.

In Magnesian-limestone; not common. Whitley, Humbleton-hill, Tunstall-hill, Silksworth, and Dalton-le-dale.

The whorls of young individuals are slightly angulated, but they are much rounder in full-grown specimens. The chambers are small and numerous, and the siphuncle is close to the ventral margin. The dorsal margin is slightly sinuated; the umbilicus moderate, and the surface covered with obscure striæ of growth. It is not very common, and is generally in fragments when found.

Class. GASTEROPODA, *Cuvier.*

Order. PECTINIBRANCHIATA, *Cuvier.*

Family. Ianthinidæ, *Gray.*

8. PLEUROTOMARIA, *Defrance.*

1. P. penea, *d'Verneuil.*

Pleurotomaria penea, d'Vern., Geol. Russ. ii., p. 336, pl. xxii., f. *5*, a, b.

In Magnesian-limestone; rare. Dalton-le-Dale.

This species is somewhat conical, with a short spire and about four whorls, very much flattened above and slightly convex below. We have seen only two specimens of this species, which were not very well preserved, but as far as they could be compared they agreed with the *P. penea* of Russia.

2. P. nodulosa, *King.*

Pleurotomaria nodulosa, King, Geol. Russ. i., p. 225.

In Magnesian-limestone; not common. Humbleton, Tunstall, Garmonsway, near Coxhoe Hall.

This species is easily distinguished from all others found in the limestone by its beautifully decussated surface, and by having one row of distinct wavy nodules round the suture, and another round the slit in full-grown specimens. In young specimens the nodules are absent. It is the largest species found in the Magnesian-limestone. We possess one specimen more than an inch in length and width.

3. P. Sedgwickii, *n. s.*

Pleurotomaria carinata, Geol. Russ. i., p. 225; not Sow. nor Phill.

Shell rather conical, small; spire, elevated; whorls, 6 or 7, slightly keeled, flattened above, slightly convex beneath; suture not deep, rather below the keel of the previous whorl; surface with obsolete lines of growth; pillar-lip straight, slightly reflexed, forming a small umbilicus, sub-angulated

at the base; outer-lip deeply curved towards the slit; slit long, narrow.

In Magnesian-limestone; common. Humbleton, Tunstall, Silksworth, Dalton-le-Dale.

VAR. AMPULLOSA.

Shell rather depressed, ampullose; spire less elevated; whorls rounded, convex above and below; suture deep.

Rather rare. Silksworth.

P. Sedgwickii is very distinct from the *P. (H.) carinata*, Sow., of the Mountain-limestone, to which it has been referred. The spire of this species is very conical, and composed of seven or more whorls, which are very much flattened above and which increase very gradually in size, whereas in the *P. carinata* the whorls are fewer in number, rounder in form and increase more rapidly. The striæ of growth are also much less distinct in the present species. In general form it much resembles the *P. Karpinskiana*, of the Mountain-limestone of Russia. The specimens which are considered as a variety of this species differ from the general form in having a shorter spire and rounder whorls.

In dedicating this neat species to Professor Sedgwick, we are desirous of expressing our admiration of his excellent paper "On the Geological Relations and Internal Structure of the Magnesian-limestone," etc., published in the Geological Transactions. This paper contains a more detailed and correct account of the Magnesian-limestone of this district than any other work on the same subject.

FAMILY. LITTORINIDÆ, *Gray.*

9. LITTORINA, *Ferrusac.*

1. L. MANCUNIENSIS, *Brown.*

Turbo Mancuniensis, Brown, Manch. Geol. Tr. 1, pl. 6, f. 1, 2, 3.

Turbo minuta, Brown, Manch. Geol. Tr. 1, pl. 6, f. 4, 5.

In Magnesian-limestone; not uncommon. Tunstall, Humbleton, Silksworth.

This species varies considerably in appearance. The spiral

ribs in some specimens are very distinct, with a deepish furrow and a smaller rib between them; in others the ribs are indistinct and the surface is covered with spiral planes. The ribs are smaller and more numerous on the under part of the whorls. The striæ of growth are generally very strong. The *T. minuta* appears to be only the young of this species.

2. L. TUNSTALLENSIS, *n. s.*

Shell small, conical; spire elongated, composed of 4 *or* 5 *gradually enlarged whorls, which are very round and finely ribbed or sulcated; aperture round; pillar-lip rather flattened.*

In Magnesian-limestone; rather rare. Tunstall-hill.

Though found with the former species, it is easily distinguished from it by the gradual enlargement and roundness of the whorls, the fineness of the ribs, the comparative length of the spire, and the absence of a slit behind the pillar-lip. It is also less common and much smaller. Specimens sometimes occur which are nearly smooth.

3. L. MINIMA, *Brown.*

Natica minima, Brown, Manch. Geol. Tr. i., pl. 6, f. 22—24.

In Magnesian-limestone; not common. Tunstall, Silksworth.

This smooth species has the pillar-lip flattened with an angulated base, but so slight, as not to destroy the orbicular form of the mouth; when not worn, it is covered with fine striæ of growth.

With the former species this very much resembles some of the recent *Littorinæ*. The outer-lip of some of the specimens has been fractured and again repaired similarly to what may often be observed in many littoral species.

10. TURRITELLA, *Lamarck.*

1. T. PHILLIPSII, *n. s.*

Melania ——, Phill., Geol. Trans. 2nd ser., iii., p. 118.

Shell elongated, narrow, slightly tapering, turretted; spire with 12 *or more rounded whorls, which are rather convex and slightly flattened behind; suture deep; pillar-lip slightly angulated in front; aperture sub-orbicular.*

In Magnesian-limestone ; not common. Tunstall, Humbleton, Dalton-le-Dale.

In the Geological Transactions this shell is indicated as a Melania by Professor Phillips. It is evidently a marine shell bearing a greater resemblance to Turritella than to any other genus we are acquainted with. It is dedicated to the above-named gentleman, who first noticed it as occurring in these rocks.

2. TUNSTALLENSIS, *n. s.*

Melania ——, Geol. Trans. 2nd ser. iii., p, 118.

Shell elongated conical; spire with 8 *whorls, which are much rounded,, smooth ; suture deep ; aperture orbicular.*

In Magnesian-limestone ; not common. Tunstall-hill.

The spire is shorter, and the whorls are more convex, and enlarge more rapidly in this than in the preceding species. As it has not been noticed before it must have been considered identical with the former species.

11. CHEMNITZIA, *D'Orbigny.*

We procured a fragment of a small shell from Tunstall-hill, which possesses more of the characters of this genus than of any other we are acquainted with. It has a few gradually increased whorls, which are very convex, and deeply fluted. The suture is deep, and the pillar straight. This may be the shell included in the tabular list in the Geology of Russia, as *Loxonema rugifera.* It cannot, however, be referred to that species, nor to the genus *Loxonema,* as the suture is deep, and not pressed against the former whorl, as in that genus. It is also destitute of striæ.

12. EULIMA, *Risso.*

1. E. SYMMETRICA, *King.*

Macrocheilus symmetricus, King, Geol. Russ., p. 225.

In Magnesian-limestone; rather rare. Tunstall, Silksworth.

This elegant little shell is rather subulate in form. The spire has about eight slightly-convex whorls, which are quite smooth. It is sometimes nearly an inch in length, and a quarter of an inch in width.

ORDER. SCUTIBRANCHIATA, *Cuvier.*

FAMILY. CALYPTRÆIDÆ, *Gray.*

13. CALYPTRÆA, *Lamarck.*

1. C. ANTIQUA, *n. s.*

Shell small, patelliform; strongly ribbed longitudinally; margin crenulated; two deep furrows internally, from the apex to the margin, corresponding with two strong ribs on the outer surface.

In Magnesian-limestone; rare. Tunstall-hill.

Only one small specimen of this shell has occurred. The characters noted above are very conspicuous, and its strong resemblance to many of the Calyptræa has induced us to place it in that genus.

ORDER. CYCLOBRANCHIATA, *Cuvier.*

FAMILY. CHITONIDÆ, *D'Orbigny.*

14. CHITON, *Linnæus.*

Chiton, Ann. Nat. Hist., vol. xiv.; London Geol. Journal, 1846, p. 10.

In the Magnesian-limestone; rare. Tunstall, Humbleton, Silksworth.

Plates of a Chiton were first discovered in the limestone of Tunstall-hill, by W. K. Loftus, Esq., of Newcastle, in company with Mr. W. King. We have since taken specimens at Humbleton and Silksworth. The plates have, hitherto, been found separate, but not far distant from each other. Figures of the plates of this Chiton are given in the London Geological Journal, by Mr. W. King.

Class. CONCHIFERA, *Lamarck.*

Order. LAMELLIBRANCHIATA, *Blainville.*

Family. Tellinidæ, *D'Orbigny.*

15. TELLINA, *Linnæus.*

1. T. Dunelmensis, *n. s.*

Shell elliptical; beaks small, not prominent, situated near the anterior end, which is somewhat rounded; posterior elongated more acute than the anterior; two cardinal teeth in each valve.

In Magnesian-limestone, rare. Humbleton Hill.

Differs very slightly in general outline from the *Sanguinolaria Romeri*, figured in the Geology of Russia.

Family, ———.

16. SANGUINOLITES, *M'Coy.*

1. S. elegans, *King.*

Allorisma elegans, King, Ann. Nat. Hist., xiv., p. 316.

In Magnesian-limestone; rather rare. Humbleton, Tunstall?

This fine species is generally badly preserved. It is a transversely elongated shell, with the posterior much lengthened and obliquely truncated, and the anterior short and acutely rounded. It is slightly constricted near the anterior extremity.

Family, ———.

17. EDMONDIA, *de Koninck.*

1. E. elongata, *n. s.*

Shell elongated oval; beaks prominent, near the anterior end; anterior short, rounded; posterior elongated, the dorsal margin on a line with the beak; surface convex, covered with strong concentric lines of growth; hinge margin without teeth; umbonal cavity divided longitudinally by an elongated, thin, slightly-curved visceral plate, depending towards the cavity of the shell.

In Magnesian-limestone ; rare. Tunstall, Humbleton.

It is more elongated than the *E. unioniformis* of the Mountain-limestone. The margins are also more nearly parallel, and it is of a smaller size.

Family. Solenimyadæ.

18. SOLENIMYA, *Lamarck.*

1. S. ABNORMIS, *n. s.*

Shell transversely oval ; beaks not prominent ; posterior short, narrow, rounded ; anterior elongated, rounded, much wider than the posterior ; surface slightly waved concentrically, plain ; muscular impressions obliquely placed, deep.

In Magnesian-limestone ; rare. Tunstall, Silksworth.

From the *S. primæva* of the Mountain-limestone, this species differs in being destitute of the radiating ribs so conspicuous in that species, and also in being less arcuated, and broader on the anterior portion of the shell. The anterior muscular impressions of this species are also larger and less obliquely placed. It is very rare.

2. S. NORMALIS, n. s.

Shell, transversely oval, narrow, slightly arcuated ; beaks indistinct near the posterior end ; anterior elongated ; muscular impressions large, slight ; a few raised lines diverging from the beaks to the free margins on the cast; external surface smooth.

In Magnesian-limestone ; rare. Humbleton Hill.

A single valve of this apparently rare shell was found in Humbleton quarry. It slightly resesembles the *S. biarmica* of the Russian Permian rocks, and another species from the Mountain-limestone of Northumberland, but the beak is near the posterior end, and the shell is narrower than it is in those species. It very strikingly resembles a recent species from the Mediterranean.

FAMILY. ———.

19. MYOCONCHA, *Sowerby.*[*]

1. M. COSTATA, *Brown.*

Arca costata, Brown, Manch. Geol. Tr. i., pl. 6, f. 34, 35.

Modiola costata, Geol. Russ. i., p. 224.

In Magnesian-limestone ; common. Humbleton, Tunstall, Silksworth, Roker, Souter Point, Whitley.

This species is of an oblong ovate form, with the anterior very slightly produced and rounded. The posterior is much elongated and slightly rounded. The surface is ornamented with five or more radiating ribs, which are slightly elevated and confined to the posterior portion of the shell. The surface between these ribs is flattened and covered with strong lines of growth. The hinge-margin of the right valve is furnished with a distinct, oblique tooth or callosity, which fits into a corresponding depression in the left valve. The anterior muscle secretes a small ridge or bar under the beak, which leaves a groove in the cast. The scar of the posterior muscle is large and oval, and no sinus has been observed in the pallial line. It agrees very well in general characters with the Myoconcha of Sowerby. Externally it strikingly resembles the *M. Helmersiana,* an oolitic fossil of Russia.

2. M. MODIOLIFORMIS, *King.*

Pleurophorus modioliformis, King, Geol. Russ., p. 224 ?

In Magnesian-limestone ; not uncommon. Humbleton, Tunstall, Silksworth.

This species is shorter and more tumid than the former, and very much resembles in general form some of the recent Modiolæ. It sometimes has a few radiating ribs on the posterior surface, but at other times it is almost smooth.

20. AXINUS, *Sowerby.*

1. A. TRUNCATUS, *King.*

Schizodus truncatus, 1845, King, Geol. Russ. i., p. 224 ; ii., p. 309.

[*] Sowerby, Min. Conch., tab. 467.

In Magnesian-limestone; not uncommon. Humbleton, Tunstall, Silksworth, Cornforth; Whitley Quarries.

In this species the margins are more nearly parallel, and the posterior end is much wider and more truncated than in the *A. obscurus*. The anterior is rather convex, and very much rounded. The beaks are prominent, and the surface of the valves is slightly waved and ornamented with numerous concentric acute ridges, which are most conspicuous on the anterior extremity.

2. A. OBSCURUS, *Sow.*

Axinus obscurus, Sow. Min. Conch. tab. 314.

In Magnesian-limestone; not common. Marsden, Byers' Quarry, Roker.

The specimens which are referred to this species occur in several of the thin beds of limestone on the coast between South Shields and Sunderland. They are generally much smaller than those which occur in Yorkshire.

FAMILY. ARCADÆ, *Gray.*

21. ARCA, *Linn.*

1. A. LOFTUSIANA, *n. s.*

Shell transversely elongated, sub-rectangular; anterior, short, tumid; posterior, elongated, often slightly compressed, obliquely truncated; beaks prominent, approximating; surface strongly ribbed; ribs, numerous, strong, rarely bifurcated, granulated on the anterior and posterior; hinge-line, with four or five oblique teeth on the anterior, and two or three parallel teeth on the posterior side.

In Magnesian-limestone; not common. Tunstall, Humbleton.

The general form of this shell is slightly rectangular owing to the free margins being almost parallel to the hinge-line, and to the posterior being much elongated. The anterior in some specimens is very tumid, in others slightly compressed, comparatively short and rounded. The posterior is very much elongated, widened, flattened, and obliquely truncated. The surface is covered with numerous strong radiating ribs, which are covered with distinct, close granulations on the posterior and anterior parts of the shell. The beaks are large and placed near to the an-

terior end, and as the ligamental area is small they are rather close.

It may be easily distinguished from the *A. tumida*, Sow., by its more elongated and less tumid appearance. The anterior is rather longer and rounder, and the posterior much longer and not so sharply truncated. The margins are more nearly parallel and the ligamental area is smaller. It is also distinguised from the *A. antiqua*, Münst., of the German Zechstein, by its less ovate and ventricose form. At first we were inclined to consider it identical with the *A. Lacordairiana*, of M. de Koninck, but it differs from that species in many particulars.

We dedicate this species to W. K. Loftus, Esq., of Newcastle, to whom the naturalists of this district are indebted for the discovery of the Chiton at Tunstall-hill.

2. A. TUMIDA, *Sow.*

Arca tumida, Sow. Min. Conch., tab. 474, f. 3.

In Magnesian-limestone ; common. Humbleton, Tunstall, Silksworth, Dalton.

This characteristic species is very tumid towards the anterior portion of the shell. The beaks are very distant, in consequence of the great size of the ligamental area. The surface is covered with strong radiating ribs, which rarely bifurcate, but gradually widen towards the lower edge of the shell. These ribs are distinctly granulated on the posterior slope only. The free margin is very much curved, and the curve for the byssus is very large. The individuals of this species are generally well preserved. Many of them were bored by some carnivorous animal before they were imbedded in the rock.

3. A. KINGIANA, *d'Verneuil.*

Arca Kingiana, d'Vern., Geol. Russ. ii., p. 313, pl. xix., f. 11.

In Magnesian-limestone ; rather rare. Tunstall-hill.

This species is not very common in our limestone. The specimens are rather small. Some of them have a few obsolete diverging ribs on the middle and posterior portions of the shell, but do not otherwise differ from the description given of the Russian specimens.

22. LEDA, *Schumacher*.

1. L. Vintii, *King*.

Nucula Vinti, King, Geol. of Russ. i., p. 224 ?

In Magnesian-limestone ; rather rare. Whitley, Northumberland ; Byers' Quarry, near Souter Point.

The anterior portion of this species is rounded and much more convex than the posterior, which is small and slightly rostrated. The surface is covered with numerous fine concentric lines of growth. It occurs in a thin bed of limestone in Whitley Quarries, and in a very thin crystalline bed near Souter Point.

Family. Mytilidæ, *Fleming*.

23. MYTILUS, *Linnæus*.

1. M. acuminatus, *Sow*.

Modiola acuminata, Sow., Geol. Tr., 2nd ser., iii., p. 119, No. 10.

Mytilus Hausmanni, Goldf., Petrif., 138, f. 4.

In Magnesian-limestone ; not rare. Tunstall, Humbleton, Silksworth, Dalton-le-dale.

This common species is of an elongated subtrigonal form. The beaks are terminal and acute, furnished internally with a small pit or septum separated from the cavity of the shell by a thin plate. The hinge-margin is very much thickened internally, and the outer surface is covered with strong lines of growth. It is very common in some localities.

2. M. squamosus, *Sow*.

Mytilus squamosus, Sow., Geol. Tr., 2nd ser., iii., p. 120, No. 11.

In Magnesian-limestone ; not rare. Cleadon and Marsden Hill, Souter Point.

This species is more ovate and less equivalved than the preceding. The surface is finely laminated. It is not so common as the former, and is generally very badly preserved.

FAMILY. AVICULIDÆ, *Gray.*

24. MONOTIS, *Bronn.*

1. M. GRYPHÆOIDES, *Sow.*

Avicula gryphœoides, Sow., 1829, Geol. Tr., 2nd ser., iii., p. 119, No. 7.

Avicula speluncaria, Quenst., 1835, Weigm. Arch., pl. i., f. 1.

In Magnesian-limestone; not rare. Humbleton, Tunstall, Silksworth, Ryhope, Dalton-le-Dale.

This semi-flattened shell is very generally distributed in the fossiliferous bed of limestone, which is quarried in the above localities. The surface of the convex valve, which is generally imperfect, is covered with a few strong imbricated or granulated diverging ribs, between which there are others much finer and closer together. The flat valve is quite smooth, and has a deep triangular notch near the hinge-margin.

As Mr. Sowerby's name has the right of priority, we have adopted it, though that gentleman had subsequently applied the same name to another very different shell, probably an Inoceramus, from the Green-sand; see Geol. Tr. 2nd ser., vol. iv.

25. AVICULA, *Lamarck.*

1. A. ANTIQUA, *Münst.*

Avicula antiqua, Münst., Goldf., Petrif., pl. 116, f. 7.

In Magnesian-limestone; not rare. Tunstall, Humbleton, Silksworth.

This is the commonest and largest species of Avicula found in the limestone. The surface, when perfect, is covered with numerous, fine, elevated, lines of growth. In this species the posterior extremity is broad, and slightly forked.

2. A. KERATOPHAGA, *Quenstedt.*

Avicula keratophaga, Goldf., Petrif., pl. 116, f. 6.

In Magnesian-limestone; not rare. Tunstall, Humbleton.

This species is much smaller than the former. The posterior is narrower, more produced, and much forked. The anterior is small and pointed. The surface is finely striated, as in the *A. antiqua.*

3. A. INFLATA, *Brown.*

Avicula inflata, Brown, Manch. Geol. Tr. i., pl. 6, f. 25, 26.

Gervillia tumida, King, Geol. of Russ. i., p. 225 ?

In Magnesian-limestone ; not rare. Tunstall-hill.

This is a more tumid species than either of the former. The beaks are small and far apart, so much so that the dorsal margin has a wide flattened area, in which are slight indications of marginal pits. The surface is striated as in the former species.

We have several fragments which appear to belong to other species of Avicula, but they are too imperfect to be satisfactorily determined.

FAMILY. PECTENIDÆ, *Broderip.*

26. PECTEN, *Linnæus.*

1. P. PUSILLUS, *Schloth.*

Pleuronectes pusillus, Schl., Mun. Ak., vi., pl. 6, f. 6.

Pecten pusillus, Münst., Goldf., Petrif., pl. 98, f. 8.

In Magnesian-limestone ; common. Humbleton, Tunstall, Dalton-le-dale.

This little shell is very regular and convex in shape, having the ears nearly equal and the surface quite smooth. In one or two localities it is very abundant..

Two or three other species of Pecten are mentioned in the Geological Transactions, 2nd ser., vol. iii., as occuring at Humbleton, but after assiduously searching this locality we have not been able to discover a trace of them. It is probable that the young of *M. gryphœoides* has been mistaken for other species.

ORDER. PALLIOBRANCHIATA, *Blainville.*

FAMILY. LINGULIDÆ, *Gray.*

27. LINGULA, *Bruguire.*

1. L. MYTILÖIDES, *Sow. ?*

Lingula mytilöides, Sow. Min. Conch. tab. 19, f. 1, 2 ?

In Marl-slate; not uncommon. Ferryhill, Thickley.

Valves of a Lingula are found in the Marl-slate in several localities, but it is doubtful whether they belong to the above species to which they have been for some time referred. The

compressed shell is oval and the surface is distinctly concentrically striated; but all the specimens we have seen were too imperfect to be determined satisfactorily.

Family. Orbiculidæ, *Gray.*

28. ORBICULA, *Cuvier.*

Two or three upper valves of an Orbicula were obtained from the Magnesian-limestone of Tunstall Hill, but they are so badly preserved that the specific characters cannot be correctly ascertained.

Family. Terebratulidæ, *Gray.*

29. TEREBRATULA, *Llwydd.*

1. T. elongata, *Schloth.*

Terebratulites elongatus, Schloth., Petrif., pl. 20, f. 2.

Terebratula elongata, Geol. Russ. ii., p. 66, pl. ix., f. 9 a, b, c, d.

In Magnesian-limestone; common. Humbleton, Tunstall, Silksworth, Dalton-le-Dale.

This most common and characteristic Terebratula of the Magnesian-limestone is very variable in appearance. Some of the individuals are very convex, elongated, and truncated in front; others are as correspondingly flattened, widened, and rounded. Generally, the perforated valve is slightly sinuated, and often has a distinct groove running down the middle. The other valve is slightly convex, with a slight indication of a sinus in the middle. This shell is generally described as being smooth, but under the lens the surface is very distinctly shagreened. The imperforate valve is furnished with a simple loop-like process for the support of part of the animal, slightly resembling that of the recent *T. Australis.* This character is sufficient to distinguish it from the *T. hastata*, Sow., of the Mountain limestone, which has, according to Mr. M'Coy, an internal support very distinct, and which slightly resembles that of the following species. Specimens of this shell have occurred nearly two inches in length, but generally they are not more than one-fourth of that size.

2. T. Schlotheimii, *Von Buch.*

Terebratulites lacunosus, Schloth., Schrif. der Mun. Ak., vi., pl. 8, f. 15-20.

Terebratula Schlotheimii, V. Buch über Terebr., p. 39, pl. 2, f. 32 ; Geol. Russ, ii., pl. viii., f. 4 a, b, c, d, e.

Shell subpentagonal; perforated valve flattened on the sides, deeply sinuated in the middle; imperforated valve trilobed, elevated in the middle in the part corresponding to the sinus in the lower valve, gradually depressed towards the margin; anterior margin produced horizontally in the sinus and on the sides to a considerable distance beyond the cavity of the shell; surface with 2, 3, 4, 5, *or* 6 *more or less indistinct plaits, in the sinus, and as many on each side, covered with obsolete granulations, and a few distant striæ of growth.*

In Magnesian-limestone ; common. Humbleton, Tunstall, Silksworth, Dalton-le-Dale.

T. Schlotheimii occurs rather plentifully in the localities mentioned above, and it is frequently associated with the two following species which appear to have been hitherto confounded with it. It is, however, easily distinguished from them by its neatness of form, by the narrowness of its sinus, the anterior part of which is higher than in either of the other species, and by the extensive development of the front margin in a horizontal direction from the cavity of the shell. It is said to occur in the Zechstein of Germany, and in the Mountain-limestone of Russia.

3. T. Humbletonensis, *n. s.*

Shell subtrigonal or obovate ; perforated valve with a broad sinus in the middle, rounded towards the lateral margins ; imperforated valve high in the middle, depressed towards the sides ; the front margin of the sinus and sides produced horizontally a short distance from the cavity of the shell ; surface, with numerous plaits in the sinus, which are sometimes bifurcated, and a few on the sides, granulated.

In Magnesian-limestone ; not rare. Humbleton.

Under this name we venture to separate some shells which

occur with the former at Humbleton, and which seem to have been hitherto regarded as belonging to the same species. After examining an extensive series, however, of both these forms, we are obliged to conclude from the following constant characters that they are quite distinct. In the present species the form is more ovate, and the sinus is much wider and less elevated in the front. The plaits are always more numerous, and when they are not bifurcated they are more nearly parallel than in the preceding species. It is also of a much larger size, and occurs only in one locality.

4. T. CORYMBOSA, *n. s.*

Shell nearly globular, about the size of pea; perforated valve sinuated in the middle; imperforate, very convex and high in the centre; surface, with two distinct plaits in the sinus, und one on each side, granulated.

In Magnesian-limestone; not rare. Humbleton, Tunstall, Dalton-le-Dale.

This small species, like the preceding, appears to have been confounded with the *T. Schlotheimei*, with which it is generally found. It is, however, always more spherical, and has, uniformly, two plaits only in the sinus, and one on each side. The small size and rounded form distinguished it instantly from either of the former species.

FAMILY. SPIRIFERIDÆ, *Gray.*

30. ATRYPA, *Dalman.*

1. A. PECTENIFERA, *J. Sowerby.*

Atrypa pectenifera, Sow., Min. Conch., vii., pl. 616.

Terebratula pectenifera, Geol. Russ. ii., pl. 8, f. 12 a, b.

In Magnesian-limestone; not rare. Humbleton Hill.

This interesting shell, though very characteristic of the Magnesian limestone, is yet very local in this district, occurring only in one locality. It is an orbicular lens-shaped shell, having the surface, when perfect, ornamented with lamelliform rows of close-set spines. The apex of the lower valve is furnished with a large perforation, and the internal processes are similar to those of Spirifer.

31. SPIRIFER, *Sowerby*.

1. S. UNDULATUS, *Sow.*

Spirifer undulatus, Sow., Min. Conch., tab. 562, f. 1; Gen. Shells, Spir., f. 3.

Terebratulites alatus, Schloth. Min. Taschb. vii., pl. 2, f. 1, 3, 6.

In Magnesian-limestone; not common. Tynemouth Cliff, Humbleton, Tunstall, Thickley.

This fine Spirifer varies considerably in appearance, some individuals being almost semicircular, and others subtrigonal and very much winged. On the casts the apical recesses of the lower valve are very granulous. The spiral coil is large and nearly fills the cavity of the shell, and is finely preserved in specimens found at Humbleton. The quarrymen term this shell the "*butterflee*."

2. S. CRISTATUS, *Schloth.*

Terebratulites cristatus, Schloth., Min. Ak. vi., pl. 1, f. 3.

In Magnesian-limestone; not common. Tunstall, Humbleton.

The general form of this shell is semicircular. The lower valve is rather deep, and almost divided into two parts by a large mesial plate which extends from the beak nearly to the centre of the valve. The upper valve is slightly convex. The outer surface of both valves is folded into nine or more sharply angulated plaits, and covered all over with minute elevated granulations. Internally the shell is minutely punctured. The lines of growth are generally very distinct. It may be questioned whether this species is identical with the *S. octoplicatus*, Sow. In the latter the general form is more tumid and the beaks are more recurved than in the former species.

3. S. MULTIPTICATUS, *Sow.*

Spirifer multiplicatus, Sow., Geol. Tr. 2nd ser. iii., p. 119.

In Magnesian-limestone; not rare. Humbleton, Silksworth, Dalton, Tunstall.

This species is more common than either of the former, and owing to the manner in which it is preserved it is by far the most interesting. It often occurs in a soft powdery substance,

which fills some of the cavities between the harder parts of the rock at Tunstall. In this state it can be easily cleaned from the surrounding matter, and shews the structure of the shell almost as conveniently as if it were recent.

In general form it is round and tumid. The beak of the lower valve is slightly curved upwards, and the area is not well defined. The plaits on the surface and the extremities of the hinge-line are slightly rounded. These characters will readily distinguish it from the preceding species. The specimens from Dalton are much rounder than those from the other localities.

A small shell, apparently belonging to this genus, is found in the lowest bed of limestone at Whitley and Pallion, but the specimens we have seen were so imperfect that the species could not be ascertained.

Family. Orthidæ.

32. ORTHIS, *Dalman.*

1. O. pelargonata, *Schloth.*

Terebratulites pelargonatus, Schl., Mun. Ak. vi., pl. 8, f. 21, 24.

In Magnesian-limestone; rather rare. Dalton-le-Dale, Humbleton, Silksworth, Tunstall.

This pretty shell is very irregular in general form. It much resembles, when seen from above, some of the recent Thecidea. It belongs, however, to an unattached genus, of which it is the only representative in the Permian system of England, and apparently one of the last species of the genus which existed.

The lower valve is comparatively deep, and the beak is curved either to one side or the other. Between the beak and the hinge-margin is a large flattened area and a slightly convex distinct, closed deltidium. The upper valve is slightly convex, rather hollowed in the middle. The outer surface is covered with distinct radiating ribs, which are slightly raised, and bifurcated near the margin. The lines of growth are distant till the shell attains nearly its full size, and then they are very close. The hinge-line of the lower valve is straight, and furnished with two small condyles, one on each side of the deltidium. In the other valve two callosites, one on each side of the umbonal cavity,

diverge from the middle of the hinge-line, and are produced into two elongated processes which fit into the deltidium of the lower valve. A socket on each side of these processes receives the articulating condyles of the other valve. This species is said to occur in the Zechstein of Germany, and a closely allied species, the *O. Wangenheimei*, is found in the Russian Permian rocks.

Family. Productidæ, *Gray*.

33. PRODUCTUS, *Sowerby*.

1. P. horridus, *Sow.*

Productus horridus, Sow., Min. Chon., tab. 319, f, 1.

Productus calvus, Sow., Min. Chon., tab. 560, f. 2—6.

Gryphites aculeatus, Schl., Min. Taschb. vii., pl. 4, f. 1, 2, 3.

In the Magnesian-limestone; common. Whitley Quarries, Humbleton, Tunstall, Dalton-le-Dale, Garmonsway.

P. horridus is very characteristic of the Magnesian-limestone, as it is the largest and oftentimes the most abundant species. The specimens from the lowest compact limestone have been described as a species, *P. calvus*, by Mr. Sowerby. They are sometimes larger than those which occur at Humbleton. As only part of the shell is generally preserved, the spines are not always visible. This appearance has led to the erroneous conclusion that this variety was spineless, and consequently distinct from *P. horridus*.

In this species the hinge-line of both valves is furnished with a row of large spines. The spines are hollow, and seem to have served as a protection for filaments or tentacular appendages to the mantle or some other part of the body. The spines on the body of the shell were closed at the base as often as it became necessary for the animal to enlarge it. After the shell was sufficiently enlarged, new spines were formed in lieu of the old ones, which were now no longer serviceable.

2. P. latirostratus, *n, s.*

Shell gryphœoid or concavo-convex; lower valve convex bilobed, or with a slight furrow or sinus in the centre; upper valve slightly concave, or nearly flat; beak of lower or convex valve, large, and very much flattened; hinge line

of upper valve rather angulated, furnished with a large triangular button; surface of convex valve covered with a few distant spines.

In Magnesian-limestone; rare. Dalton-le-Dale, Tunstall.

This Productus is the rarest we have in the limestone. In general form it somewhat resembles the young of the preceding species, but may be readily distinguished from it by the large flatttened beak of the lower valve. It never attains to the size of the former species, and though the muscular impressions are similarly arranged, yet they are not so deep.

The *P. latirostratus* forms a passage from the *P. horridus* to the following species, which have a very flattened beak, a distinct close deltidium, and two condyles on the hinge-line of the lower valve.

3. P. SPINIFERUS, *King.*

Productus spiniferus, Geol. Russ. i., p. 223 ?

In Magnesian-limestone; not uncommon. Humbleton, Tunstall, Dalton-le-Dale, Clack's Heugh.

This species, which is rather common at Humbleton, has the spines of the convex valve very much pressed against and lying along its surface. The surface of both valves is covered with fine wrinkled, radiating striæ. This is the only species of Productus found in the Permian system with a striated surface.

4. P. MORRISIANUS, *King.*

Productus Morrisianus, Geol. Russ. i., p. 223 ?

In Magnesian-limestone; not uncommon. Tunstall, Humbleton, Dalton-le-Dale, Garmonsway.

A very irregular shell with the beak of the convex-valve produced and pressed downwards. Both valves are covered with close-set spines. It generally occurs with the former.

5. P. ASPERRIMUS, *n. s.*

Shell small, concavo-convex; lower valve convex; beak with a small flattened area, and a closed deltidium on the upper side; hinge-line straight with two condyloid processes, one on each side of the deltidium: upper valve slightly concave; hinge-line with a small pointed process or button and a socket on each side of it to receive the con-

dyles of the lower valve: surface of both valves covered with close rows of small spines, which are rather regularly arranged.

In Magnesian-limestone; not uncommon. Humbleton, Tunstall, Dalton-le-Dale.

This is generally found with the preceding species. It may easily be distinguished from them by its neat and regular form, the smallness of the beak, and the regular disposition of the spines.

In Prof. Sedgwick's list two species of Productus, *P. antiquata* and *P. spinosa*, which are peculiar to the Mountain-limestone, are stated to have been found in the Magnesian-limestone at Midderidge and Humbleton. It is almost unnecessary to say we have not found either of these species which must have been introduced by mistake.

ARTICULATA.

ANNELIDA.

34. SERPULA, *Linnæus.*

. S. MINUTISSIMA, *n. s.*

Serpula small, vermicular, nearly cylindrical, smooth.

In Magnesian-limestone; not uncommon. Tunstall, Humbleton, Dalton-le-Dale.

This small species of Serpula is generally attached to the outer surface of Terebratulæ, and the inner surface of valves of Productus and the chambers of a Nautilus. It is rather elongated and vermiform, and requires to be examined with a powerful lens.

35. SPIRORBIS, *Lamarck.*

. S. GLOBOSUS, *M'Coy.*

Spirorbis globosus, M'Coy, Carb. Foss. Ireland, p. 169, pl. 4, f. 10?

In Magnesian-limestone; rare. Humbleton.

A few specimens apparently belonging to this species were procured from Humbleton Quarry, attached to the inner surface of valves of *Productus horridus*.

S. OMPHALOTES, *Goldf.*

Serpula omphalotes, Goldf., Petrif. i., p. 225, tab. 67, f. 3?

In Magnesian-limestone; rare. Humbleton.

Two or three specimens of a semiflattened Spirorbis, associated with the former species from Humbleton, agree very well with Goldfuss' figure and description of *Serp. omphalotes*. The attached surface is very flattened, and the spire has two or more gradually increased turns. It is about the tenth of an inch in diameter.

RADIATA.

CLASS. ECHINODERMATA.

ORDER. ECHINIDA.

FAMILY. CIDARIDÆ.

36. CIDARIS, *Klein.*

Cidaris, Geol. Russ. i., p. 221.

In Magnesian-limestone; rare. Humbleton, Tunstall, Dalton-le-Dale.

Fragments of an apparently undescribed species of Cidaris are occasionally found in the above localities.

CLASS. CRINOIDEA.

37. ENCRINITES, *Miller.*

E. PLANUS, *Miller.*

Cyathocrinites planus, Mill. Hist., Crinoidea, p. 86 ?

Encrinites planus, Scloth., Petref., tab. 26, f. 6 a—c. ?

In Magnesian-limestone; common. Tynemouth Cliff, Humbleton, Tunstall.

Portions of the column of a species of Encrinite are frequently very abundant at Humbleton, but the cap very rarely occurs. The column is not quite cylindrical, some of the joints being more prominent than others. The articulating surface of the joints is strongly radiated. The outer surface of the stem is covered with fine waved concentric lines which are easily overlooked.

Class. ZOOPHYTA.

Order. HELIANTHOIDA.

Family. Madreporidæ.

38. CARYOPHILLIA, *Lamarck.*

1. C. QUADRIFIDA, *n. s.*

Coral simple, with a nearly cylindrical tubular stem; cup deep, gradually tapering, extending nearly the whole length of the coral, divided by three or four equally distant, narrow, lamellæ; surface longitudinally striated with distinct annular rings of growth.

In Magnesian-limestone; rare. Humbleton Hill.

The cup of this coral is very deep, and tapers gradually from the bottom to the top of the stem, where the edge is extremely thin. Internally it is divided by four thin plates or lamellæ, which are at equal distances from each other. The outer surface is striated or furrowed longitudinally, and the periods of growth are marked by distinct annular rings. In general form it slightly resembles some species of Turbinolopsis, but differs in having a deeper cup, and less solid stem.

39. STENOPORA, *Lonsdale.*

1. S. CRASSA, *Lons.*

Stenopora crassa, Lons., Geol. Russ., i., App. A., p. 632, pl. A., f. 12.

In Magnesian-limestone; not uncommon. Humbleton, Tunstall.

The specimens from the above localities are rather smaller than those described by Prof. Lonsdale. In addition to his des-

cription we may add that the outer surface is covered with minute tubercles, arranged in circles round the mouths of the cells. It is not uncommon at Tunstall.

Order. ASCIDIOIDA.

Family. Escharidæ.

40. FENESTELLA *(Mill.), Lons.*

1. F. anceps, *Schloth.*

Ceratophytes anceps, Schloth., Mun. Ak. vi., pl. 2, f. 7.

Gorgonia anceps, Goldf. Petrif., p. 98, tab. 36, f. 1 a, b, c, d; Geol. Tr. iii., 2nd ser., pl. 12., f. 7.

In Magnesian-limestone; not uncommon. Tunstall, Humbleton.

In this coral the longitudinal branches are not connected with each other by transverse processes, as in most of the species of this genus, but they are separate, frequently bifurcated, with short opposite lateral branches springing from the sides. The stem of the coral is flattened, covered on one side with four rows of cells arranged alternately, with a slightly elevated ridge between each row. The cells are cylindrical, and curve over each other in the stem of the coral.

2. F. ramosa, *King.*

Hornera ramosa, King, Geol. Russ. i., p. 221? Geol. Tr. 2nd ser., iii., pl. 12, f. 5.

In Magnesian-limestone; rather rare. Humbleton, Tunstall.

This species is figured, but not described, in the Geological Transactions. It is more bifurcated than the former, and is also destitute of the numerous short lateral branches.

3. F. antiqua, *Goldf.*

Gorgonia antiqua, Goldf. Petrif., p. 99, tab. 36, f. 3 a.

Coral, with the branches very small, frequently bifurcated and sharply angulated on the poriferous face; meshes nearly rectangular, twice as wide as the branches; cells small, internal, 2 rows separated by an angulated ridge, the mouth of each cell furnished with a cup-like process; transverse branches, not cellular, alternate, 2 or 3 cells distant; reverse smooth, or slightly furrowed longitudinally.

In Magnesian-limestone; rare. Tunstall, Humbleton.

Though not before recorded as occurring in our limestone, this coral appears to be the true *Gorgonia antiqua* of Goldfuss, who described from a Zechstein specimen. It is, however, very distinct from the corals referred to this species by Prof. Lonsdale in the Silurian System, Prof. Phillips in the Palæozoic Fossils, and Mr. M'Coy in the Carboniferous Fossils of Ireland, and appears to belong exclusively to the Permian rocks. It approaches closely, in general appearance, to the *F. flustracea*, but the meshes are twice as wide as in that species, and the branches are more bifurcated and irregular. The *F. antiqua* is also destitute of the elevated row of tubercles running longitudinally between the cells so conspicuous in the following species. It is also of a less size, and not so common.

4. F. FLUSTRACEA, *Phillips.*

Retepora flustracea, Phill., Geol. Tr. 2nd ser., iii., p. 120, pl. 12, f. 8.

Coral depressed, funnel-shaped, much folded; branches parallel, distantly bifurcated, meshes rectangular, as wide as the branches; cells surrounded with an elevated cup-like process, in two rows separated by a high longitudinal series of tubercles; transverse branches thick, opposite, not cellular; reverse, flattened, smooth or furrowed.

In Magnesian-limestone; common. Tunstall, Humbleton, Ryhope, Dalton-le-dale.

This coral is occasionally found of a great size, and with the next species is very characteristic of the limestone of this district, and the Permian rocks generally. It differs from the *F. antiqua* in the following particulars:—The branches are less bifurcated, more flattened and closer; there are only two cells in the distance between the transverse branches, and the angulated ridge between the cells is furnished with a row of elevated tubercles. This species is figured in the Geological Transactions, but it is not described.

5. F. VIRGULACEA, *Phillips.*

Retepora virgulacea, Phill., Geol. Tr. 2nd ser., iii., 120, pl. 12, f, 6.

Coral conical or funnel shaped; branches frequently bifurcated, compressed; cells numerous, arranged in oblique irregular rows across the branches, an elevated ridge or cup-like margin round each cell; transverse branches always cellular, very oblique; reverse smooth or slightly furrowed longitudinally.

In Magnesian-limestone; common. Tunstall, Humbleton, Silksworth, Dalton-le-dale.

This is another common and characteristic species of the limestone; it often occurs of a great size. The branches are very irregular in breadth and thickness, and are scarcely ever in the same plane. The pores are more numerous and more irregularly arranged in this species than in any other belonging to the limestone of this neighbourhood. A characteristic figure of this species is given in the Geological Transactions.

6. F. RETIFORMIS, *Schloth.*

Fenestella retiformis, Lons., Geol. Russ., i., App. A, p. 631.
Gorgonia infundibuliformis, Gold. Petrif. Tab. 36, f. 2, b. c.

In Magnesian-limestone; not common. Tunstall.

The coral which we refer with some doubt to this species, somewhat resembles the *F. virgulacea* in its appearance, but the branches and cells are more regular, and the former less compressed.

40. RETEPORA, *Lamarck.*

1. R. LONSDALII, *n. s.*

Coral narrow funnel shaped in its young state, folded into several compressed tubes in full grown individuals; meshes, oval, numerous, arranged in quincunx; cells, on the outer surface, tubular, not curved over each other, but piled horizontally, and arranged in two irregular rows along the interstices; interstices narrow; reverse internal, smooth.

In Magnesian-limestone; rare. Silksworth, near Sunderland; Tunstall-hill.—*Mr. G. Tate.*

This is the only species of Retepora that we are acquainted with in which the cells are placed on the outside of the coral,

and the only one that resembles the *R. membranacea* of the Mountain-limestone in its singular funnel-shaped mode of growth.

PLANTÆ.

42. LEPIDODENDRON.

Portions of the stem of a species of Lepidodendron are occasionally found in the Lower-new-red-sandstone at South Shields, and in the Marl-slate at Cornforth.

43. CALAMITES.

A fragment of a fine species allied to the *C. approximatus* of the Coal-measures was found in the sandstone quarries of South Shields, and is preserved in the Newcastle Museum.

44. VOLTZIA.

Several fucoid plants occur in the Marl-slate. One has been figured as a Voltziæ in the "Fossil Flora," vol. iii., p. 195. As they are imperfectly preserved, it is uncertain to what genus they really belong. Some of them have been termed *Caulerpites*

ADDRESS OF THE COMMITTEE OF THE TYNESIDE NATURALISTS' FIELD CLUB,

DELIVERED AT THE ANNIVERSARY MEETING, HELD APRIL 21ST, 1849.

GENTLEMEN,—In consequence of the unavoidable absence, and the numerous engagements, of our respected President, the Vicar of Newcastle, it has fallen to the lot of your Secretaries, under the direction of the Committee, to lay before you a statement of the proceedings of the Club during the past year. But, before giving, in detail, an account of the different Field Meetings, it may not be out of place to make a few remarks on the state and prospects of the Club, and also to notice what has been done by some of our members, in promoting a knowledge of the natural history of the district, independently of our regular meetings. The number of members, in our first printed list, was 87. The number on the list, as corrected to April, 1849, is 100, thus showing an increase of thirteen, notwithstanding that there have been twelve deaths, or resignations, since the first establishment of the Club. It was not to be expected that the number of members would materially increase; but it is gratifying to be able thus to show that there is so considerable a number of persons, in the district, who take an interest in the objects for the promotion of which the Club was established. During the past, as well as the preceding years of the existence of the Society, several valuable and interesting papers have been read. Most of these have either been printed in full, or in abstract. Considerable progress has likewise been made towards the formation of accurate lists of the different natural productions of the counties of Northumberland and Durham. Of the matter furnished towards the completion of this object, a considerable portion, as you are aware, has already appeared in your Transactions, and a good deal more is ready for

the press, or in the course of preparation. It is a matter of congratulation to notice the very favourable mention that has been made in the published proceedings of similar institutions, and in some of the periodicals of the day, both of the transactions of the Club, as a whole, and of individual papers. A notice which appears in the address of William Spence, Esq., F. R. S., the President of the Entomological Society of London, as delivered at the last anniversary meeting, it may not be out of place to quote, "Here also," he observes, "may be mentioned papers on *Anobeum molle*, and on the damage done to wheat by *Cucujus monilicornis* and *Calandra granaria*, by Mr. Bold; on the occurrence of *Limnoria terebrans*, at the mouth of the Tyne, by Mr. Hancock; and the commencement of a Catalogue of the insects of Northumberland and Durham, by Mr. Hardy and Mr. Bold, which appear in Vol. I. of the Transactions of the Tyneside Naturalists' Field Club, published this year. These papers were read to the Society in 1846, but I refer to them as well as to Mr. Darling's paper on an anomaly in the history of the Honey Bee; Mr. Selby's Notes on Insects in 1846; Mr. Hepburn's Notes on nocturnal *Lepidoptera;* Dr. Johnston's Description of the *Acarides* of Berwickshire, and Mr. Hardy's Synopsis of the Berwickshire *Staphylinidæ*, which appeared in the last part of the Transactions of the Berwickshire Naturalists' Club,—both for the purpose of expressing a hope that the excellent examples of these two northern societies, of the Cotswold Naturalists' Club, and others, will be very generally followed in every part of the British empire. Nothing could be better calculated than a Naturalists' Field Club, in every district where a few naturalists reside, to serve at once to promote social and healthy excursions; to animate and encourage, by mutual sympathy, their love of natural history; and to investigate, thoroughly, that of their locality, and thus discover new and rare species of animals, and new facts in their economy, which would otherwise escape observation." In the "Phytologist," and the "Literary Gazette," very favourable notices of our transactions have appeared. The "Critic," also, in a recent number, devoted considerable space to

a review of our publications, dwelling upon the usefulness of the society, and quoting largely, both from the address of our first president, and the accounts of the field meetings.

But whilst we may congratulate ourselves on the success of the Club, in promoting the objects for which it was instituted, and on the value of the papers which it has been the means of contributing to science, yet we must not forget that the cost of printing has exceeded what was originally anticipated, and that it will be necessary to curtail the expenses during the ensuing year. With regard to what has been done by some of our members, independently of the meetings, it may be mentioned that a paper which will be read by Mr. A. Hancock and Dr. Embleton, at the anniversary meeting at which this report is presented, contains an account of a species of Ribbon Fish *(Gymnetrus)*, lately taken off Cullercoats. Mr. Bold has, during, the past year, added several species of *Coleoptera* to our Fauna, and has also been fortunate enough to meet with one species, new to science. His researches have also added several new localities of rare species. The discoveries alluded to will be found embodied in a paper, which will also be read by the same gentleman at this meeting.

It may, however, be observed, that the new species belongs to the genus *Colymbetes*, and that Mr. Bold has named it *C. dispar*. Mr. Albany Hancock, in pursuing his investigations into the mode in which those marine mollusks, whose habit it is to bore into wood, clay, rocks, or the shells of their congeners, were enabled, with such facility, to excavate their habitations, has ascertained that certain sponges also have the power of boring into various substances. In his researches into the habits of these singular and obscure creatures, he was fortunate enough to detect nine new British species of *Cliona*, three of which belong to the coast of our district. A species of nudibranchiate mollusk also, which was sent to Messrs. Alder and Hancock, by Mr. Richard Howse, Jun., proves to be new, and will be duly described by those gentlemen, in their splendid work on the British *Nudibranchiate Mollusca*, now publishing by the Ray Society. The Rev. W. Greenwell gathered, at Kyloe Crags, fine

specimens of *Asplenium septentrionale;* and, although the habitat is not a new one, it is, nevertheless, gratifying to find that this rare and interesting fern still occurs within our district. Mr. Tate, of Alnwick, a gentleman well known for his geological investigations, more especially of the fossils of the mountain limestone, has detected, during the past year, *Ceterach officinarum,* on the ruins of Hulne Abbey—a species that has not before occurred in this district. Another plant, *Hypericum androsœmum,* new to the Northumberland Flora, was discovered last year, in a wood, near Alnwick, by Mr. John Storey, Jun. This interesting addition to our local Flora, its discoverer believes to be indigenous. The following habitats, furnished by Mr. Bungey, are also worthy of notice :—*Sambucus Ebulus,* near the City of Durham; *Hottonia palustris,* and *Ranunculus Lingua,* near Houghall; *Gagea lutea,* banks of the Wear, at Butterby; *Pyrola rotundifolia,* sea coast, near Horden Hall; *Osmunda regalis,* Crook Hall Wood, all in the county of Durham. Mr. John Thompson has also contributed a few habitats of some of our rarer plants, amongst which may be mentioned *Jasione montana,* dry banks near the city of Durham; *Allium arenarium,* and *A. oleraceum,* growing together near Middleton-one-Row; and *Rumex Hydrolapathum,* near Butterby, Durham. The other discoveries, made by members of the Club, will be found in the following report of the proceedings of the various Field Meetings.

The First Field Meeting of the year, was held in Gibside Woods. The place of assembly named was Winlaton Mill; but only a few of the party met at the appointed place, and although, afterwards, a considerable number arrived, they rambled about in scattered parties of three or four, until evening, when they assembled at the hospitable board of Ralph Carr, Esq., of Dunstan Hill. After dinner, two papers were read, one by Mr. Carr, on the effects of the great heat of the summer of 1847, on larches and other trees, in the grounds near his seat at Dunstan Hill. The other paper was by Mr. W. K. Loftus, on "Evidences of Diluvial Action at Belsay." Gibside and its woods have been too well examined to leave much chance of finding any objects of Natural History previously undetected; and, therefore, although

many interesting species, in various departments were observed, your Committee have none to record as new to the district.

The Second Field Meeting was held at Hazleden Dene; but the extremely unfavourable state of the weather, caused the attendance to be very scanty. A few members, however, passed through the Dene, but nothing of any consequence was noticed.

The Third Field Meeting, of the year, was held by the invitation of Thomas Sopwith, Esq., F.R.S., at Allenheads, where that gentleman had made every arrangement both for entertaining the party, and for aiding in the investigations, for which they had assembled. The members, about twenty in number, visited the Allen Smelt-Mills, where they were shown every attention, by the principal manager, Mr. Thomas Steel. On the arrival of the party at Allenheads, Mr. Sopwith suggested, and his plan was adopted, that the party should form themselves into three divisions; one to visit the interior of the lead mines; the second to botanize on the adjacent moors; and, the third to view the exterior of the mines, and to examine the geological features of the district. After being suitably equipped, the first party descended the mine, and were shown the several processes of mining operations, and also the principal phenomena of the veins, and the manner in which the ore is distributed in veins or strings, which are perpendicular or nearly so, or in flat workings, where the lead is found in a horizontal position, for a limited distance, seldom exceeding a few fathoms, on the side of the veins. The party, formed for examining the exterior of the mines, and the general geology of the district, were conducted by Mr. Sopwith, to a point from whence they could see an extensive range of country, especially in a northern direction, extending to the borders of Scotland, and embracing geological features of great magnitude and importance. Amongst these are the Burtree-Ford Dyke, which cuts off many of the principal lead veins;—the line of dislocation of the Stublick Dyke, which has the effect of throwing down a part of the Newcastle Coal-field, into the midst of the Carboniferous or Mountain-limestone district; and beyond this, a prominent line is formed by the bassett of the basaltic rocks, on which the Roman wall is founded.

These, and the more local phenomena, were illustrated by maps and diagrams; and the party were shown the washing floors and machinery where the ore is cleared from impurities, preparatory to being smelted. The botanizing party, in the meantime, were not idle, and besides many plants, common to such situations, several which are comparatively rare in our district were found. The more interesting perhaps were *Vaccinium uliginosum, Listera cordata, Saxifraga stellaris,* and *Sedum villosum;* for this last the habitat is new. The plants above noticed were principally gathered by the Rev. John F. Bigge. In the evening the party assembled at the hospitable board of Mr. Sopwith, to whom the Club is wholly indebted for this day of high interest and social enjoyment. A notice, of the occurrence of a Fossil fish, was read, at this meeting, by A. Hancock, Esq.

The Fourth Field Meeting was held on the 18th of August, at Chevington Wood and the neighbourhood of Warkworth, a district interesting for its picturesque beauty and its romantic associations, as well as for its numerous and varied natural productions. As the best means of carrying out the purposes of the meeting, the members who had assembled divided themselves into parties, each set pursuing more particularly its favourite department, not forgetting, however, to bestow due attention on an examination of those curious antiquarian remains which have so long rendered Warkworth a noted place. Several interesting plants were observed. Mr. John Storey collected, in Chevington Wood, specimens of *Callitriche platycarpa,* a species which has not hitherto been recorded as occurring in Northumberland. Mr. Storey likewise noticed *Potamogeton perfoliatus,* in the Coquet. He also found, in the same stream, the *Ruppia rostellata* of Babington's Manual. It is, perhaps, doubtful whether the plant, to which this name has been applied, is more than a variety of *Ruppia maritima;* but as we are not aware that more than one other Northumberland habitat was previously known, it is interesting to note that the same species, or form, occurs in each, and therefore that the true *Ruppia maritima* has not yet been met with in the county, although the present plant is mentioned under that name, in

"Winch's Flora of Northumberland and Durham." Mr. Bungey, of Durham, met with *Œnanthe Lachenalii*, in a pond near Warkworth. This species was confounded by the late Mr. Winch with *Œnanthe peucedanifolia*. *Œ. Lachenalii* likewise occurs in marshes on the Wear, between Hilton and Southwick, in the county of Durham, and is the only habitat, for the plant, mentioned in Winch's work. In other departments of Natural History, but little appears to have been done; the only instance worth mentioning, perhaps, is the occurrence of a rare nudibranch *Eolis despecta*, on the tangle, at Coquet Island, where it was procured by Mr. Alder.

The Fifth Meeting of the year was held on the 15th of September, in the neighbourhood of Embleton, Dunstanborough Castle, &c. The party proceeded from Newcastle by an early train, to the Christon Bank Station, and thence walked to the village of Embleton, where they breakfasted with Mr. Robert Embleton, by whose kindness also they were conducted to the localities most worthy of being inspected. This gentleman also exhibited to the party, living specimens of *Alcyonella stagnorum*, which were procured from a pond at Howick; and, afterwards, a few of the members visited the locality, and had the satisfaction of seeing this interesting Zoophyte, in its natural site. The stern old ruin of Dunstanborough, and the extraordinary geological features of its immediate neighbourhood, occupied some of the party, whilst others examined the marine *Invertebrata* of the locality, and the various other natural productions which the neighbourhood affords. Examples of a few of the rarer species of plants were collected. Among these were *Ranunculus Lingua*, in the fosse of Dunstanborough Castle. *Geranium sanguineum*, on the sea shore:—*Potamogeton pusillus* var. *tenuissimus*. Koch, and *P. plantagineus*. The last named species, and the variety of *P. pusillus* were found by Mr. D. Oliver jun., and are new to our local Flora. In reviewing the preceding details, it is gratifying to see that the results of the year's investigations have been so considerable, more especially when it is remembered that most of the places of meeting had already been examined. We may, therefore, look forward with hope to the

labours of succeeding years; for, if so much has been done in such localities, what may not be expected from those portions of the two counties which have, as yet, been scarcely visited by the naturalist?

The following gentlemen were elected officers for the ensuing year:—

PRESIDENT.

Mr. Joshua Alder.

VICE-PRESIDENTS.

Mr. Ralph Carr.
D. B. White, M. D.
Mr. Albany Hancock.

TREASURER.

Mr. Thomas Burnet.

SECRETARIES.

Mr. John Thornhill. | Mr. John Storey.

COMMITTEE.

Edward Charlton, M.D.
Rev. J. F. Bigge, M.A.
Mr. G. C. Atkinson.
Mr. John Hancock.
Mr. R. Howse.
Mr. T. J. Bold.
Dennis Embleton, M.D.
Mr. J. H. Fryer.
Mr. R. Y. Green.
Mr. John Thompson.
Mr. William Kell.
Mr. D. Oliver, Jun.

MEMBERS ELECTED SINCE THE 30th MARCH, 1848.

Andrews, George, *Durham.*
Bethune, Rev. Angus, *Seaham Harbour.*
Bulman, George, *Leazes Terrace, Newcastle.*
Brady, G. S., *Gateshead.*
Embleton, Robert, *Embleton.*
Gibson, W. Sidney, F. S. A., F. G. S., *George Street, Newcastle.*
Storey, John, Jun., 1, *St. Mary's Place, Newcastle.*
Taylor, Arnold, *Sunderland.*
Thompson, Edward Pett, *Elswick Villas, Newcastle.*

VII.—*Evidences of Diluvial Action, at Belsay, &c.* By Wm. Kennett Loftus, Esq.

[Read May 18, 1848.]

My object in submitting this brief notice to the members of our Club, is to draw their particular attention to an interesting phenomenon, exhibited in a quarry of the Carboniferous Limestone, in the grounds of Sir Charles Monck, at Belsay, and at a short distance from the new road to Otterburn.

The quarry is worked for the purpose of procuring the stone for burning into lime in the adjoining kilns. On my first visit, some years ago, the uppermost bed, which crops out towards the north-east, was in working: the dip of the beds, consequently, was in the opposite direction.

On a subsequent visit, during a geological ramble in company with Mr. King, about three years since, I was so fortunate as to obtain an opportunity of seeing a surface of the stone exposed to view, over an extent of about half an acre, which had previously been covered by a quantity of earth and rubbish, and which was now removed in order to extend the working of the quarry. The strata then appeared to dip at an angle of nearly thirty degrees, and on the lowest part of the quarry, a bed of detritus rested, upwards of twenty feet in height.

While collecting specimens of the few Fossils (*Encrinites* and *Trilobites*) which the Limestone contains, our attention was soon diverted to the extraordinary appearance of the exposed surface. In the direction of the dip throughout, it was deeply scored and scratched by longitudinal, and nearly parallel, lines, of various width—so deeply, in fact, that, on standing at the bottom of the quarry, and looking upwards, we could plainly see the surface irregularly furrowed, in a transverse direction, which was evidently occasioned by the depth of the longitudinal grooves or scratches, which had acted with more or less force on different

portions of the surface. Many of the furrows were six inches in depth.

On looking around in hopes of finding some explanation of the cause of this phenomenon, we perceived that the mass of earth and rubbish, resting upon the lowest part of the quarry, was filled with stones of various sizes—from about a yard in diameter to a few inches. Lying upon the surface of the quarry, were several large blocks of too great size for the workmen to remove, and which were consequently left remaining there to be broken up. The whole of these had their edges and angles completely worn down and were scatched on all sides and in every direction, and were frequently also polished ;—evidently a proof that in causing the scratches and grooves on the surface of the quarry, they had likewise mutually rubbed and ground each other to the state in which we found them.

As these Boulders are, I believe, all of the same limestone as the quarry, and similar beds among the Cheviot Hills, we may fairly presume that they have not been transported from any considerable distance.

Along the whole of the road from Newcastle to Ponteland, blocks similarly scratched and polished may be seen among the heaps of stone, brought from the bed of the river Pont, for the purpose of mending the roads.

At the mouth of the Tyne, several large blocks exhibit markings of the same description, which must have been produced by the same agency,—whatever that may have been. Several of the party here present, may remember Mr. Carr's directing the attention of the Club to these blocks, on the occasion of our meeting at Tynemouth.

The solution of the causes which have produced effects so wonderful and so extensive, is a subject of the greatest interest to the Geologist, and one which has created considerable discussion.

That the "Boulders," which are found, in England, extending from Cumberland, through Yorkshire, to as far south as Huntingdonshire,—and known by the name of the "Northern Drift," —were conveyed by some mighty torrent from the North-West is generally admitted ;—but whether we can consider the "Drift"

of Belsay Quarry, the Pont, and that at the mouth of the Tyne as having been transported by the same powerful agent, is a subject worthy of investigation.

In conclusion, I would notice two interesting examples of these Northern Boulders :—One is in the immediate neighbourhood of the place of meeting of to-day ; on the road to Lanchester, and a mile or thereabouts from Whickham, there lies a large block of porphyry, which, Mr. Alder, who first observed it, identifies with stone of the same description, *in situ,* in the lake district and whence he supposes it to have been transported.

The enormous block of Granite, lying in the main street of Darlington, must have attracted the observation of every one passing through that town. From its peculiar composition, it is at once recognised as from Shap Fells, in Cumberland.

I have ventured on intruding this notice on the attention of our Club, in the hope that the subject may attract some consideration, and induce us to fix an early meeting at Belsay, or some other locality, where we may attempt to investigate this interesting phenomenon, connected with this district.

WM. KENNETT LOFTUS.

Stand House, Newcastle, May 18, 1848.

VIII.—*Notice of the Occurrence of Fossil Fish, in the Rocks, near the great Slip-dyke, at Cullercoats Haven. By* Albany Hancock, Esq.

[Read July 26, 1848.]

During the last summer, I was so fortunate as to procure a few specimens of fossil fish, from a locality where, I believe, they had not previously been observed. It is now several years since these

interesting relics, of a by-gone fauna, were discovered in the quarries at Whitley; and it will be remembered that, in 1838, a shaft was sunk there, 10 or 20 fathoms deep, to reach the Marl-slate, for the purpose of exhibiting its treasures to the members of the British Association, then assembled at Newcastle. A few specimens of fish were, at that time, procured. None, I believe, have been obtained since. From the pains taken, at this period, to get at the Marl-slate, it would appear that no one suspected that it cropped out to the day, a little more than half a mile from the spot where the shaft was sunk. Such, however, was the case; and the Geologists who then examined the great slip-dyke, in Cullercoats Haven, must have trodden on the bed from which the fish, first alluded to, were procured.

It is evident, on examining, in this locality, this gigantic dislocation of the coal measures, that the lower members, of the Magnesian-limestone, come into view; and, as these rest on the Marl-slate, it might be expected to occur here. I therefore traced the line of the dyke, from the southern extremity of the haven, towards the banks, and, about mid-way, between these two points, observed that the limestone rested on a dark blue shale, and not on the yellow sandstone, which supports it a little further to the east. This shale, from its position, there could be little doubt, was the Marl-slate; but not being very familiar with its appearance, I broke a piece off, for future examination. One glance, however, at this fragment, was sufficient to set all doubt aside: it bore the impression of a fish. Since that time, Mr. Richard Howse and I have examined the locality more carefully, and, chiefly by the exertions of this gentleman, we have procured upwards of a dozen specimens, some of which are in fine order.

The following species occurred *Pygopterus mandibularis*, *Palœoniscus longissimus*, *P. glaphyrus*, *P. elegans*, and *P. comtus*. The last mentioned was the most abundant.

Newcastle, July, 1848.

IX.—*A Century of unrecorded local Coleoptera, with a Description of a new Colymbetes.* By Thomas John Bold.

[Read at the anniversary meeting of the "Tyneside Naturalists' Field Club," April 21st, 1849.]

1. Dyschirius æneus, *Zeigler.* Two specimens, Cambois, May. —*Mr. John Scott.*
2. Notaphus obliquus, *Sturm.* One specimen, found on the bed of the lake at Gosforth, in August.
3. Hydroporus granularis, *Linn.* Tolerably abundant in pools and ditches, Boldon Flats, May and June.
4. H. geminus, *Fab.* One specimen from a pond at Gosforth, August.
5. Colymbetes (Agabus) dispar, *Mihi.*

Zoologist, January, 1849, Supp. xxiv.

Ovatus, fortiter convexus, postice attenuatus, nigrofusco-subæneus, subtiliter reticulato-strigoso-subpunctatus; ore, labro, frontis thoracique marginibus, maculis duabus verticis, palpis, antennis, pedibusque rufo-ferrugineis; elytrorum marginibus basique plerumque, late testaceis. Long. Corp. 3-3½ lin.

Male.—With somewhat of the habit of *C. paludosus;* ovate, very convex, glossy, nigrofusco-subæneus, finely reticulate—strigose—subpunctate, more especially on the head and thorax. Head scarcely convex, with two deep frontal impressions between the antennæ, and an obscure transverse vertical depression; the mouth, labrum, head in front, two large spots on the vertex, the palpi and the antennæ rufo-ferruginous; the tips of the palpi and the apices of the joints of the antennæ, those towards the base excepted, narrowly dusky. Thorax short, transverse, very considerably narrowed anteriorly, posteriorly not much narrower than the base of the elytra; widely emarginate in front, the anterior angles reaching to the eyes, and closely embracing

the head, acute ; the sides oblique and rounded, distinctly margined ; the base sinuated ; above convex, with a small fovea on the disk, a row of punctures at the apex, and another at the base, the former somewhat deep and irregular, the latter smaller, interrupted in the middle, crowded towards the posterior angles in a slight depression sunk on each side, continued on the lateral margins, where they become scattered ; the sides broadly ferruginous. Scutellum black, glossy, very finely strigose. Elytra ovate, rather broad, the sides somewhat arcuate or rounded, gradually increasing in width to a little behind the middle, when they are rather abruptly and very considerably attenuated, the apex obtuse, slightly rounded ; very convex, especially towards the base, and gradually sloping from the middle to the apex ; more distinctly punctate towards the base ; glossy, nigrofusco-subæneus ; the shoulders, the outer margins of the base, and the lateral margins broadly testaceous ; the apex concolorous ; a short row of fine, not very numerous punctures on each side of the suture posteriorly, and four rows of more distinct impressions on each elytron, of which the innermost is the most regular, the others being much scattered, especially after the middle, and towards the apex. Body beneath, black ; abdomen attenuated, with the elytra projecting over it, the posterior edges of the segments and the apex, rufo-testaceous. Legs rufo-ferruginous ; the femora, more frequently only the posterior, slightly clouded with fuscous ; anterior and intermediate tarsi with the three first joints in each considerably dilated ; posterior, with the four basal joints beneath furnished with very long ciliæ, which are often abraded.

Female.—Obscure above, especially on the elytra, which resemble those of *C. Sturmii ;* slightly broader behind, and shorter than the male ; head, thorax, and scutellum shining ; elytra very finely, closely, and uniformly reticulate—strigose, much better marked than in the males ; the puncturing more obsolete, and the sides more fuscescent ; posterior and intermediate tarsi compressed, simple, not dilated ; posterior without long ciliæ.

Closely allied to *C. uliginosus,* from which the form, sculpture, and the obscure tint of the female will readily distinguish

it. It appears to have a still greater affinity with A. Reichei of Aubé (*Iconog. et Hist. Nat. des Coleop. d'Europe. tome.* V. 138, pl. 16, fig. 6), but as he does not mention the dissimilarity of the sexes, and as his character represents the sculpture as "strigoso-subpunctatus," which does not agree with our insect, it being distintly recticulate-strigose, I lean to the conclusion that it is a species not before described.

Found in pools and ditches at Boldon Flats, in May and June.

I have possessed a female of this species for some years, and although unable to assign it to any recorded British species, I was yet unwilling to describe it, until I could do so from more ample materials, which last season placed at my disposal; about twenty specimens having occurred, forming a series which exhibits little variation.

6. Colymbetes guttiger, *Gyll.* In abundance in a pond at Gosforth, during May and June.
7. Heterocerus marginatus, *Fab.* Crawling on mud, Gosforth. May and July.
8. Octhebius bicolon, *Kirb.* Abundant in the same locality as the preceding.
9. Hydrochus elongatus, *Fab.* Boldon Flats. May.
10. Hy. brevis, *Herbst.* About twenty specimens, from a pond at Gosforth, in May. They frequent the shallow, dirty parts of the pond, and are very lethargic in their motions.
11. Hy. parumoculatus, *N. Sp.* Newcastle.—*Mr. J. Hardy.*
12. Ocypus fuscatus, *Grav.* Rare. In decayed wood near Axwell Park, and on the sand links near South Shields.—Under stones, at Marsden.—*Mr. J. Hardy.*
13. Oc. ater, *Grav.* Tasgius confinus Curtis, fol. 438. Rare. Beneath stones, on the sand banks near Hartley, in September, and at the foot of the cliffs at Tynemouth Castle, in August.
14. Philonthus chalceus, *Steph.* Hartlepool, in April.—*Mr. J. Hardy.*
15. Ph. scutatus, *Erich.* Not uncommon throughout the district; appearing early in February, and continuing throughout the season.

16. Ph. Fucicola, *Leach.* Beneath sea-weed, at Marsden, in May.—*Mr. J. Hardy.*
17. Ph. Cephalotes, *Grav.* In cellars, at Newcastle, and from Long Benton. Mr. Hardy met with it on the coast, near Hartlepool; and in Ravensworth woods.
18. Ph. bipunctatus, *Panz.* A single specimen taken on the links at Hartlepool by Mr. Hardy.
19. Ph. ventralis, *Grav.* Hot beds, Long Benton.—Hartlepool. —*Mr. J. Hardy.*
20. Ph. splendidulus, *Grav.* Rare. Three specimens, taken at Long Benton.
21. Quedius ruficollis, *Kirby.*—Raphirus ruficollis, *Steph. Illust., Mand.* V. 244.—*Manual,* No. 3125. Very rare. Long Benton. A specimen has also been taken by Mr. A. Hancock.
22. Q. peltatus, *Erich.*—Raphirus attenuatus, *Steph. Illust., Mand.* V. 242. Rare. In woods near Ravensworth and Swalwell.—*Mr. J. Hardy.*
23. Q. semiobscurus, *Marsh.* By the marshy margins of rivulets and ditches.
24. Q. maurorufus, *Grav.* In woods, but rare.
25. Q. picipennis, *Steph.* Rare. Long Benton.—Mr. J. Hardy has specimens from Ravensworth, and Gateshead Fell.
26. Q. attenuatus, *Gyll.*—Raphirus nitipennis, *Leach, Steph. Illust., Mand.* V. 242. Ravensworth, Dunstan, and Gateshead Fell.—*Mr. J. Hardy.*
27. Q. fuscipes, *Kirby.*—Raphirus fuscipes, *Steph. Illust., Mand.* V. 243. One specimen taken at Long Benton in April.
28. Xantholinus fulgidus, *Fab.* Very rare. One specimen from Long Benton, and another, taken on the banks of the Tyne, in May.
29. X. tricolor, *Fab.* Long Benton. Mr. Hardy also found specimens near Marsden.
30. Leptacinus parumpunctatus, *Gyll.* Long Benton.
31. L. batychrus, *Knoch.* Common in hot beds.
32. L. linearis, *Grav.*

33. LATHROBIUM QUADRATUM, *Payk.* Rare. Long Benton. Mr. W. Peacock met with it near Sunderland.
34. LITHOCHARIS OCHRACEA, *Gyll.*—Sunius ochraceus, *Steph. Illust., Mand.* V. 275. Hot beds, Long Benton; frequenting boards laid on the dung, and hiding in crevices, and in holes made by Anobium striatum. According to Erichson it is found in Europe, America, and Brazil.
35. STILICUS RUFIPES, *Müller.* Rare. South Shields, and on the banks of the Derwent, near Axwell, in May.—*Mr. J. Hardy.*
36. S. AFFINIS, *Erich.* South Shields, Marsden, and near Axwell, in April, and May.—*Mr. J. Hardy.*
37. S. ORBICULATUS, *Payk.* Not uncommon.
38. DIANOUS CŒRULESCENS, *Gyll.* Rare. One specimen found in the Ouse Burn Dene, in April.
39. STENUS BUPTHALMUS, *Grav.* In marshy places. Gosforth. —Ravensworth, and Gibside.—*Mr. J. Hardy.*
40. S. MELANOPUS, *Marsh.* Ravensworth.—*Mr. J. Hardy.* At Gosforth, on the bottom of the lake, where the water was dried up.
41. S. PUSILLUS, *Kirby.* In moss, not uncommon.
42. S. NANUS, *Steph.*
43. S. NIGRITULUS, *Gyll.* Rare. Long Benton.
44. S. BINOTATUS, *Liungh.* Borders of ponds. Gosforth, Long Benton, Boldon Flats. May and June.
45. S. PUBESCENS, *Kirby.* On pond plants. Gosforth.
46. S. PALLITARSIS, *Kirby.* One specimen. Ravensworth.—*Mr. J. Hardy.*
47. S. NITIDUS, *Kirby.* Gosforth and Long Benton.—Ravensworth woods.—*Mr. J. Hardy.*
48. S. PICIPES, *Kirby.* Gosforth, Long Benton, &c.—Ravensworth.—*Mr. J. Hardy.*
49. S. NITIDIUSCULUS, *Kirby.* Gosforth and Long Benton.—Ravensworth, and South Shields.—*Mr. J. Hardy.*—Ryhope Dene.—*Mr. W. Peacock.*
50. S. PROBOSCIDEUS, *Gyll.*—Long Benton, Gosforth, and Boldon

Flats, Gibside, Ravensworth, and Marsden.—*Mr. J. Hardy.*

51. S. PALLIPES, *Grav.* Rare. Gibside, and Ravensworth.
52. S. FLAVIPES, *Kirby.* Rare. Long Benton, and Boldon Flats. —Gibside, and Ravensworth.—*Mr, J. Hardy.*
53. BLEDIUS OPACUS, *Block.* Rare. Two specimens taken near Axwell.—*Mr. J. Hardy.*
54. B. SUBTERRANEUS, *Merkel.* On the banks of the Derwent, above Winlaton Mill.—*Mr. J. Hardy.*
55. TROGOPHLŒUS BILINEATUS, *Kirby.* Long Benton.—Ravensworth.—*Mr. J. Hardy.*
56. T. PUSILLUS, *Grav.* Long Benton.
57. COPROPHILUS STRIATULUS, *Fab.* Coast near Hartlepool.—*Mr. J. Hardy.*—Sunderland.—*Mr. Wm. Peacock.*
58. SYNTOMIUM ÆNEUM, *Muller.*—Syntomium nigroæneum, *Curtis,* pl. 228. Gosforth, Long Benton, and Gibside.—Ravensworth.—*Mr. J. Hardy.*
59. PHLŒOCHARIS SUBTILISSIMA, *Mannerh.* Ravensworth, and Gibside.—*Mr. J. Hardy.*
60. GEODROMUS PLAGIATUS, *Fab.*—Lesteva plagiata, *Steph.* Gibside, very rare.—*Mr. J. Hardy.*
61. ARPEDIUM SUBPUBESCENS, *Kirby,* Long Benton.—Near Winlaton Mill.—*Mr. J. Hardy.*
62. OMALIUM CONFORMATUM, *Hardy,* MSS. Ravensworth, and South Shields.—*Mr. J. Hardy.*
63. MICROPEPLUS STAPHYLINOIDES, *Marsh.* Long Benton.—Marsden.—*Mr. J. Hardy.*
64. BOLETOBIUS FORMOSUS, *Grav.* Fugar Bar.—*Mr J. Hardy.*
65. B. CASTANEUS, *Steph.* Long Benton.
66. MYLLÆNA GRACILIS, *Heer.* Ravensworth.—*Mr J Hardy.*
67. PHYTOSUS SPINIFER, *Rudd.* Hartley.—South Shields, and Marsden.—*Mr. J. Hardy.*
68. TACHYUSA FLAVITARSIS, *Sahlb.*—Aleochara ruficrus, *Kirby?* A single specimen, taken near Long Benton, in March.
69. T. CARBONARIA, *Mannerh.* Rare. On the muddy bed of Gosforth Lake.

70. Falagria obscura, *Grav.* Hot beds, Long Benton, but rare.
71. Autalia rivularis, *Grav.* Gosforth, in May.
72. Aspidiphorus orbiculatus, *Gyll.* Near Axwell Park.—*Mr. J. Hardy.*
73. Hister duodecimstriatus, *Schrank.* On hot beds, and in vegetable refuse. Long Benton.—Tyneside.—*Mr J. Hardy.*
74. H. neglectus, *Zenker.* One specimen. South Shields.—*Mr. J. Hardy.*
75. Saprinus rotundatus, *Ill.* Very rare. Roker.—*Mr. W. Peacock,*
76. Abræus globosus, *Ent. Heft.* Hot-beds at Long Benton.
77. Aphodius Lapponuma, *Gyll.*—Aphodius subalpinus, *Hardy, Ann.*, and *Mag. Nat. Hist.* xix., 380. Rare. Prestwick Carr.—*Mr. J. Hardy.*
78. A. melanopus, *Kirby.* Same locality as the preceding.
79. Psammodius Sabuleti, *Payk.* Banks of the Derwent, very rare.—*Mr. T. Pigg.*
80. Cis festivus, *Panz.* A single specimen from Ravensworth. *Mr. J. Hardy.*
81. C. bidentatus, *Marsh.* Ouse Burn Dene.—Mr. J. Hardy finds it at Gibside, and Ravensworth in *Polyphorus versicolor.*
82. Salpingus viridipennis, *Zeigl.* Rare. Ravensworth, and near Swalwell.—*Mr. J. Hardy.*—I have also taken it at Long Benton.
83. Sphaeriestes immaculatus, *Steph.* Rare. Greencroft, and Gosforth. September.
84. Orchesia minor, *Walk.* Rare. On the flowers of the Hawthorn, and Guelder rose.—*Mr. J. Hardy.*
85. Platydema æneа, *Payk.* Ryhope Dene.—*Mr. W. Peacock.*
86. Cneorhinus exaratus, *Marsh.*—Philopedon exaratus, *Steph. Manual.* In meadows, near Axwell Park, and at Elswick, in June.
87. Pissodes Pini, *Linn.*

On visiting the Gosforth woods, in May, I was led to examine some recently-felled Scotch firs, and was much pleased on finding specimens of this beautiful and rare insect. They were

living in apparent harmony with great numbers of *Hylobius Abietis*, and, like them, were feeding on the soft juicy bark of the young trees and branches. I found them, in almost every case, on the underside of the trees or branches, and they appeared to prefer those lying amongst grass in damp places.

The sexes are similar in appearance, excepting that the male has the rostrum shorter and stouter, and, with the thorax, more roughly punctured than in the female. The male is also generally smaller than the other sex, but both vary much in size, some specimens being as large again as others. Recently developed individuals are pale coloured; one that I dug out of a stump of Scotch fir, on the 22d of July, was softer, of a paler ferruginous, and had the scaly bands and spots much darker coloured than the generality of specimens.

As above mentioned, I found them first in May, but by no means common; they were most abundant in the beginning of June; in July they were scarce; and by the middle of August, became so rare, that I relinquished searching for them.

Specimens have also been found at Dinsdale, by Mr. W. Peacock; at Gibside, by Mr. T. Pigg; and recently I had a pair brought me, which were found on Sunderland Pier.

88. DORYTOMUS AGNATHUS, *Dahl.* On willows, near Axwell Park. June—August.
89. ANTHONOMUS POMORUM, *Linn.* Rare. Long Benton.
90. PACHYRHINUS CANALICULATUS, *Marsh.* Prestwick Carr. July.
91. P. COMARI, *Herbst.* Prestwick Carr. July.
92. P. 4-TUBERCULATUS, *Fab.* Gosforth, Long Benton, and Tynemouth.
93. NEDYUS PYRRHORHYNCHUS, *Marsh.* Near Axwell Park.
94. N. BORAGINIS, *Pk.* Rare. Long Benton, in May.
95. GYMNÆTRON NIGRUM. Shotley Bridge.
96. TRYPODENDRON DOMESTICUM, *Linn.* Near Axwell, in March. —*Mr. J. Hardy.*
97. TOMICUS BIDENS, *Fab.* ? Gosforth, and Gibside. Found in the bark of felled Scotch fir, and, more rarely, in that of the Larch.

I insert this species with doubt, the male having, at least,

eight teeth on the retuse part of the elytra; two, small and acute, on the upper part; then, two large decurved ones, between which and the apex are four very obscure denticulations.

98. MACROCNEMA MARCIDA, *Ill.* Sea-coast. In abundance on Cakile maritima.

99. M. AFFINIS. Boldon Flats. On the Bitter-sweet *(Solanum Dulcamara)*.

100. COCCINELLA M-NIGRUM, *Fab.* Rare. Sea-coast, near Whitley.

X.—*On extensive Fissures observed in the Stems of two living and healthy Trees of the Spruce Fir.* By RALPH CARR, Esq.*

[Read May 18, 1848.]

THE latter part of summer, and the beginning of autumn in 1847, were remarkable, it will be recollected, for a long-protracted drought. In the last week of September, I happened to be engaged in marking for the axe, a number of trees that were to be taken out of a plantation at Hedgeley, which, being then of the age of 19 years, required to be thinned for the third time. It formed a compact mass, occupying about eleven acres, upon a light surface-soil, under which lies, in many places, a substratum of clay, not unfavourable to the growth of oak. The species which I had planted were chiefly the last-named tree, to come forward as a permanent crop, accompanied by some Sycamore, and a liberal sprinkling of Birch. The nurses were Larch and Spruce Fir. The Larch had already begun to show symptoms of heart-rot, a disease to which that species is more peculiarly liable on land that has been recently under the plough, as had been the case with more than half of the surface in this instance.

* Mr. Carr's paper was not received in time for insertion in its proper place.

The Spruces, in most parts, had grown better than could have been expected on such light land, and were evidently more to be relied on than the Larches, although upon land of this description not many of them could be expected to live to the age of full maturity, since the species requires either a strong soil, or otherwise a very regular and equable supply of moisture in the ground on which it stands. Under such circumstances, my object whilst thinning the plantation, was, first, to open out the Oaks, and next to give a preference and free space to the Spruces, in order that they should continue healthy as long possible, and especially that the vitality of their lower branches, so essential to the vigour and beauty of this tree, should not be destroyed, by exclusion from the air, the light, and the dew. It was necessary, therefore, to examine a vast number of Spruces individually and closely, to determine whether each was worthy of having some neighbouring Larch condemned to fall, in order to afford it room.

After having gone over good part of the ground in this manner, I was much surprised to discover two Spruces (the European *Abies excelsa*) most singularly rent, almost from end to end of their stems, by a series of wide and extensive fissures, just as we see in the case of Larches that have been felled, peeled, and left exposed to the sun. The diameter of these two trees, at the lower end, was greater than that of a man's thigh, yet the openings seemed to penetrate nearly to the centre of the wood. Strange to say, vegetation was in full vigour, there was not the slightest symptom of injury from lightning; not a single spinelet of foliage was scorched, not a splinter along the course of the cracks was ruffled or displaced. Frost, in the preceding winter, could not have been the agency, for the fissures were as fresh as if I had opened them that very hour by means of a wedge; nay, they were probably even then extending themselves. To attribute the effect to wind was impossible. In the first place, there had been no violent gales for a long time; then, the Spruce Fir is a plant so accurately balanced by its form, that it can never suffer from the screwing motion which sometimes gives rise to the rending of the Ash, or Wych Elm during gales. Above

all, the plants in question stood near the centre of the plantation, exceedingly well sheltered. Could the long drought have been the cause of an appearance, which, so far as my experience has gone, must be rare in our climate? This seemed more probable.

Yet even against this solution of the difficulty there were some considerations not to be neglected. First, the spot, where these two Spruces and many others grew, was one of the best in respect of soil, within the limits of the plantation, and it was naturally always rather moist, though not with stagnant water. The soil is of considerable depth, black, and of the nature of ancient peat or forest-soil, and, not having been under the plough, was always covered with a fresh green herbage. It was the most unlikely spot of all to be deprived entirely of moisture by the long drought, though doubtless it had reached a very unusual degree of dryness. Again, I happened to remember that in the preceding month of May, I had cut out a number of Larches, and several Spruces also, from a distant part of the same plantation; that the Larches were immediately peeled and left lying in the shade, whilst the Spruces had been carried out, in their bark, and laid together on the south side of the woodland, so that they must have been exposed all summer to the sun. I was very curious to see whether these poles of Spruce had been cracked or "galed" by the heat and exposure. On going to the spot I found them lying as I expected, but without a single fissure. The Larches, though lying well shaded, were a good deal rent.

I may now add, two years subsequently, that the health and vigour of the two Spruces in question has continued without any check. They are thriving as well as any of their neighbours. The fissures are superficially almost all closed. The lower branches, as well as those higher up, continue alive and healthy, and still clothe and protect the stems from excessive evaporation, as they did at the time of the injury.

On the whole, it seems to me difficult to infer that drought could be the primary, or, at least, the only cause, of this occurrence, to two trees only out of so many, and those but little ex-

posed to the sun or to the air. So little is known of the action of electric and magnetic streams, in connection with the phenomena of vegetation, that to refer what we cannot otherwise explain to their agency, with any degree of positiveness, would be absurd. Yet I think it more than probable that the ordinary course of the sap must have suffered some temporary and partial interruption or derangement, from some powerful, though obscure, cause, before such an unequal contraction of the woody tissue could occur, as to rend its whole substance so extensively. I hope, on some future occasion, to exhibit before our Club, cross sections from the stem of one of the trees, which I intend to fell, to obtain them, whilst its fellow shall live on.

It is probable that in the spruce forests of Switzerland and Scandinavia, where the summers are both hotter than ours, and electricity often more active, such instances of living trees opening in fissures, may be well known. They may indeed be familiar to the owners of large resinous woodlands in our own country. If so, perhaps we shall receive authentic information on a subject of considerable interest.

Oct. 5, 1849.

XI.—*Account of a Ribbon Fish* (Gymnetrus) *taken off the Coast of Northumberland. By* Albany Hancock and Dennis Embleton, M. D., Lecturer on Anatomy and Physiology, in the Medical School of Newcastle upon Tyne.*

[Read at the Anniversary Meeting, April 21, 1849.]

On the 26th of March, 1849, a fine specimen of a species of *Gymnetrus*, or Ribbon Fish, was captured by Bartholomew Tay-

* By the kindness of R. Taylor, Esq., F. L. S., the Club has been supplied with copies of the plates which illustrated this paper in the Annals and Magazine of Natural History for July, 1849.

lor and his two sons, the crew of a fishing coble belonging to Cullercoats. It was found at about six miles from shore, and in from twenty to thirty fathoms water. The men having started from their fishing ground to return homewards, observed at a little distance what appeared to be broken water; the old man being struck with such a novelty directed his lads to pull towards it; on nearing the spot they perceived a large fish lying on its side on the top of the water. The fish as they approached it righted itself, and came with a gentle lateral undulating motion towards them, showing its crest and a small portion of the head occasionally above water; when it came alongside, one of them struck it with his picket—a hook attached to the end of a small stick, and used in landing their fish; on this it made off with a vigorous and vertical undulating motion, and disappeared, Taylor says, as quick as lightning under the surface. In a short time it re-appeared at a little distance, and pulling up to it they found it again lying on its side; they plied the picket a second time, and struck it a little behind the head; the picket again tore through the tender flesh by a violent effort of the fish, which escaped once more, but with diminished vigour; on the boat coming a third time alongside, the two young men putting their arms round the fish, lifted it into the boat. Signs of life remained for some time after the fish was captured, but no doubt it was in a dying or very sickly state when first discovered by the Taylors.

It was exhibited the same day at Tynemouth, North and South Shields, and brought to Newcastle next morning. In the afternoon we first saw it; we found it much injured by the strokes of the hook and by rough handling during its removals and the examinations it had undergone. The fins were a good deal torn, but the fish was evidently quite fresh.

Its colour was a uniform silvery gray all over, resembling bright tin-foil or white Dutch metal, except a few irregular dark spots and streaks towards the anterior part of the body. On closer inspection the remains of a bright iridescence was seen about the pectoral fin and head, the blue tint predominating.

External description.—The fish presents somewhat the form

of a double-edged sword blade, being excessively compressed; its greatest thickness is decidedly nearer the ventral than the dorsal border; from the thickest part it slopes gradually to each border, the dorsal being the sharper. The length of the fish is 12 ft. 3 in., the mouth not being projected forward; immediately behind the gills it measures $8\frac{1}{2}$ in. in depth; from this point it gradually enlarges to a distance of upwards of two feet further back, where it attains its greatest depth of $11\frac{1}{4}$ in.; this dimension remains much the same for $1\frac{1}{2}$ ft. beyond; it then gradually but perceptibly diminishes to the end of the dorsal fin, where the depth is 3 in.

The thickness through the head at the gill-covers is 2 in., at the part of greatest depth $2\frac{3}{4}$ in.; Plate I. fig. 2 shows a section at this part. Opposite the anus somewhat less; it then gradually diminishes to the end of the dorsal fin, where it is upwards of three-eighths of an inch, fig. 3.

The fishermen state that when this fish was first taken it was all over of a brilliant silvery iridescent hue, resembling in intensity that of the fresh herring, which soon faded, and shortly after we saw it, all traces of the iridescence except those already mentioned had disappeared. The skin is covered over with a silvery matter in which no scales are visible to the naked eye, but which is most readily detached from the skin and adheres to anything it comes in contact with. Submitted to the microscope it is found to consist partly of minute convex scale-like bodies of elongated pyramidal outline with the base rounded, Pl. I., fig. 4, which are formed of fine clear crystalline-looking filaments, arranged side by side, and radiating from the apex to the base of the scale; these filaments grow much finer towards the base, where a number of minute granules are also observed. The scales remind one of some of those seen on the wings of moths. The bulk of the silvery matter of the skin, however, is made up of a soft matter finely granular, and presenting numerous transparent fragments of what have the aspect of acicular crystalline bodies. We have not been able to detect the mode of arrangement of the scale-like bodies on the skin. Round the posterior margin of the preoperculum is a broadish dusky mark on the

skin, and near the top of the head above the eye a crescentic mark of a dark iridescent blue colour; besides these there are on the side of the body several narrow, dusky black, slightly waved lines considerably apart from each other and obliquely inclined from before backwards; of these eight or nine are above the lateral line and of unequal length; below the same line they are more numerous, diminishing in size on the whole till they end in mere spots at some distance behind the anus. The lower series seems to correspond in some measure with the upper. Interspersed among the lines are a few irregular spots of the same hue towards the head. The dorsal and ventral ridges are also dusky. The lateral line was at first smooth and very distinct, but after the fish had been a few days in Goadby's fluid, elongated flat scales became apparent on the line; it can be traced from the back part of the head above and behind the eye, sweeping down gradually to within $3\frac{1}{4}$ in. of the ventral margin at 18in. from the snout; at the anus it is 2 in. from the margin; it thence runs backwards, still approaching the margin, to the caudal extremity.

Four longitudinal flattened ridges, each rather more than 1 in. broad, extend from the head to the tail immediately above the lateral line, which cuts them off very obliquely in front; the uppermost, which is the longest, running forwards almost to the eye.

The surface of the skin of the body is studded with very numerous distinct and separate tubercles of bone; the smallest and most depressed lie between the ridges and towards the ventral and dorsal margins, the largest, and most elevated upon the ridges, some of these last being $\frac{1}{12}$ in. in diameter. On the ventral ridge are numerous, irregular, and prominent tubercles slightly hooked backwards. The tubercles present no regular arrangement, they are imbedded in the skin, and it is difficult to say whether or not they had been covered by the silvery matter of the skin; when we examined them, their apices were uncovered by it. Some were observed to have a perforation at the apex which was occupied by a soft papilla. The tubercles are replaced

in the neighbourhood of the head by irregular depressed indurations of the skin.

The head is small and short, measuring 9 in. from the snout to the posterior margin of the gill-cover; the outline of the lower jaw is a wide arch convex below, and stretching forwards and upwards to the mouth, which is placed in an elevated position and opens upwards and forwards; the mouth is small, nearly circular, and capable of being projected 2 or 3 in. forwards when the lower jaw is depressed. The profile of the head from the anterior end of the crest is at first suddenly concave, the concavity facing forwards and upwards, and just behind the anterior end of the curve exists the nasal chamber which is small, and owing to the damaged state of the fish we could only find one small aperture, which was longer than it was broad. Beyond this concavity the premaxillary bones project nearly horizontally to the mouth. The eye is $1\frac{1}{2}$ in. in diameter, the iris of a beauful silvery white, and rather broader than the diameter of the pupil. The eye is situated $2\frac{1}{2}$ in. below the base of the crest and $1\frac{1}{4}$ in. behind the frontal concave profile. There is a narrow imperfect circle of a dusky colour round the contour of the eyeball. The eye is very flat. The tongue is rather prominent, but small, smooth and fixed. There are no teeth. The interior of the mouth is black.

The gill-covers are large in proportion to the size of the head, prolonged backwards, their posterior angles considerably elevated. The preoperculum has somewhat of a crescentic form, the lower border convex; the anterior horn is narrow and prolonged to its articulation with the lower maxilla, the posterior border has an obtuse angle pointing backwards. This border corresponds to, and may rest upon, the edge of the concavity formed by the operculum above and the interoperculum below. The operculum is on the whole broad and irregularly quadrate, with the upper anterior angle prolonged forwards and upwards; the upper margin is smooth and slightly concave nearly as far as the angle, it then curves suddenly downwards a little to the angle which is rather obtuse. Below this is the posterior border,

which is somewhat sinuous and rather oblique from above downwards and forwards.

The inferior border is nearly straight, and directed upwards and forwards corresponding with the interoperculum.

The remaining bone, which we take for the interoperculum, is narrow and thin, prolonged almost to a point under the jaw and widening gradually to its posterior end, which is rounded and projects backwards beyond the preoperculum. Its lower border is convex and lies almost horizontally.

These are the only pieces observed as entering into the formation of the gill-covers. The above bones are exceedingly delicate and fragile, and present the radiating lines of development with great prominence; the silvery skin covering them is remarkable for its delicacy.

The branchiostegal rays are seven in number; the uppermost a broadish plate marked by radiating lines, the rest diminishing successively in size, having the ordinary characters of such rays.

The four branchial arches diminish in size backwards, and the pharyngeal is less than the fourth branchial arch. The rays of the convexities of the branchial arches are very numerous; the concavities of these arches are beset with prominent blunt-pointed tubercles which are studded with a number of short setæ or bristles, sharp-pointed but rather soft, which project inwards towards the pharyngeal cavity. The first branchial arch has in addition a row of short pale-coloured rays or plates, the inner edges of which are also furnished with setæ which project likewise inwards. On the roof of the pharynx are two or three pairs of short laminæ (pharyngo-branchial) furnished with similar setæ, pointed backwards and downwards in the direction of the entrance to the œsophagus.

The dorsal fin extends from immediately behind the upper and posterior end of the curved frontal profile to within 3 inches of the tail of the fish. The anterior part of the fin, more prominent than the rest, is composed of twelve rays, which were stated by the captors to have been 12 or 14 inches in length when the fish was taken, and to be each furnished with a membranous ex-

pansion on its posterior edge, increasing in width upwards something like a peacock's feather.

The first ray is a pretty strong spine arising just within the frontal curve, the three next are very slender, and much closer together than the rest, and when we first saw the fish, united for 4 or 5 inches (their length at that time) by a membrane; the next is as slender as the preceding, but rather farther apart; the three or four after this are nearly as strong as the first, the rest diminish in strength and length, and become uniform with the rays of the dorsal fin.

It is difficult for us to say whether the twelve front rays constituted a detached crest or formed merely the anterior continuation of the dorsal fin, though after careful and repeated examinations we found shreds of membrane in each interval between them, and their bases also were connected with a continuous membrane. In the interval between the twelfth and thirteenth rays the remains of a membrane were found connecting the base of these rays, and their shafts were ragged and woolly looking, as if a membrane had been torn off from them. We are, therefore, inclined to conclude that the crest was really a continuation of the dorsal fin and not a separate structure, though it is probable enough that the ends of its rays may have been for some distance free and even furnished with a membrane on their posterior margin widening to the top, giving them the appearance of peacocks' feathers as asserted by the fishermen. This probability is heightened by the fact of the head of the *Gymnetrus* from the Cornish coast being provided with two long rays having broad membranous expansions at their ends, which would justify a casual observer in comparing them in form to the above feathers. It is not unlikely besides that the second, third, fourth, and fifth rays, on account of their resemblance in delicacy to the ordinary fin-rays, may have terminated differently from the rest. The rays having been broken, we cannot say of ourselves whether they were uniform in size or not; but from what we have learnt by questioning those who saw the fish, we conclude that the middle rays were the longest, those in front and behind them

gradually decreasing in length. The rays of the crest are more closely set generally than those of the rest of the dorsal fin, which stand about half an inch apart. Exclusive of the crest there are 268 rays in the dorsal fin. They terminate in fine points that project a little beyond the margin of the very delicate connecting membrane. This membrane was colourless according to the fishermen, but was bordered by a pale red when we observed it. The rays of the back are highest about the middle of the fish, where they measure upwards of $3\frac{1}{2}$ inches, and at the termination of the fin are about one inch in height.

From the end of the fin the dorsal margin slopes rather rapidly downwards to within about an inch of the ventral margin, and is then prolonged to a rounded point at the caudal extremity. There is no caudal fin. The skin at this part, it is true, was broken, but on pressing together the broken edges they seemed to leave no hiatus. The fishermen persisted that the part was at first entire, and that there was no appendage whatever. At a distance from this point of about two inches along the ventral margin there exists a shallow notch. Both the margins of the fish at this part are very thin. On carefully inspecting the surface of the body, something like a series of transverse marks corresponding with the bodies of the vertebræ can be discerned, and the number of these has from this appearance been roughly estimated at about 110.

The pectoral fins are placed close behind the gill-covers, and much nearer to the ventral margin than to the lateral line, which is at least half an inch above the points of the rays of the fins; these fins are colourless, delicate, subtriangular, and the longest rays measure two inches. They are eleven in number, and a good deal arched.

The ventral fins are represented by a pair of very strong and straight spines, stated by the fishermen to have been 7 or 8 inches long and as if broken at the end, and furnished along the posterior edge with a delicate membrane about half an inch broad. When we saw them they were about 4 in. long, and the membrane was distinctly visible at their bases. These spines, which at their root measure about $\frac{1}{4}$ in. in diameter, project from each

side of the ventral ridge immediately behind the pectoral fins, are inclined backwards, and capable of a limited lateral and backward motion. We are assured by a gentleman who witnessed the landing of the fish, that these spines were bright crimson and resembling the feelers of a boiled lobster; hence we conclude that they must have been originally flexible towards the end, and much longer than 7 or 8 in. as stated by the fishermen .The same gentleman says that the rays of the dorsal crest were simple and unbordered by a membrane.

The whole fish is remarkably delicate and tender, and easily broken when bent laterally, as shown by the injuries it has sustained by being lifted in and out of the boat, &c.; the flesh is white and fine.

Internal examination.—On opening the fish, the abdominal cavity, Pl. II. fig. 2, is found to be small, and the eye is at once arrested by the bright pale orange vermilion colour of the liver, the rest of the viscera presenting no peculiarity of tint.

The œsophagus, Pl. II. figs. 2 & 3 *a*, at first slightly funnel-shaped, soon assumes a diameter of one inch, and then forms a gradually increasing tube as far as the coming off of the duodenum 23½ in. below the orifice, where it measures 2¼ in. in diameter.

Nothing like any cardia or line of demarcation between the œsophagus and stomach exists in this tract. The duodenum comes off abruptly as a short tube 1½ in. in diameter, inclining forwards from the under surface of the stomach. The stomach, fig. 3 *b*, is continued on beyond the duodenum as a straight tube, gradually diminishing in diameter towards the posterior end of the fish, measuring an inch across opposite the anus. At this point it has the rectum or intestine lying below it, the ovaria and ureter above, the oviduct and ureter running down to the anus on its right side.

It is slightly contracted opposite to the anus, and a little beyond this enters a canal among the muscles, a continuation of the abdominal cavity, situated at about 1½in. from the ventral margin and with tendinous walls, to which it is pretty firmly adherent throughout. It is enlarged slightly after entering the canal, and then diminishes gradually from the diameter of rather

more than an inch to the size of a crowquill. It can be traced backwards to within 1ft. 8in. of the caudal end of the fish, gradually approaching the ventral border, and terminating in a blunt blind extremity, Pl. II. figs. 2 & 3 *c*. The canal, in which the cæcal prolongation is lodged, is prolonged for an inch or two beyond the end of this latter, and contains several small blood-vessels, and the cellular coating of the cæcum arranged in cords, the vessels being gradually lost by passing backwards and outwards into the surrounding muscular tissue, the cellular cords being attached to the sides of the termination of the canal.

The anterior main part of the stomach, when laid open, was quite empty, the inner surface of the œsophagus and stomach as far as two inches below the pylorus perfectly uniform and smooth ; from the point here indicated, the upper wall of the stomach presents the gradual beginnings of a few longitudinal plicæ, on tracing which backwards they are found to increase in number until, at five inches in front of the anus, the whole inner surface of the tube is provided with them. They are continued on in the stomachic cæcum to within two or three inches of its termination. At about halfway along this cæcum was found a small quantity of the spawn of some fish partially digested, several of the ova being still entire ; a little way in front of these was an angular bit of cinder.

The pylorus, fig. 3 *d*, coming off as above mentioned from the most enlarged part of the stomach, extends for only 1½in., when it becomes suddenly constricted, and presents internally the usual circular valve.

The duodenum, figs. 2 & 3 *e*, beyond, is a cylinder of about 1in. in diameter and 1ft. in length, perforated all round by very numerous circular openings, the orifices of the pancreatic cæca, which measure about $\frac{1}{8}$ inch in diameter and 1 inch in length, and completely mask the whole duodenum. This part of the tube extends forwards, lying parallel to and beneath the stomach, and overlapped by the posterior lobes of the liver for about 4in., and then, emerging as it were from the pancreatic cæca, is continuous with the remainder of the intestine, figs. 2 &3 *f f*, which then is suddenly bent backwards and runs along the

lower border of the pancreas obscured by the cæca of the right side; and then keeping along the floor of the abdominal cavity, it passes on as a straight tube to the anus, figs. 2 & 3 *g*, at the front of which it opens separately. The diameter of the duodenum is diminished one-half at its exit from the pancreas, and the intestine continues of the same size to within an inch or two of the anus, where it is gradually lessened to about $\frac{1}{4}$ inch. The length of the intestine from duodenum to anus is 3ft. 5in. The inner surface of the intestine below the duodenum presents a very delicate honeycombed texture, the laminæ being fine, of varying size, and crossing each other in all directions, the largest standing up pretty high and taking a longitudinal course. This form of valvulæ conniventes extends to within three or four inches of the anus. A few inches below the end of the duodenum was observed a delicate and transparent, but large and crescentic, membranous valve, projecting into the cavity of the intestine. There is no division into large and small intestine, unless the above valve point it out. No cæcal appendage, except to the stomach. The intestine contained nothing but a quantity of pancreatic secretion.

Attached to the upper surface of that part of the intestine which is opposite to the pylorus, is the spleen, fig. 3 *h*, ovoid in form, delicate and spongy in texture, 2 in. long by $\frac{3}{4}$ in. broad, and of a very pale reddish brown colour. Large blood-vessels run along both the upper and lower borders of the intestine below the duodenum.

The liver, figs. 2 & 3 *i*, is large, and extends 18in. backwards from the anterior end of the abdominal cavity lying below the œsophagus, somewhat pointed in front, and becoming more bulky towards the posterior end, where it is truncated diagonally from above downwards and forwards.

The upper surface has a deep fissure partially dividing it into two unequal masses, the left being larger than the right; along this fissure run the hepatic and pancreatic blood-vessels; the gall-bladder and the cystic duct lie also attached to it.

The gall-bladder, fig. 3 *j*, about 5 in. long and $1\frac{1}{2}$ in. broad, is of an irregularly elliptical form, its long diameter corresponding

nearly with the length of the fish; the cystic duct comes off from its anterior end, and, running backwards parallel to it and to the hepatic duct, joins the latter just before coming to the posterior border of the liver: the common duct, fig. 3 *k*, after this runs backwards among the lower appendices pyloricæ of the left side, and debouches into the duodenum on a small papilla upwards of an inch distant from the pylorus. The gall-bladder contains a small quantity of yellow olive-coloured bile. The texture of the liver is so soft and fragile that it cannot be preserved.

The ovaria, figs. 2 and 3 *l*, lie directly above the stomach, are about 3ft. 3in. long, and extend forwards nearly as far as the middle of the liver. Their ends taper to points diverging slightly from each other; traced backwards, they gradually increase in bulk to $\frac{3}{4}$ in. in diameter at their middle; soon after this they diminish in size, become more closely connected, and unite at 27 in. from their anterior points into one body, which tapers gradually to $\frac{1}{3}$ in. in diameter, and then curving downwards to the external orifice on the right side of the stomachic cæcum, only becomes rapidly smaller, and opens behind the intestine. On laying open the common tube or oviduct, it is found for 2 or 3 in. from the orifice quite plain; above this, longitudinal folds of the lining membrane appear small and irregular at first, but soon larger, more projecting, and then occupying the whole inner surface of the tube. These plicæ, which become tortuous and collected into rows of two or three together, are found to extend to the ends of the ovarian cavities, and are studded throughout with minute ova of unequal sizes in an undeveloped state.

The ureter, figs. 2 and 3 *m*, a simple tube of the size of an ordinary goosequill, runs from the external orifice, just within which is a slight vesical dilatation, fig. 3 *n*, along the median line, lying above and attached to the ovaria, and in contact with the roof of the abdominal cavity, for a distance of 1 ft. 11 in., when it perforates the fibrous membrane separating the kidney from the other viscera. It runs obliquely forwards and upwards into the kidney, fig. 3 *o*, which, inclosed in its proper cavity, extends from an inch behind where the ureter joins it as far as the cranium, a distance of 2 ft., reaching farther forward than the di-

gestive cavity. The organ is partially and unequally cleft by a median fissure, the left side being larger than the right. Its tissue is reddish brown, spongy and friable. The posterior end of the kidney tapers to a point. The anterior end also tapers a little, but is rounded. The ureter enters the under surface of the gland, and terminates by opening into the general cavity which exists along the median line of the organ. Along the upper angle of this cavity and elsewhere are the openings of small canals bringing the secretion from the uriniferous tubules. These last can be readily seen with a common magnifying glass.

The supra-renal glands, fig. 3 *p*, are two small ovoid bodies, much paler than the kidney, partially imbedded in that organ on its upper surface, at a distance of two inches from its posterior extremity. There is no trace of air-bladder.

The heart, which is double the size of that of an ordinary cod-fish, occupies a spacious triangular cavity. Its ventricle is large, firm, and triangular. The bulb of the aorta is smaller than that of the cod. The auricle is capacious and of irregular form.

The blood-vessels beyond were not examined, and we could not investigate the nervous system.

In a little blood obtained from the heart, the blood-discs, Pl. I. fig. 5, are found to vary much in size, and also in form from sub-circular to elliptical and even fusiform, having their extremities or poles somewhat pointed. The nucleus is generally large and distinct, and presents several nucleoli of different sizes, giving it in many instances a granular appearance.

General remarks.—Having referred to what we have been able to find recorded respecting the genus *Gymnetrus*, we found that the figures as well as the descriptions of the external parts were very imperfect, and the anatomy little known; hence we thought it desirable to make the above description fuller than otherwise would have been necessary. Seven or eight species only have been recorded. Cuvier and Valenciennes, in vol. x. p. 365 of their 'Histoire Naturelle des Poissons,' describe one species from a manuscript in the library of Sir Joseph Banks, which is probably identical with ours, and to which they have given the name of *G. Banksii*. It was thrown up at Filey Bay, March 18,

1796, and taken to York market on the 21st. The description is as follows :—"La queue lui manquait aussi. Sa longueur était de treize pieds, son épaisseur de trois pouces, la longueur de sa tête de sept. Ses flancs étaient garnis de petites protubérances argentées disposées en séries longitudinales. La dorsale, qui s'étendait depuis la tête jusqu'à l'autre extremité, était rouge, et avait deux cent quatre vingt dix et treize rayons (les treize rayons sont sans doute ceux de la nuque) ; la pectorale en avait douze ; la ventrale un seul. Il n'y avait point d'anale ; on ne voyait point de dents ; l'intérieure de la bouche était noir ; la distance de l'anus à la bouche était de quatre pieds. Toutes circonstances qui, comme on voit, se rapprochent beaucoup de ce que nous avons observé dans nos Gymnètres de la Méditerranée."*

This description, though not conclusive, is sufficient to warrant us in adopting the name given by the French naturalists, and thus to avoid running the risk of adding uselessly to the list of synonymes.

Another species is described in the same work, vol. x. p. 298, under the name *Gymnetrus Gladius*, which very much resembles our specimen ; besides, however, some minor differences, the upper border of the operculum differs materially—in the former it is convex, and presents three angular points ; in the latter it is smooth and concave.†

There are two Norwegian species which appear generally to precede or accompany the shoals of herrings, and hence are called "King of the Herrings." Of these, the *Regalecus Glesne* of Ascanius (*G. Ascanii* of Shaw) seems to be the most nearly allied to our fish, but it is distinguished from it by the following marks :—It is 10ft. long and 6in. deep ; its length is, therefore, to its depth as 20 to 1. From the measurements given in the former part of this paper, it will be seen that our fish is thirteen

* It has not been in our power to refer to the work here mentioned ; but to the kindness of Mr. Adam White, of the British Museum, who called our attention to the above record, we are indebted for this extract, and also for another relative to *G. Gladius*.

† The *G. Telum* of the same authors is also different from our fish, this having 268, that 398 rays in the dorsal fin.

times longer than it is deep. This has 268 rays in the dorsal fin; that 120.

Again, the *G. Ascanii* is devoid of the transverse dusky streaks on the anterior part of the body so characteristic of our species, but is furnished with longitudinal rows of minute dusky spots, and has, moreover, three broad dusky bands across the posterior part of the body behind the anus, and its forehead is white; it is also described as having teeth; the crest also probably differs, if the figure given in the 'Encyclopédie Méthodique' be correct; the dorsal fin is continued round the caudal extremity for a little distance along the ventral line, being somewhat elongated at the extremity, forming a kind of caudal fin. The gill-membrane has only four or five rays. Thus, though there is a striking general resemblance, there are several important points of distinction between the *G. Ascanii* and the *G. Banksii*.

The other Norwegian species named *G. Grillii* (Lindroth, Nouvelles Mémoires de Stockholm, xix. pl. 8) is noticed in Griffith's 'Cuvier,' as being 18ft. long, and having upwards of 400 rays in the dorsal fin, and we conclude, therefore, that it also is distinct from our species.*

Of the so-called Indian species, one, the Russellian, described as a probable variety in vol. iv. pt. 2 of Shaw's 'Zoology,' is only 2ft. 8in. long, and has 320 rays in the dorsal fin, and differs in several other respects.

The other is the Blochian Gymnetrus of Shaw, the *G. Hawkenii* of Bloch, the figures of which are incorrect. This, however, in all probability ought not to be considered as an Indian species. The history of it, so far as we can gather, is as follows:—

It appears that on the 23rd February, 1788, a species of *Gymnetrus* was drawn on shore in a net at Newlyn, in Cornwall, and all that is really known of it is obtained from a figure with notes, which was in the possession of the late Mr. Chirgwin, of Newlyn, who freely granted permission to Mr. Couch, of Polperro, to

* We have since been informed by Mr. J. E. Gray that *G. Grillii* has the same number of rays, and the same dark cross bands on the anterior part of the body, as the Cullercoats fish.

have a copy taken of it. Through the kindness of Mr. Couch, we have been favoured with a reduced copy of the above figure, made by Mr. Thomas Q. Couch; and in the letter accompanying the drawing, Mr. Couch states that Mr. Chirgwin assured him that his figure was the only true original, the fish having been drawn ashore not far from his house; that, however they might differ, all other figures were copied from his, and that the note written on his figure is the only one originally made from the specimen. Mr. Couch further says, that he has no doubt, from circumstantial evidence, that the figure and account of the *G. Hawkenii* were communicated to Bloch, by a Mr. John Hawkins, brother of the late Sir Christopher Hawkins, Bart. Mr. Hawkins himself, as Mr. Couch concludes from Mr. Chirgwin's remarks, did not actually inspect the fish. The copier of the figure sent to Bloch, appears to Mr. Couch to have committed a great mistake by attempting to correct one which he supposed to have been made by the original draftsman, and the mistake consists principally in his having removed the two filaments in front of the dorsal fin to the situation of the ventral fin, thus making four filaments there instead of two. The same mistake appears to have been made with regard to the figure of the *G. Hawkenii* in Yarrell's 'Fishes,' that figure being, as Mr. Yarrell informs our friend Mr. Alder, incorrect as regards the number of ventral filaments, and the addition of the caudal fin.

It appears therefore that the *G. Hawkenii* of Bloch, is simply the fish caught at Newlyn incorrectly copied. In the notes appended to the drawing sent us by Mr. Couch, and which are copied from the original, are merely mentioned the date of the capture as above and the measurements; "its length without the tail, which it wanted, was $8\frac{1}{2}$ ft., its extreme breadth $10\frac{1}{2}$ in., and its thickness but $2\frac{3}{4}$ in.

Its proportions therefore, allowing the tail to be somewhat deficient, come pretty near to those of our fish; if the drawing however, is to be relied on, it differs from ours in having only two filaments from the head with expanded feather-like extremities, and in having the ventral processes like those of the head. The fins also are crimson, and the body is marked all over by delicate

roundish spots, and has a few obscure streaks obliquely placed below the lateral line.

On the whole, then, we are inclined to believe the Cornish specimen distinct from the *G. Banksii*, though, from the evident want of knowledge of the draftsman, much reliance cannot be placed on his details.

Notwithstanding the rarity of the genus *Gymnetrus*, there is every reason to believe that specimens of it have been taken from time to time off the north-eastern coast of England. It appears by the 'Annual Register,' that a fish was captured off Whitby, January 22, 1759, closely related to, if not identical with, our species. The account, which may be interesting, we here reproduce. It is by Lionel Charlton, author of a 'History of Whitby' :—

"Yesterday (Jan. 22) a very extraordinary fish was brought here by our fishermen, which broke into three pieces as they were hauling it into the coble. It was 11 ft. 4 in. long, exclusive of the tail, had a head like a turbot or brat, was about a foot broad near its head, but not above 4 or 5 in. near the tail, and not anywhere more than 3in. thick. The thickest part was its belly, and it gradually diminished away towards the back, which was sharp, and had all along it one continued fin from the head to the tail. It was covered with an infinite number of white scales, which stuck to and dyed every thing that it touched; and might be said in some sort to resemble the quicksilvered back of a looking-glass. It appeared, when laid on the sand, like a long oak plank, and was such a fish as nobody here ever saw before, which caused a vast concourse of people round it the whole day."

The breaking of the fish was owing to its great delicacy of structure, and probably its little capacity for lateral motion. It was necessary to take great care in removing the Cullercoats fish for fear of fracture from the same causes.

We are informed by Mr. Stanton, of Newcastle, that upwards of fifty years ago a silvery fish, resembling in its general characters the subject of this paper, was exhibited here, and we have been favoured by Mr. Robert Bewick with a copy of a hand-bill relating to a fish shown in this town March 27, 1794, undoubt-

edly referring to the specimen seen by Mr. Stanton. It is as follows :—"To be seen at Moses Hopper's, Flesh Market, a most curious fish, taken at Newbiggen by the Sea, 10 ft. long, 1 ft. broad, 2 in. thick, and is thought to be the greatest curiosity that was ever seen in the kingdom before."

This fish was sketched by our celebrated townsman Thomas Bewick, but unfortunately the sketch has been mislaid.

We have lately been favoured with a letter from Mr. George Tate, of Alnwick, respecting a fish of this genus, from which we make the following extract :—"A fish was exhibited in January or February of the year 1845, similar in its general form to that a drawing of which you showed me when I was last in Newcastle. One of the Preventive Service men observed this fish lying in a shallow pool in the sands, about a mile south of Alnmouth, where it had been left by the receding tide. Its great length and unusual appearance at once raised the man's curiosity and excited his fears. On approaching it the creature bent itself round so as to appear like the rim of a coach-wheel, and the man supposing it was about to dart upon him, drew his sword and struck it on the head. The fish struggled much, but the man striking it repeatedly, at length succeeded in cutting off its head.

"This fish was 16 ft. long, 11 in. deep, and about 6 in. thick at the thickest part, from which it very gradually diminished both in thickness and depth. The eye was large, measuring about 5 in. in circumference. The teeth very small and very acute. The skin was smooth, and no pustulations or hard points were observed, neither were any transverse streaks noticed; but there were a few longitudinal ridges or corrugations about half an inch apart along the sides. The colour was a silvery gray, and the skin was covered by minute silvery-looking scales or particles, which were in such great quantity, that in the course of the struggles the creature made after being struck, the spot where it was found was covered over with them. There were no pectoral or ventral or anal or caudal fins, neither was any crest observed. These however may have been broken off, as the head was much injured by the blows which it had received. One fin, of a rich dark crimson colour, extended uninterruptedly from the

neck along the back to within a few inches of the tail, which ended in an obtuse point. The fish was very beautiful; the large eye, the rich crimson-rayed fin cresting its back, and the bright silvery hue of its body, rendered it a striking and attractive object." The fish thus described by Mr. Tate, it will be seen, resembles rather the *Regalecus Glesne*, in its having teeth and being devoid of the transverse streaks.

The following account of the capture of two fish of this genus has been taken down by us from the oral relation given by John Blackett Anderson, of Walker, near Newcastle. He states he recollects the taking of two fish about fifty years ago at the outer Fern Islands. They were left by the tide in a shallow pool, and a signal being made by the keeper of the lighthouse, a boat went from the shore and brought them to Bambrough. They were sick when taken. One was about 4 ft. longer than the other, the larger specimen was 18 ft. long. It could not be less, for it was as long as the breadth of a house-end which measured 18 ft., and against which it was laid out on a bench. The fish were about a foot deep, and were flat; their colour was silvery, like a silver fish, but not so white. There were four processes, about 18in. long, from the head, of a red colour, like the feelers of boiled lobsters; they tapered gradually towards their ends, which were enlarged to the form and size of a large button. Thinks these specimens occurred in spring. They were kept till putrid, and then thrown away. They excited much interest throughout the neighbourhood. Recollects them well, for he was living then on the spot. Has not seen the Cullercoats fish.

We have moreover learnt, from a Norwegian captain who frequents this port, and has traded to Archangel, that in the White Sea, fish closely resembling the Cullercoats one are occasionally seen; the silvery colour, long attenuated form, and rapid undulating motion, being their chief characteristics. They are there called Stone Serpents.

It has occurred at once to many here, and to ourselves also, on first viewing this *Gymnetrus*, that it may possibly have been taken for the famous Sea Serpent. The Archangel name of the fish, seen there, strengthens the idea that it may at times [illegible]

deceived the eye of some credulous mariner, from its rapid undulating motion, linear form, and from its occasionally appearing at the surface, and leaving a lengthened wake behind it, thus creating an exaggerated idea of its extent.

On consulting, however, the accounts which have appeared of the Sea Serpent, we find that they relate in most instances to creatures widely different from the Ribbon Fish, such as whales, seals, sharks, &c., seen under disadvantageous circumstances or imperfectly observed. Still, though the *Gymnetrus* may not have originated the idea of the existence of a marine serpent, we think it not improbable that the occasional appearance of this fish may very materially have tended to keep up among the Norwegian fishermen that faith which they are stated to hold in the existence of such a monster.

Of the habits of the *Gymnetrus* little can be said. The delicate general conformation of the body, the smallness and tenderness of the mouth, the absence of teeth, the delicacy of the fins, show clearly that it is a fish not organized for attack—the dorsal crest and the ventral processes being obviously for the purpose of balancing the body, and not for either attack or defence. Its means of defence may consist partly in the bone-studded skin, but chiefly in the adaptation for flight, evidenced in the compressed form of the body, and in the great length and power of the tail. The small amount of half-digested food found in the stomachal cæcum goes so far to prove the non-rapacious habits of the *Gymnetrus*, and make it probable that its habitual food is confined to the spawn of other fish, and the soft, small, and defenceless inhabitants of the deep. The absence of air-bladder seems to indicate the sea-bottom as the natural resort of this fish, where its food would be most abundant.

The only evidence of its being indigenous on the north-eastern coast rests in its having been observed six times since 1759. There is little doubt of the remarkable circumstance that all the six have been captured during the spring months.

In conclusion, we have only to state, that the fish is now in the possession of Mr. Edward Whitfield, of Newcastle, who kindly granted us permission to make the necessary examinations, and

we are happy in being able to state that that gentleman has expressed his intention of presenting this rare fish to the museum of the Natural History Society of Northumberland, Durham, and Newcastle upon Tyne.

Since writing the above we have received a pamphlet entitled 'An Account of the Rare Fish, *Regalecus Glesne*, caught off Cullercoats," &c. In it we find a copy of a figure of a *Gymnetrus* taken at Newlyn, in Cornwall, on Saturday, 23rd day of February, 1788. This figure, with descriptive notes appended, is bound up at the end of a copy of Pennant's 'British Zoology' in the Banksian Library. Mr. J. E. Gray supposes this figure and notes to be the authority for the various descriptions and figures of the Cornish specimen of *G. Hawkenii*. The Banksian figure, though possessing a good general resemblance to a *Gymnetrus*, differs so widely from the figure we have been favoured with by Mr. Couch, that we believe neither of them to have been a copy of the other, and the differences in the measurements that accompany the figures are such as to strengthen this belief; the length of the Banksian specimen is said to be 8 ft. 10 in., Mr. Couch's $8\frac{1}{2}$ ft. The depth of the former is 10 in., of the latter $10\frac{1}{2}$ in.; the thickness of the former $2\frac{1}{4}$ in., of the latter $2\frac{3}{4}$ in. These discrepancies could scarcely have arisen from errors of copying, but are more likely to be the result of examinations by different observers. It would therefore appear that there must either have been more than one fish caught on the Cornish coast, or else that different drawings and descriptions have been made of the same specimen.

The figure in the pamphlet does not appear to us materially to elucidate the species of the Cornish fish; indeed the details both of the figures and descriptions are so imperfect that they may quite as readily be taken for the *G. Gladius* as for the *G. Banskii*; the spotting of Mr. Chirgwin's drawing brings strongly to mind the markings of the *G. Gladius*.

We are glad to be able, from a letter of Mr. Yarrell in the above pamphlet, to add to the list of specimens now put on record one which was cast on shore alive at the village of Crovie, near

Macduff, after a severe north-easterly gale in March, 1844. It is thus described :—"Length without the tail, which was wanting, 12 ft., greatest depth 12 in., greatest thickness $2\frac{3}{4}$ in. The dorsal fin was $2\frac{1}{2}$ in. in height, and extended from the back of the head to a point near the tail. Rays in the dorsal fin, apart from its anterior elongation on the head, 264. Filaments rising from the head, 15 ; the longest measuring 27 inches. They were connected at the base by a thin membrane, similar in consistency to that which connects the rays of the dorsal fin, and are evidently a continuation of that fin. The pectoral fin is $2\frac{1}{2}$ in. long, the rays 12 in. The ventrals consisted of two filaments 3 ft. in length. They were fringed with a thin membrane on two sides, and had evidently been broken. The head was 9 in. long from the point of the lower jaw to the end of the operculum. The whole body was covered with a delicate silvery white membrane, under which appeared a series of tuberculated and smooth bands, extending over the whole length of the body ; twelve of these bands occupied the space above the lateral line. When the fish was in a fresh state these bands did not appear distinctly, but when the skin was taken off they appeared distinct enough. Behind the pectoral fins appeared a few narrow dark bands extending across the fish ; these were quite distinct when the fish was in a fresh state, but the skin does not retain a trace of them. The dorsal fin had an orange tinge, and the lateral line extended along the lower third of the body. The distance of the vent from the end of the operculum was 46 inches."

We agree at once with Mr. Yarrell in pronouncing this to be the same species as the Cullercoats fish, and it is confirmatory of our opinion that the crest was really a continuation of the dorsal fin. This Scotch specimen, like the English ones, was caught in the spring, and makes the eighth British example of this fish, which is therefore not so extremely rare as has been supposed.

We observe that in the last Number of the "Annals," Professor J. Reid, of St. Andrews, has given a highly interesting description of what he believes to be the first British example of the Deal fish, and we take the present opportunity of stating that in the Newcastle Museum there is a specimen which was taken at Newbiggen, on the Northumberland coast, June 18th, 1844.

This specimen is 5ft. 5in. long, and has 1ft. maximum depth. The body was of a silvery gray, and the dorsal fin and tail red.

Another example of the occurrence of the Deal Fish is given by Mr. Charles St. John, in his Field Notes and Tour in Sutherlandshire.

The following description is quoted from that work:—"Length, 3 ft. 6 in.; depth, 7 in.; greatest thickness, between half and three-quarters of an inch; colour, bright silver, with one very thin crimson fin running the whole length of the back. The tail very transparent, fan-shaped, and of a bright crimson. A large flat eye and a small mouth, which the fish had a peculiar power of elongating to a considerable extent." We have seen a very good coloured drawing of this individual by Mr. St. John, and understand that it was taken alive, hooked through the back by a common haddock hook.

EXPLANATION OF PLATES I. AND II.

PLATE I.

Fig. 1. Anterior portion of *Gymnetrus Banksii*, the jaws being slightly protruded; the dotted lines on the crest and ventral processes represent these parts as they are believed to have been originally; the continuous lines represent them as they were seen by us.

Fig. 2. Outline of section of body at part of greatest thickness, showing the relative depth and thickness.

Fig. 3. Outline of section of ditto, showing ditto ditto at three or four inches from tail.

Fig. 4. Two of the radiated scale-like bodies from the silvery matter of the skin.

Fig. 5. Different forms of blood-globules, some shown on edge.

PLATE II.

Fig. 1. Side view of *G. Banksii* in outline.

Fig. 2. Side view of ditto, abdomen laid open, showing the viscera *in situ*: *a*, œsophagus; *c c*, cæcal prolongation of stomach; *e*, pancreatic cæca covering duodenum; *f*, intestine; *g*, anus; *i*, liver; *l*, ovaria; *m*, ureter.

Fig. 3. Plan of viscera removed from body: *a*, œsophagus; *b*, stomach; *c c*, stomachic cæcum; *d*, pylorus; *e*, pancreatic cæca surrounding duodenum; *f*, intestine; *g*, anus; *h*, spleen; *i*, liver; *j*, gall bladder; *k*, ductus communis choledochus; *l*, ovaria; *m*, ureter; *n*, vesical dilatation of ditto; *o*, kidney; *p*, supra-renal bodies.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ AT THE FOURTH ANNIVERSARY MEETING, HELD IN THE COMMITTEE ROOM OF THE LITERARY AND PHILOSOPHICAL SOCIETY, NEWCASTLE, MARCH 1ST, 1850, BY JOSHUA ALDER, ESQ., PRESIDENT.

GENTLEMEN,—At the conclusion of my year of office, and before resigning the chair to which you did me the honour of electing me at the last anniversary, it now becomes my duty to take a short review of the proceedings of the Club during the past season.

In doing this, it is not my intention to enlarge upon the advantages of the study for the advancement of which we are associated,—a subject on which I hope we are all agreed,—but rather to confine my remarks as much as possible to matters of a practical nature.

Our meetings during the year have not, perhaps, left us anything very remarkable to record, but, at the same time, they may be looked back upon with satisfaction, as having afforded us many opportunities of instructive intercourse and enjoyment, while rambling together over those pleasant tracts of country in which they have been held. But although, excepting in one instance, no great novelty has been met with during our excursions, yet I hope to show that the year has not passed over without some results, due to the exertions of individual members, which, embodied in the Transactions of the Club, will afford a permanent memorial of its usefulness.

In no country in Europe has so much been done for the advancement of local natural history as in Great Britain. Our works on native species are more numerous and accurate, especially in the zoological department, than those of our continental neighbours, while the great extent of our sea coasts gives a variety to our natural productions which few other countries

winter, however, it has made its appearance in considerable numbers, driven probably from its usual continental haunts by the severity of the season. Several individuals have been shot on the banks of the Tyne, as well as in some other places in this neighbourhood. Some birds not generally considered migratory have likewise appeared in more than usual numbers this winter: —of these may be mentioned the greater spotted Woodpecker and the Kingfisher. Mr. John Hancock shot two specimens of the Pigmy Curlew *(Tringa sabarquata)* out of a flock on Whitley Sands in September last. Tengmalm's Owl *(Strix Tengmalmi)*, another rare visitant, has also been met with: one occurred on the coast north of Whitburn, and a second individual was shot near Rothbury in April last. These specimens, which are male and female, are now in the possession of Mr. John Hancock. A young male bird of the Goshawk *(Accipiter palumbarius)* was shot in Northumberland this year. The red Viper has been added to the Northumberland Fauna by Mr. F. H. Salvin, who captured a specimen on Cheviot in October last. The specific difference between this, which is supposed to be the *Coluber chersea* of Linnæus, and the common viper has not been satisfactorily made out.

Another specimen of that remarkable fish, the *Gymnetrus Banksii*, the account of which forms so conspicuous an ornament of our last year's Transactions, has lately occurred at Redcar, a place so nearly within the limits of our district that it may not inappropriately be mentioned here. It was alive when caught, and measured 11 feet in length, somewhat less than the individual got at Cullercoats, which in colour and markings it appears to have closely resembled. It has been purchased for the British Museum. A less conspicuous, though scarcely less rare British fish, the *Centrolophus pompilius*, or Black Fish, was caught last autumn at Cullercoats, and, happening to be there at the time, I fortunately secured it for our Museum. The only British locality hitherto recorded for this fish is the coast of Cornwall, on which a few individuals have been obtained at rare intervals, amounting, I believe, to no more than five since its first discovery in the time of Borlaise, nearly a century ago. Its occurrence on this coast,

so far beyond its supposed geographical range, is therefore interesting. One of those strange looking inhabitants of the ocean the short Sun Fish *(Orthagoriscus Mola)* was caught at Cullercoats last summer and brought up to Newcastle for exhibition by the fishermen. It fortunately afterwards came into the hands of Dr. Embleton for dissection, as did also a fine specimen of the Porbeagle Shark *(Lamna Cornubica)* above eight feet long, caught at Hauxley. Two or three examples of this shark have occurred on the Northumberland coast in the course of the autumn.

Among the Mollusca, the following rare species have been added to our Fauna during the year. *Bulla strigella, Rissoa vitrea, Pleurotoma nebula,* and *Pleurotoma brachystoma;* also an undescribed species of *Odostomia,* which I have named *Odostomia conspicua.* These were all dredged off Whitburn. The employment of the dredge on our coast, now for the first time successfully, leads to the hope that many important additions to our Fauna may be made in future years by this means; as the dredge has now become an essential auxiliary to the naturalist in exploring the wonders of the deep.

An Ascidian new to the coast, *Cynthia echinata,* occurred to me when at Whitburn in the summer, and I was so fortunate as to meet with an undescribed species of the same family at Cullercoats in October last, which I have named *Molgula siphonata.*

Mr. Bold informs me that the last year has not been a favourable one for the labours of the entomologist. Owing perhaps to the unwonted dryness and ungenial temperature of the early months, the common *Lepidoptera* did not appear in any thing like their usual numbers, and during the early summer, those pests of the garden, the common white butterflies, were scarcely to be seen. Towards autumn Mr. Bold noticed them rather more frequently, and saw several patches of cabbages rendered useless by hosts of the larvæ of *Mamestra Brassicæ.* The same or a nearly allied larva was in abundance on the halm of pease. *Coleoptera* were certainly not in their usual quantity. Nevertheless Mr. Bold secured several new to our Fauna, and again took *Colymbetes dispar,* described in the last part of the Club Transactions.

A curious little crab, *Eurynome aspera*, dredged by Mr. R. Howse, off Whitburn is new to the coast, as is another small and rather rare species, *Ebalia Cranchii*, got at the same time.

But the most interesting discovery in this department is that of a burrowing Cirripede found at Cullercoats by Mr. Albany Hancock. This little creature forms a habitation by boring into the substance of dead univalve shells, a habit until lately unobserved in this tribe. The anatomy, too, of this animal is curious, from its shewing a great deviation from the usual form of the class, and an approach to the typical crustaceans. This species, for which a new order and genus have had to be formed, is called by Mr. Hancock, *Alcyppe lampas*.

The only Echinoderm met with new to the coast is the *Syrinx Harveyi*, got by Mr. Howse in one of the dredging expeditions off Whitburn already mentioned. This species was first described in Forbes's 'British Starfishes' from specimens found at Teignmouth in Devonshire, the only habitat then known, and I am not aware of its having been since met with until the present time.

In Zoophytes I have again the pleasure of alluding to the discoveries of Mr. Albany Hancock. On the excursion to the Northumberland lakes, two beautiful fresh-water zoophytes of the order *Bryozoa*,—a *Fredericella* and a *Paludicella*,—were got in Crag Lough by that gentleman. This success induced him to pay two more visits to the same locality, during which in that and Bromley Loughs, two additional species were found, belonging to another genus, *Plumatella*, as well as a specimen or two of what appeared to be a third *Plumatella*, and an imperfect specimen of an *Alcyonella*. With the exception of a *Plumatella* found by Mr. Hogg in a rivulet near Stockton, and *Alcyonella stagnorum* got by Mr. Embleton in a pond at Howick, none of the freshwater *Bryozoa* had been previously observed in these counties. The genus *Paludicella* is new to England. Mr. Hancock considers three of the species undescribed, which he has named *Plumatella punctata*, *Plumatella Allmani*, and *Paludicella procumbens*. The other species found were *Fredericella sultana* and *Alcyonella stagnorum*. Along with these novelties, a beautiful little flesh-coloured *Hydra*, probably a variety of *Hydra fusca*, was found in

considerable abundance. In his microscopical investigation of this species Mr. Hancock has succeeded in making out, more completely than has been hitherto done, some important points in the anatomy and development of this curious genus, the first account of whose habits and properties, when given by Trembly, appeared to the world like a romance. Mr. Hancock's investigations have been principally directed to its second or oviparous mode of reproduction, the process of which he has satisfactorily ascertained. He has been equally successful in making out the character and mode of operation of the stinging apparatus with which this little animal is supplied. This consists of minute bodies embedded in the tentacles having a poison bag surmounted by a tribarbed dart, which is capable of being ejected upon its prey.

To complete the list in the zoological department, I may mention that three species of polype-like animalcules, apparently new, and uniting the *Infusoria* with the Campanularian zoophytes more nearly than any yet known, were met with by myself during the summer; two of them, marine, on the shore at Whitburn, and one from the freshwater of Crag Lake.

In Botany little novelty has turned up. The only plants new to the counties are *Ulex nanus*, discovered by Mr. Daniel Oliver, junior, near Staward Peel, and *Myriophyllum alterniflorum*, lately found in Crag Lough by Mr. John Thompson. *Potamogeton rufescens*, gathered by Mr. Storey in the same lake, may probably be also considered new to our Flora. Some additional habitats for the rarer plants will be found in the account of the field meetings.

Mr. Tate's researches on the polished and scratched surfaces of rocks, viewed in connection with the boulder formation, shew that geology has not been entirely neglected. The indications of important changes in our planet afforded by these surface deposits, and the marks of violent action they have left, involve some of the most curious problems in geology. They have until now been little studied in our neighbourhood, but the communication read at our last meeting, and a short paper on a similar subject in the

4th Part of our Transactions by Mr. Loftus,* shew that a rich field is still open for research even in the common deposits of stones and mud, with which the surface of these counties is everywhere covered.

It remains now to give a brief account of the meetings held during the year; in drawing up which I have occasionally availed myself of the assistance afforded by the notes of our secretary Mr. Storey.

The first field meeting took place on the 18th of May on the banks of the Wansbeck above Morpeth. The weather at the time of starting, and indeed during the day, being somewhat unfavourable but few of the members attended. They assembled at Morpeth station and strolled by the side of the Wansbeck as far as Mitford, and after a pleasant ramble of several hours, in which a few plants were collected, including *Arabis hirsuta*, *Myrrhis odorata*, *Arabis thaliana*, and several ferns, they returned towards Morpeth. Two of the members, Mr. Storey and Mr. Burnet, intending to search for *Equisetum umbrosum*, had proceeded by an early train several miles to the northward of Morpeth. The *Equisetum* referred to appears to have been first noticed in Northumberland, (only the second recorded English locality,) by Mr. Joseph Sidebotham, who announced this interesting discovery in the Phytologist for 1848. After walking three or four miles, they had the good fortune to collect several specimens of this rare plant on the banks of the Coquet near Felton; but as the season was somewhat advanced only two fertile stems were procured. By the

* It may be as well to notice here a small mistake in Mr. Loftus's paper, where he states that a block of porphyry observed by myself on the Lanchester road near Sunnyside was similar to what is now found in the Cumberland mountains. The boulder which I observed, nearly twenty years ago, was of *Cheviot* porphyry, and consequently leads to a different inference as to the direction of the current that brought it there.

I mentioned to Mr. Loftus my having observed at the same time among the water-worn stones taken from the neighbouring fields and broken up to mend the roads, more than one example of the Cumberland rocks, especially of the epidotic porphyry of which the celebrated boulder stone of Borrowdale is composed. This may have led to the mistake.

side of the same stream *Equisetum hyemale* and *E. palustre* were likewise observed. These gentlemen afterwards joined the party at dinner at Morpeth.

The second meeting was at Dipton and Devil's water on the 8th of June. On this occasion there was a better attendance of members. Starting from the Hexham station, the party proceeded to Dipton, or Deepdene, as I believe it was originally called: from thence two or three of the members extended their walk by Dotland Park to Dukesfield, in search of *Lysimachia vulgaris*, which had lately been observed to grow in that place. They fortunately succeeded in obtaining the object of their search. The rest of the party spent the morning very agreeably in following the downward course of Dipton burn, through a romantic valley, varied with bold rocks and overhanging woods. Some rare plants were collected, particularly *Neottia Nidus-avis* and *Melica nutans*. A few of the members, who had left Newcastle by a later train, joined the others near Newbiggin, the seat of John Atkinson, Esq., beautifully situated near the junction of Dipton burn with the Devil's water. Those of the party who called at the house were hospitably entertained by Mr. Atkinson at lunch. They then proceeded up the Devil's water to Nunsbrough, a picturesque spot, where the stream winds very circuituously through a prettily wooded area surrounded by elevated banks so as to form a kind of amphitheatre. Crossing the stream at this place, where many of the stragglers of the party had united, they turned downwards by the Devil's water towards Dilston, but the approach of the dinner hour, which after a long days ramble had considerable attractions, especially to those who had not partaken of Mr. Atkinson's lunch, made it necessary to pass the ruins of the ancient seat of the Ratcliffes with only a hasty glance. Seventeen sat down to dinner at the Railway Inn, near Corbridge Station. After dinner, notice of the discovery of a boring Cirripede, at Cullercoats, by Mr. Albany Hancock, was read by the chairman; and a letter from the senior secretary, Mr. John Thornhill, who had taken an active part in the organization of the club, announced his intention of resigning in consequence of his inability from want of sufficient leisure to attend to the duties of the

secretaryship. Four new members were elected :—Dr. De Mey of Newcastle; Mr. Jefferson, Surgeon, Hexham; Mr. Herbert Crawshay, and Mr. Edmund Crawshay of Gateshead. The day though not bright was, upon the whole, tolerably favourable, and most of the party appeared highly pleased with the excursion. Several good plants were collected, but, excepting those already mentioned, perhaps none are particularly worthy of record. The country travelled over is rich in the beautiful tribe of Orchidaceæ; eight different species of which were gathered during the day.

The third meeting took place on the 22nd of June. The tract of country selected for the excursion included Hawthorn and Horden Denes; but in consequence of the distance of these denes from the nearest railway station and from each other, it was found impossible to include them within the limits of a day's excursion. Hordon dene was therefore the only one visited. The usual magnesian limestone plants were gathered, including some of the rarer of the Orchis tribe; *Epipactis ensifolia* was got in fine flower, and the Fly Orchis, *Ophrys muscifera*, was also obtained. The beautiful *Primula farinosa* was found growing in such profusion in one spot near Easington, as to colour the ground with its lilac flowers. A few of the members visited the old hall at Horden to examine the ancient staircase and other antiquities of the interior. After a long day's ramble the party eventually dined together at the Bridge Inn, Bishopwearmouth.

The fourth meeting was at the Northumberland lakes on the 20th of July. Bardon Mill was the place of rendezvous, and the muster was tolerably good, notwithstanding the rather unpromising appearance of the morning. The day, however, proved fine, with the exception of a few slight showers. The party, two or three of whom breakfasted at the village inn, pursued the devious footing of a rustic track through the valley of Bardon Burn to Chesterholme. The wooded sides of the valley afforded one or two good plants to the botanists, the most attractive of which was the pretty *Pyrola minor*. *Crepis succisæfolia* and *Orobanche major* were likewise gathered. At Chesterholme the numerous well-preserved antiquities obtained from the neighbouring station attracted much attention. After exploring the remains of the

Roman station of Vindolana, the party crossed the country to the old military road, in the vicinity of which are the little moorland lakes, or loughs, as they are provincially called, that were to form the boundary of the day's excursion. These Loughs, situated in a wild district unadorned with wood, possess little picturesque beauty, with the exception of Crag Lough, a small sheet of water lying beneath fine basaltic cliffs, formed by the *whin-sill*, which here rises into a range of hills crossing the country in a direction nearly east and west, and presenting a bold escarpment to the north. These hills give a striking character to the surrounding scene, and are well known to the antiquary from the circumstance of the celebrated Roman wall passing along their summits. A few of the members explored the northern shore of Crag Lough, where Mr. Storey gathered *Potamogeton rufescens, P. perfoliatus* and *P. pectinatus:* the remainder pursued the line of the Roman wall over the top of the crags, descending to the lake at the east end, where some of the more assiduous naturalists commenced turning over the loose stones at the water's edge. This search was rewarded by the discovery of two beautiful fresh-water zoophytes, new to the north of England, which, as before recorded, were obtained by Mr. Albany Hancock. A few freshwater shells were observed, among which were *Physa fontinalis, Planorbis albus*, and *Ancylus lacustris;* these were all of small size, apparently dwarfed by their exposure in this elevated situation. A scarce little bivalve, *Pisidium nitidum*, was also found. Bromley Lough was only reached by two of the botanists, Mr. Storey, and Mr. Daniel Oliver, intent upon obtaining 'the glory of this barren waste', the beautiful white water lily, *Nymphœa alba*, which here grows truly wild. *Scutellaria galericulata* was likewise found, growing upon the margin of this lake.

Again following the line of the Roman wall, whose preservation in so perfect a state called forth the admiration of those gentlemen who had not previously seen it in this locality, the party passed along the cliffs as far as the great Roman station of Housesteads, the ancient Borcovicus, where some time was spent in examining the extensive remains. From hence the party, well pleased with the events of the day, made the best of their way to Haydon

Bridge, where an excellent dinner was provided at the Anchor Inn. This was rather hastily dispatched to save the evening train to Newcastle.

On occasion of the fifth meeting, the club again turned their steps westward, selecting a tract of country a little beyond that of the previous meeting. In consequence of the unsettled state of the weather the attendance was thin. The members assembled at Haltwhistle station; whence the walk led to Wall Town Crags, a favourite locality of the botanist on account of the rare plants that here grow on the basaltic rocks. The plants of this locality, which had been visited by the club on a former occasion, are so well known that it is unnecessary here to enumerate them. The remainder of the day was spent in traversing the wild and undulating country towards Gilsland. During this walk and on the banks of the Irthing the following plants were obtained. *Saxifraga aizoides, Galium boreale, Hieracium boreale, H. umbellatum, Vicia sylvatica, Potamogeton gramineus, P. pusillus,* and *Asplenium viride.* A heavy storm of rain, accompanied with thunder and lightning, came on in the afternoon and dispersed the party, some of whom got very much wet. Only six members, including three who had gone to Gilsland by a later train, assembled at Greenhead to dinner. The secretary announced a paper on the freshwater polypes got at the previous meeting by Mr. Albany Hancock, but want of time prevented its being read.

The last field meeting of the season,—an extra one,—took place on the 7th of September, at Ryhope. Again an unfavourable state of the weather prevented a large assemblage. The members from Newcastle were joined at Sunderland by a few of those residing in that town. The walk chosen led over Tunstall Hill, commanding one of the most extensive prospects in the neighbourhood. The view of Sunderland and the surrounding country, with a wide expanse of sea beyond, was very fine. Some good fossils are obtained on this hill, but on the present occasion, time did not allow of a search being made for them. Thence the route lay through Tunstal Hope to Ryhope. After resting a while at this village, the party proceeded to Ryhope Dene, and passed through this romantic little valley to the sea coast. Here

they divided: some going forward by the sands to Seaham Harbour, while two or three, less disposed for walking, remained to explore the rocks at low tide. The shore on this part did not afford much worthy of notice, but an elegant and delicate little zoophyte of the genus *Plumularia* was found clothing the under side of shelving rocks near low-water mark. It proved to be a curious variety of *P. pinnata* with the ova-vesicles attached to the creeping root-fibres, which had not before been observed on this coast, where the species is usually found in deep water. Dr. Johnston informs me that he has received the same variety from Devonshire. Mr. John Storey, jun., one of the party who had remained behind, took some beautiful sketches of the coast scenery, which is here rendered picturesque by the varied forms assumed by the magnesian limestone rocks. A few land shells were collected in Ryhope Dene, but owing to the lateness of the season few plants were observed. *Scolopendrium vulgare* grows to a large size in this dene. A frond of one of the specimens collected measured from the base to the apex, after being dried, above $19\frac{1}{4}$ inches. The party united again at Ryhope and returned by railway to Sunderland, where they examined the extensive excavations of the magnesian limestone for the docks now in progress, and afterwards dined together in Bishopwearmouth.

An evening meeting for the reading of papers was held in the Rooms of the Natural History Society in Newcastle, on the 12th of December. A considerable number of members and their friends, including some ladies, assembled in the Museum, which was brilliantly lighted with gas. Numerous beautifully dried and mounted specimens of flowering plants, collected at the field meetings by Mr. Daniel Oliver, jun., were displayed on the tables; as were also a series of forty exquisite prints in chromo-lithography, being the proof plates of a work about to be published on the *Cephalopoda*, or Cuttle Fishes, of the Mediterranean, by M. Verany of Genoa: accompanying these, specimens of the animals in spirits were exhibited, particularly that of the *Argonauta Argo*, or Paper Nautilus, about which there has been so much controversy among naturalists. Many illustrated works on Natural History, belonging to the Literary and Philosophical Society, were also

laid on the tables. The company having adjourned to the committee room, two short papers,—'Additions to the Mollusca of Northumberland and Durham', and an 'Account of three new species of Animalcules,'—were read by the president, the former illustrated by specimens. The next paper was by Mr. Carr of Dunstan Hill, 'On the composite names of places, of Anglo-saxon derivation, chiefly in Northumberland.' In the unavoidable absence of Mr. Carr, this interesting paper was read by the secretary Mr. Storey. Mr. Tate of Alnwick followed with a paper 'On polished and scratched Rocks, viewed in connection with the Northumbrian boulder Formation,' which was listened to with great attention. 'Notes on a species of *Hydra* found in the Northumberland lakes,' and extracts of an elaborate paper (which time would not allow of being read entire) 'On the Anatomy of the Fresh-water Bryozoa, with descriptions of three new species,' by Mr. Albany Hancock, were read by the secretary. Mr. Wailes, in conclusion, called the attention of the meeting to the splendid coloured plates of Bateman's 'Orchidaceæ of Mexico and Guatamala,' a copy of which he had kindly sent for inspection, together with another beautiful work, Hooker's 'Rhododendrons of the Sikkim Himalaya.' The company afterwards returned to the Museum, where tea and coffee were provided, and the evening concluded with conversation and a further inspection of the various objects of attraction there displayed.

In reviewing the meetings of the season, a few remarks suggest themselves. It is to be regretted that our field meetings have been rather thinly attended, but this, no doubt, arose from the unfavourable state of the weather at the times when they were held; for on no occasion have we been favoured with a thoroughly fine day. We may hope to be more fortunate in the ensuing season. The practice of breakfasting together at the field meetings has been discontinued on economical considerations, and for the purpose of affording an opportunity to a greater number, especially among the younger members to whom expense may be a consideration, of joining in our excursions. To those who prefer comfort to economy, the option of breakfasting *en route* is still open; and, when a very early hour of starting is fixed upon, a

subsequent breakfast may not be unacceptable. I would, however, suggest that on those occasions an earlier dinner hour should be fixed upon. It has also appeared to me that the tract of country laid out for the day's excursion has been occasionally too extensive, and that a shorter walk, in which the country might be examined more at leisure, would be desirable. I regret also that the practice of reading short papers after dinner has been so nearly discontinued. This has been principally occasioned by the length of the excursion and the late dinner hour not allowing time for the purpose.

By a rule of our club, it was proposed to unite the pursuit of antiquities with that of natural history in our field excursions; and it is therefore to be desired that the antiquaries of the district would more frequently join us on these occasions. The year now passed has been rendered memorable among the antiquaries of the north by a field excursion on a large scale.—I allude to the pilgrimage along the line of the Roman wall, got up by Mr. Bruce,—in which some of our members joined. It may, however, be worthy of the consideration of those antiquaries who are members of our club, whether its meetings might not be made more available than hitherto for furthering the objects of their pursuit. Mr. Carr has set an example of communications on antiquarian subjects, which we may hope that other members will be induced to follow.

Very favourable notices of our Transactions have lately appeared in the Athenæum, the Literary Gazette, and the Botanical Gazette. It is encouraging to receive the meed of applause from such quarters. 'We wonder,' says the latter periodical, 'that the success of this club has not caused similar associations to be formed in other parts of the country: if natural history had not hitherto been so wholly neglected in our educational systems, we should have one in every county town. May the next generation be more fortunate, and may the Tyneside Club endure until it finds itself a patriarch among Naturalists' Field Clubs.' A wish in which our members will no doubt heartily join.

Although this address has extended beyond the limits I at first intended, I am unwilling to conclude without saying a few words

with respect to the mode and spirit in which natural history should be pursued. To search out nature's treasures in the woods and fields is a rational, a healthful, and a pleasant pursuit, but the naturalist who confines himself to the collecting and naming of specimens only, losed one half the pleasure and instruction which it is calculated to impart. The works of nature can never be rightly understood without an examination of the structure of the plants and animals he collects. Their habits, their uses, and the beautiful adaptation of their organs to the functions they have to perform, afford a highly interesting enquiry, and, if the microscope be used, a still more wonderful and elaborate organization is revealed, extending even beyond the limits which our instruments can reach. In this way only can we truly appreciate the works of nature, and perceive how infinitely they surpass the rude efforts of human skill. Nor need we go far for examples, for rarity is not an element in this investigation ;

> "Not a tree,
> A plant, a leaf, a blossom, but contains
> A folio volume. We may read, and read,
> And read again, and still find something new,
> Something to please and something to instruct,
> E'en in the noisome weed."

Messrs. Hardy and Bold presented the second part of their valuable 'Catalogue of the Insects of Northumberland and Durham.'

Mr. John Hare, Newcastle; Mr. E. C. Robson, and Mr Joseph Spence, Sunderland; Mr. George Armstrong, Fawdon; the Rev. George Hunt Smyttan, Charlton Hall, Eglingham; and the Rev. J. E. Leefe, Cresswell, were elected members.

The days and places for the Field Meetings were fixed as under :—

17*th May*, ...Stanley Burn.
14*th June*, ...Staward Peel.
5*th July*.....Northumberland Lakes.
29*th July* .....Holy Island.
16*th August*, ...Fourstones and Wark.
9*th September*, ...Hartlepool.

The following officers were elected for the ensuing year :—

PRESIDENT.

DENNIS EMBLETON, M. D.

VICE-PRESIDENTS.

MR. WILLIAM KELL.
MR. JOHN THOMPSON.
REV. G. COOPER ABBES, B. A.

TREASURER.

MR. THOMAS BURNET.

SECRETARY.

JOHN STOREY, F. B. S. E.

COMMITTEE.

MR. G. C. ATKINSON.	MR. JOSHUA ALDER.
MR. RALPH CARR.	MR. ALBANY HANCOCK.
MR. GEORGE WAILES.	MR. RICHARD HOWSE.
MR. T. J. BOLD.	MR. R. Y. GREEN.
REV. J. F. BIGGE, M. A.	MR. J. H. FRYER.
MR. E. P. THOMPSON.	MR. D. OLIVER, JUN.

XII.—*Notice of the Occurrence, on the British Coast, of a Burrowing Barnacle belonging to a new Order of the Class* Cirripedia. By ALBANY HANCOCK, Esq.

[Read at the Second Field Meeting, June 8, 1849.]

I HAVE recently procured a very curious little animal belonging to the class *Cirripedia*, interesting not only on account of its modification of form, but also from its habit of burying itself in the substance of dead shells. The first individuals obtained were concealed in a broken specimen of *Fusus antiquus* procured by the Rev. G. C. Abbes, from the fishing boats at Whitburn, in the county of Durham, and fortunately preserved on account of

the fine specimens of *Cliona gorgonioides* which it contained. Since then, I have got this Cirripede alive from the boats at Cullercoats, also in *Fusus antiquus:* it has likewise occurred in *Buccinum undatum*, from the same locality. And on breaking an old specimen of the former, which has been many years in my collection, it was found to have been extensively attacked by this novel parasite. Indeed almost every dead specimen of the large *Fusus*, brought in by the fishermen, from deep water, is more or less affected by it; and the only wonder is that it should have remained so long undetected. This perhaps may be explained by the fact that this animal only attacks dead shells, and always, so far as I have yet observed, from the inside, so that it is scarcely to be seen until the shell is broken. The columella is the chief seat of the ravages of this creature, though the sides of the whorls do not by any means escape, especially if the individuals are numerous. When quite young they enter the sound shell, and as they grow, enlarge their residence, which is always of the exact size and form of the tenant.

It is interesting to remark how completely this animal, together with *Cliona*, destroys the shells of the larger mollusks of our coast. *Cliona* enters by the outer surface of the living shell, and rapidly spreads over the whorls; but it is not, until after death, that the inner surface becomes much affected by it. Then this Cirripede commences its ravages on the columella, which it soon deprives of more than half its substance, and afterwards so reduces it and the inner surface of the whorls, that this once secure retreat of the mollusk, losing all power to resist external forces, speedily becomes a crumbling ruin.

Little is to be seen externally,—a small slit in the shell or matrix marks the position of the head. This slit, which is one-eighth of an inch long, is rounded and gradually enlarged towards one end, and tapers to a tolerably fine point at the other, which is generally a little bent. At this extremity the shell is mostly stained of a reddish hue—the stain being well-defined and of an ovate or fan-like form, increasing in size for about $\frac{2}{12}$ths of an inch backwards, and having a few pale radiating lines, which converge towards the slit; on these lines there are a few minute

punctures irregularly distributed; but whether for functional purposes, or merely accidentally resulting from the close approximation of the animal to the surface, could not be determined: they are not unfrequently partially closed up with calcareous matter.

The stain is caused by the animal appearing through, which lies immediately below the surface of the matrix. This must be broken before the animal can be removed, and then it is found to be $\frac{4}{12}$ths of an inch long, and $\frac{2}{12}$ths of an inch wide at the broadest part, of an irregular ovate form, considerably depressed behind, where it expands into a broad circular disc; and narrow and compressed in front, forming a sort of produced neck or head with a longitudinal slit on the upper surface;—the general form resembling considerably, a Roman lamp, the slit representing the orifice for the passage of the wick. The produced portion, or head, corresponds to the valvular part of the pedunculate Cirripede, and contains the body and arms or feet,—the slit being analogous to the usual opening for the passage of these prehensile organs: there, are, however, no shelly plates whatever, the mantle being soft, fleshy and highly contractile, having the surface distinctly marked with fine longitudinal muscular fibres below; this part arches deeply into the matrix, and joins, rather abruptly, the under surface of the depressed disc-like portion of the animal, considerably behind the posterior end of the longitudinal slit. The margins of this slit are perfectly straight, thickened, and have somewhat the appearance of horn, but cannot be considered as forming distinct plates, though they compose, as it were, two valvular lips, which can be closed or opened at the will of the animal; in front they gradually blend with the mantle, behind, they are deeply notched, and each terminates in a projecting, slightly curved point. The external surface of these valvular lips, is furnished with numerous, minute, irregularly disposed, rather stout, curved spines, very transparent and of a crystalline appearance. The circular depressed, disc-like portion of the animal, corresponding to the pedicle of the pedunculate Barnacles, is slightly arched below, where it is pale, soft, fleshy, and as highly contractile as the anterior portion or head:

the upper surface is flat, and has in the centre a broadly ovate, horny plate, most distinct in old individuals, but never entirely covering the part, the margins always extending beyond it. This plate is of a reddish horn-colour, and is generally furnished with a few indistinct radiating ridges and tubercles, corresponding to the radiating lines and punctures seen on the surface of the matrix.

The animal, as before stated, lies immediately below the surface of the matrix, and is entirely free, except at a point just behind the slit, and in front of the horny plate, where there is a strong muscular attachment to the upper wall of the chamber. The longitudinal opening of the animal, corresponds to the slit on the surface of the matrix: this opening is kept pretty accurately plugged by the thickened valvular lips of the animal, except when it is in watch for its prey, at which time a slight opening in front permits the passage of the prehensile arms. These occupy the same position within the head or neck, as they do in the valvular part of the pedunculate Cirripedes, being placed immediately in front of the mouth. They differ however considerably from those of all other Cirripedes. The arms of this animal are only six in number; they are short and set in a circle on the extremity of a soft, fleshy, cylindrical pedicle, which is undoubtedly a prolongation of the true body of the animal; the circle opens a little behind, in the direction of the mouth The arms are each composed of three articulations, the first or lowest being much the longest, the last the shortest; they are all furnished with a few hairs on the margins and extremities: the four arms next the mouth, have attached to their inner margins at the junction of the first and second articulations, an oval cushion-like body placed longitudinally, and wrinkled transversely, most probably for the purpose of prehension. Immediately behind the arms, projects a large conical body, containing the mouth, which is placed near the base in front towards the circle of arms. The greater portion of this body is composed of the upper lip, which differs considerably from that of the other Cirripedes. In this it is delicate and horny, being enormously developed and surmounted by a sort of rostrum, which projects upwards and forwards, and terminates in a slightly produced obtuse point; the

dorsal margin is carinated and minutely denticulated. There are three pairs of mandibles, as in the other Cirripedes: the outer pair are each apparently composed of three articulations, the third or terminal one being much compressed, forming an irregular oval plate, with the upper end terminating in a tooth-like process curved inwards: the two other articulations are much narrower, but on account of their minuteness and delicacy, their form could not be determined with accuracy. Only two articulations were observed in the second pair of mandibles; the inner or first articulation, is long, thin and straight, with the extremities enlarged, and of an irregular form; the outer or second joint is very similar to that of the outer pair; it is however provided with two incurved teeth or spine-like processes, at the upper extremity. The innermost or third pair of mandibles are rather wide, squarish plates, with three or four stoutish hairs on their upper margin.

At each side of the mouth, there is a stout arm or palp which stands erect and reaches a little above the ridge of the rostrum; the anterior margin of these arms is a little convex, the posterior a little concave; and they are furnished with stout, rather soft pincers about half the length of the arm, covered with numerous long hairs: at the root of the pincers there is an articulation, so that they can be either bent forward or carried erect; there is also apparently an imperfect joint at the point where the arm joins the side of the mouth; but this could not be determined with certainty, as the horny membrane of the limb is so delicate that it is impossible to say whether the occasional flexure at this part, is owing to its flexibility or to an articulation. It is difficult to say whether these arms represent what Dr. Martin-Saint-Ange names the jaw-feet in the pedunculate Cirripedes, or the two minute processes that are closely attached to the sides of the mouth, in these animals, and which are considered palps by some writers. They seem to occupy the place of the latter, though from their form, they have much the appearance of rudimentary anterior feet of the higher *Crustacea*.

On each side of the rostrum, extending backwards, and a little way below the carinated ridge, there is a series of rather close-set

transverse plates or hairs which taper towards their points, and are stout at their origin, where they are slightly bifid, and exhibit for some distance upwards, the appearance of two channels. There can be little doubt that these organs are for branchial purposes.

The chamber in which the animal is lodged, is partially lined with calcareous matter secreted by the tenant; this lining is very thin, and principally confined to the side walls of that part in which the anterior portion of the animal is lodged: here the lining gradually thickens as it approaches the margins of the slit, and passes a little beyond them, particularly towards its posterior termination. On looking down upon the slit, this shelly lining is seen distinctly projecting inwards from the margins, and exhibiting two or three longitudinal ridges marking periods of growth, narrowing the opening backwards as the increase of the animal requires the advancement of the aperture in front. Shelly granules may also occasionally be seen filling up the curved posterior extremity of the slit.

Notwithstanding the abundance of this animal, I have not yet been able to investigate the internal anatomy, many specimens having necessarily been destroyed in making the external examinations, and others suffered in attempts to remove them from their abode. This important part of the description must therefore for the present, be left almost untouched.

The cloak below is free for a considerable way backwards; above, immediately behind the slit, it is united in front with the true body of the animal, and behind, where the broad disc-like expansion is covered with the horny plate, it blends with a thickish layer of parenchymatous matter. The stomach is long and narrow, and passing downwards and backwards from the mouth, bends rather suddenly forwards, and gradually tapering is continued into the cylindrical, fleshy pedicle which supports the arms, near to which it probably terminates. No caudal prolongation of this part was observed similar to that which is common to all the other Cirripedes; the generative organs are therefore probably modified in this animal.

Adhering to the parenchymatous matter, beneath the horny plate, the eggs are found spread out into a leaf-like expansion

co-extensive with this part of the animal; but whether or not this is really the ovarium could not be determined. It may be that the eggs have reached this position in some such way as they are supposed, by certain writers, to arrive in the pedicle of the pedunculate Barnacles. However, in this animal it is certain that the ova are never arranged in laminæ, at the base of the arms as in the other Cirripedes; but that they are hatched in the position in which they have just been described. Of this I have had ocular proof.

In the early stages of development, the eggs are of a yellow ochre colour, and the yolk is round and much smaller than the shell; the yolk gradually assumes an elliptical form, and soon fills the shell, it afterwards becomes a little flattened on one side, and by-and-by, three processes develope themselves from this part; these processes are the rudimentary arms: about this time a black spot, the eye, makes its appearance towards one end, and at the other the tail is seen to be forming; afterwards these parts enlarge, and gradually put on their perfect forms, while the egg mass assumes a full rose-colour.

On examining an individual in which the eggs had been exposed, they were all found to be in a high state of development; on applying a powerful lens, I was delighted to find that nearly all the little creatures were alive, and most of them struggling for liberty. I soon had the satisfaction to observe several disengage themselves, and launch forth into the surrounding fluid—free, natatory Crustaceans. In the course of a few hours nearly the whole were hatched, and the wine glass in which they were, exhibited a most animated scene. On holding it up to the light they were quite visible to the unassisted eye, as white points; but with the aid of a magnifying-glass, their motions could be accurately observed, and they were seen to resemble some of the *Entomostraca;* their large single eye and general conformation showing their relationship to the genus *Cyclops.* They hung, as it were, suspended in the water, and every now and then dashed rapidly upwards with a fluttering, jerking motion. They commenced their ascent with great abruptness, and as abruptly became quiescent again; and, once more hanging in the water,

were seen to descend slowly and gradually with their feet spread out above, and their back downwards. They seldom or never moved horizontally, their chief object apparently being to ascend either perpendicularly or diagonally, and always in an inverted position.

On placing a few of these minute beings under the microscope, each was found to be provided with a tail, the body being ovate, broad and depressed, having on the back an ovate shield tapering a little backwards, and with a broad interrupted line of bright rose colour towards the margins: it is to this line chiefly that the general mass of eggs has a rosy hue, as they approach maturity. The eye is large, and placed in the centre of the forehead; it is of a very deep rose colour, almost black in some lights. The tail is more than half the length of the body, and passes from below the shield, and appears to be composed of two or three articulations: at first it is very stout; but, rather suddenly narrowing, tapers gradually to a tolerably fine point and arches upwards; on the under surface, at the point of contraction, there is a small curved spine. There are three pairs of natatory legs placed well forwards, and indistinctly articulated; the anterior pair are simple and furnished with a few long setæ, at their extremities; the other two pairs are bifid, the anterior portion being much the stouter, and marked with several indistinct close-set articulations, towards the extremity; each articulation bearing, on its posterior margin, a long seta: the posterior branch of the limb is also furnished with setæ at its extremity. On each side of the head, there is a stout process a little arched backwards, with the point obtuse; these I am inclined to look upon as antennæ, for they appear to arise from the head beneath the shield, though this could not be determined with certainty. It is possible enough that they are lateral prolongations of the shield, similar to the "anterior horns" of the larva of the pedunculate Cirripedes. Whether so or not, the larva of this new animal may at once be distinguished from that of this division of the Barnacles, by the absence of the long spine projecting from the posterior margin of the shield. In other respects, it evidently shows a strong general resemblance to the larva of these animals.

The larva, then, as well as the characters of the animal itself, proves it to be a true Cirripede, while, in the former we see a confirmation of the relationship, shown by Thompson, to exist between these creatures and the Crustaceans. Indeed this animal, in several particulars, exhibits a very close approximation to them. The shape of the arms or palps, by the sides of the mouth, resembles not a little the mandibles of the Nymphons, or the anterior feet of some of the higher forms; and the horny shield, overlying the expanded portion of the animal, gives somewhat the idea of a rudimentary carapace: the rostrated upper lip, too, and setaceous branchiæ, have likewise a very crustacean appearance.

In these particulars, our new animal differs from the typical Cirripedes; but not more than in general form, which is very unlike that of either of the two great divisions of the class. The prehensile arms or feet, too, are highly characteristic in this, having, in fact, more the appearance of true feet than the cirri of the other Cirripedes; there are only six, or three pairs, while in all the other Barnacles, there are double that number, or six pairs. In our animal, the last, or terminal joint, is shortest, and is simple, having few, and comparatively short setæ: the arms or feet indeed appear to be merely prehensile organs, laying hold of prey by the aid of the cushion-like swellings, before described as attached to their inner margins.

The cirrigerous feet of the other Cirripedes, are also undoubtedly prehensile, but in a very different manner. In these, each terminates in a pair of slender, much-elongated, and curled cirri, composed of numerous, minute articulations, furnished with a multitude of very long setæ, arranged in double rows along the surface next the mouth. These setæ diverge, so that when the cirri are spread out, the tips of the setæ of the adjoining cirri cross each other, making a very complete net, which the Cirripede is for ever spreading out, and sweeping through the water in the direction of the mouth. Its prey is thus secured, and nothing can escape that comes within the range of this simple and beautiful apparatus. It is not then by currents produced by the cirri, as usually asserted, that these creatures obtain their food; the feet

form a prehensile net of the most efficient nature, and the only currents produced result from its action.

In habit, too, this animal differs from all known Cirripedes; none, I believe, but this species bury themselves in hard calcareous bodies: some indeed partially conceal themselves in foreign substances, and all may be said, in a certain sense, to be parasitical. *Tubicinella* and *Coronula* are well known to sink deep into the skin of whales; but, in both cases, the whole of the valvular, or upper portion of the animal, is exposed; and as both are well protected by their shells, it is evident that this habit is not for defence, the object apparently being to avoid that resistance of the surrounding element, occasioned by the rapid movements of this huge animal, and the consequent difficulty there would be in maintaining their hold of its smooth, contractile surface. Other genera, *Prygona*, *Crusia* and *Acasta*, are found concealed in corals and sponges; none of them, however, excavate: these bodies simply grow round the Cirripede, and as it augments in size, which it does by increasing upwards, so does the coral or sponge advance with it. *Lithotrya* is the only genus of the class that has been described as actually excavating a habitation in hard calcareous bodies; there is reason, however, to doubt the fact, as we shall see, by carefully examining Mr. Sowerby's own figures in his 'Genera of Shells.' This creature is a pedunculate Cirripede, and is stated to have at "the base of the peduncle, a shelly appendage." For the moment granting this to be true, it is evident that the holes it occupies, if made by itself, can only have been formed by either this appendage, or by the base of the pedicle before the shelly appendage was secreted. But on referring to the figures just alluded to, it would appear that neither hypothesis is correct. In one of these figures, there is very correctly delineated a couple of *Serpulæ*, adhering to the under surface of the basal appendage. Now it is pretty clear, that were this appendage used as a rasping surface, no *Serpulæ* could exist as represented; and were the excavations effected before the formation of this appendage, it must necessarily partake of the shape of the base of the newly-formed chamber to which it would be closely adherent, as in the parallel case of *Hipponyx*: it would

therefore be physically impossible for *Serpulæ* to develope themselves on the under surface of such appendage. It is probable, then, that the basal plate of *Lithotrya*, is nothing else but a broken valve of either *Clavagella*, or of some small oyster that has been growing in the deserted abode, most likely of *Clavagella*, or perhaps of *Lithodomus**.

Clitia verruca, which is unprovided with a shelly base, certainly sinks slightly into the shells to which it adheres; but this cannot be considered a burrowing Cirripede. *Alcippe lampas*, the name by which I propose to designate our new species, is the only one of the class, which according to our present knowledge, can be so considered. It is the only one, at least, that entirely conceals itself in chambers of its own making, in hard calcareous bodies.

I have not been able to examine into the method by which the excavations are effected; a fresh and numerous supply of specimens will be required for this purpose. I shall now only observe on this interesting part of the subject, that, in this Cirripede, we have a proof that an animal as highly organized as the *Mollusca*, can bury itself in hard calcareous substances without the aid of shelly plates; and that the walls of the burrow of this animal, exhibit, in a peculiar manner, the structure of the shelly matrix. This however might result either from a solvent, or from the application of minute cutting bodies, on a highly contractile, soft, and pliant surface.

From the above general review of the characters and habits of this animal, we observe at once that it differs in so remarkable a manner from both the *Campylosomata* and *Acamptosomata*,—orders established by Leach, for the accommodation of the two great divisions, the pedunculate and sessile Barnacles,—that it becomes necessary to form a new order for the reception of this curious Cirripede. This order I propose to characterize as follows:—

Order Cryptosomata.

Animal naked, burying itself in some foreign substance, at-

* Whilst this was passing through the press, I have been assured by Mr. C. Darwin, and his opinion on this subject is of the greatest value, that the basal cup of *Lithotrya* is undoubtedly formed by the animal, and that it has the power of enlarging the cavities in which the larva takes up its abode.

tached by muscular adhesion to the upper wall of the chamber, and communicating with the water by an orifice: arms or feet six, composed of three articulations, the last simple: branchiæ setaceous, attached to the external surface of the upper lip.

Genus ALCIPPE.

Animal depressed and enlarged posteriorly; anterior portion compressed, with the mantle slit longitudinally on the upper surface: the four arms or feet next the mouth, provided each with a prehensile cushion: palpi furnished with pincers; upper lip rostrated.

A. lampas. Animal with the margins of the lips thickened, each being furnished posteriorly with a curved point or process; posterior portion considerably depressed, rounded, and provided with a horny plate, on the upper surface: chamber in the shell of mollusks, partially lined with calcareous matter secreted by the animal; opening narrow, enlarged and rounded in front tapering and curved behind. Length $\frac{4}{12}$ths of an inch, breadth $\frac{2}{12}$ths of an inch.

XIII.—*Observations on Composite Names of Places (chiefly in Northumberland) of Anglo-Saxon Derivation: being a Contribution of Materials towards the formation of an Archaic and Orthographical Chart of the County.* By RALPH CARR, Esq.

[Read Wednesday, December 12th, 1849.]

THE names that have been assigned to the various localities in a country by its inhabitants, can hardly fail to be interesting and instructive to philological inquirers, however trivial and unimportant they may seem to the many, who are accustomed to pronounce them every day as mere empty sounds, conveying either no associations at all, or some mere conventional notions unworthy of attention. On the other hand, the historical and phi-

logical student soon perceives that there is no portion of language more rich in traces, whereby the habits of life, the turn of thought, and turn of expression, that once prevailed, can be learnt and appreciated. He accordingly looks with the greatest respect upon these relics of an older speech, which so many think they may venture to despise.

It is worthy of remark that, while the mind is young, and before it has been obscured by conventional habits in language, an extraordinary curiosity is often manifested about the popular nomenclature of places in the native district. Schoolboys, over their play, are fond of assigning their own interpretation to those names that come within their range; for they have an instinctive feeling that all appellations are significant; and very shrewd are the guesses which they sometimes fall upon. This is because boys and children, though ignorant of the ancient popular speech, have frequently more of that faculty, which Bishop Lowth has well called *vernacular instinct*, and which the Germans term Sprach-gefühl, (perceptiveness in language) than many of their elders are found to exhibit. They cannot always hit upon exactly the right interpretation; but their keen perception of popular idiom guards them against many a wrong one, such as older heads too often entertain.

Some years ago, it occurred to me that no small benefit would be conferred upon English philology, and that useful help would be afforded to those, who, like schoolboys in the play-ground, seek to cultivate it in their own way, if good maps, at once archæological and philological, of individual counties, could be laid before the public; and that still more valuable information would be brought within reach, if similar charts of single parishes should afterwards follow; because, in these, the names of individual fields, and of various minor features of the land, could be accurately inserted and handed down. Nor would the advantage end here, or remain without practical results. For, though it is an invidious and thankless office to attack erroneous spellings in any direct manner, and to prescribe how they may be corrected; yet by means of such maps, those who enjoy power and property, in the various localities, would be enabled to ascertain the purest

old forms of spelling, and, if so disposed, might restore them to use and to honour. In many cases all the orthographical improvements, that could be desired, might be introduced on the authority of the muniments of the estate itself.

Various erroneous and corrupt modes of conventional spelling now prevail, that could not stand for twenty years before a good archæological county map. Such would fall insensibly into disuse, though no one had gone out of his way to demonstrate their absurdity.

All would, of course, depend upon the care and judgement evinced in the preparation of such a map. Believing, however, in the possibility of such an acquisition, I have endeavoured to bring together some materials in aid of it.

In this, and some subsequent papers, I propose to examine, successively, those different terms for natural features, and for works of human hands, which have been most commonly used in the composition of names, assigned to places in Northumberland; and also to show what mode of spelling appears to be the purest and most eligible, whether of present or of former times, but always with reference to the existing pronunciation. In treating of compound names, it is very seldom necessary to deal with other than Anglo-Saxon elements. The exceptional instances will be very carefully noted as they occur. Every English compound name, being of Anglo-Saxon origin, or formed on Anglo-Saxon analogy, consists of two portions or members. Even when the component terms are three in number, they are still only two in character. Of these, the latter in situation, and which forms the conclusion of the word, may be called the substantive member, and the foregoing the definitive, qualifying, or descriptive member. Thus, in the name Cambridge, *bridge* is the substantive term, and, in a grammatical and logical sense, it is the most important member. On the other hand, *Cam* is the term which defines and distinguishes the bridge in question; the site of the town being, of course, at the ancient bridge over the river *Cam*. So if we take Oxford, *ford* is the substantive, and, fundamentally, the most important term; whilst ox, (originally *oxena, of oxen,*) defines the particular *ford*, gives to it

its character, and renders the combined word the proper name of the locality.

Now, although the substantive term (which always comes last) is fundamentally the most important, yet it is not that on which the mind dwells most powerfully. On the contrary, the descriptive member, which comes first, occupies our attention still more; and accordingly we treat it as if it were the root of the word, and throw the accent, or main stress of the voice, upon it, as Ox'-ford, Cam'bridge. This circumstance is most important to be borne in mind, because the absence of the stress from the last syllable, and its consequent feeble utterance, is the reason why, in so many words, this, the concluding term, has come to be obscurely and incorrectly expressed, both in speaking and writing.

It will be our business, in these papers, to trace and examine as many of these humble and neglected substantive terms as we can: because a proper apprehension of them lies at the root of all safe progress in the etymology, and correct spelling, of such names as we are about to deal with. These terms are, for the most part, among the homeliest and most familiar words in our language: yet they have been obscured, misunderstood, and corrupted.

I propose to begin with those significant of high ground and eminences, these features being the most prominent of the country. In another paper, will be examined the terms belonging to vales and depressions; and subsequently, those applied to waters, woods, fields, fences, roads, enclosures, dwellings, and the like. The inquiry is humble enough in its kind, but, as has been already observed, it is one capable of being followed out and extended, till it may lead to certain useful results.

Hill: Anglo-Saxon hill, or hyll, m. genit.-es. dat.-e.

This familiar word is not unworthy of some passing attention, because, though in many instances, its presence and meaning in composition, are plain enough, this is not invariably the case. If it is conspicuous in the township names, Chat-hill, Seg-hill, Dues-hill, Wreighill, it becomes obscure in Bearle, formerly written Ber-hille, that is, Barleyhill.

I will take this opportunity of observing, that the final *e* in this,

and many other instances, is not to be regarded as a mere accidental and empty redundancy. It is the old termination of the dative and ablative case, which, in names of places, was of far more frequent occurrence than the nominative, being used after the prepositions *at, in, to, from,* and *of.* In all such familiar phrases as these,—I live *at Bearle,* my land is *in Bearle,* I am going *to Bearle,* I come *from Bearle,* I am *of Bearle,*—this dative-ablative ending would be both written and sounded by our forefathers: whilst, on the other hand, the nominative and accusative of this word, and many others like it, which would be without the *e* final, could only occur in more rare and formal propositions :—as, *here is Bearl, Bearl is not far off,* or *show me Bearl.*

The final *e* of the Anglo-Saxon dative and ablative has, therefore, if I mistake not, acquired in this manner a strong hold upon our orthography of such names; that is to say, in those where it is present according to the rules of inflection in that tongue, or where it seems to represent some other vowel which was so. Though now mute, it has been respected by modern usage in writing, because old forms find more who are willing to stand up for them, in proper names of men, and of places, than in common words, which are, as it were, the property of all the world, but of no man in particular. But this final *e,* where it thus represents an Anglo-Saxon inflection, will, I hope, now be seen to possess a certain historical title to respect. It may be said almost to have a legal and documentary title, for, in the legal formulas of early muniments, the names of places almost necessarily occur in connection with the prepositions above mentioned.

The Township of Earl, near Wooler, was formerly Eard-hille, from eard, A.S., a habitation; or geard, an onstead, or enclosure. It was subsequently written Earle, (or better Earlle,) retaining the final *e,* which appears to me useful to distinguish this name from a word with which it has no connection whatever.

The oldest form of Budle is Bodehill; and it might still be written Budehill, without any violence to pronounciation. Thropple, in the Parish of Mitford, was Throp-hille, that is the

village hill, (or *cross-ways hill,*) whereas the common spelling is either unmeaning or worse, that is to say, ludicrous. Some of the various places called Ryle, were once Rye-hill, others Rye-hall. (See Hall.)

Down,—don, A.S., dun, a *height,* or *ridge of uplands,* like the *downs* along the South Coast, also sometimes a detached hill or elevation. This word occurs in Brandon, Heddon, Lumsdon, Fawdon, Biddlesdon, Humbledon, Halidon, Boldon, Marsdon, (that is *Meres-dun,* equivalent to Sea-down,) Cleedon, (formerly Clivedon.)

Sometimes we cannot easily decide, even from ancient muniments, whether a locality has received its appellation from a *Down,* or from the very different feature, designated in Anglo-Saxon times a *den;* for the best account of which I would refer the reader to Mr. Kemble's "Saxons in England."

In other instances, there is room for doubt whether the substantive element has been originally *don,* or, on the other hand, merely *ton,* or *town.* In the case of *Embleton,* (in Bamborough Ward,) written also, in old documents, *Emildon,* (an ancient township and parochial centre, situated at the foot of an *eminence* or *down,*) it is highly probable that the name might fluctuate between the two forms, even from the early times when the spot first fell into Saxon hands. In regard to the first, or definitive element, there can be little doubt that it represents the appellation of the founder, or first settler of the dominant race, or, (through the loss of a patronymic syllable,) the family name of his descendants.

Law, A.S. hlæw, a *heap, barrow, mound,* or *sepulcral hillock;* in a secondary sense probably, a natural knoll or elevation.

The Laws, in Northumberland, are often high conical hills, but these were, in numerous instances, surmounted by artificial barrows or cairns; which last may have been the feature to which the name referred, since, in other localities, the site constitutes a mere gentle rising.

Lye, in his Anglo-Saxon dictionary, observes that from *hlæw* or *hlaw* are derived the names of places terminated by *low,* as Houndslow, Ludlow, Winslow, Merlow; and these appear to have

had reference to artificial tumuli or barrows erected in memory of particular events or transactions: as, Ludlow, perhaps, as Lye thinks, *the mount of the people;* if it does not allude to the name of some distinguished men there interred. Winslow, *the mount of the battle.*

The term law, as a separate word, is still in common use among the Northumbrians, as signifying a hill, generally of some size and elevation; and, near to the Cheviots at least, is applied chiefly to hills of conical form. I am unable to say whether this is an essential characteristic or not, but am disposed to think so, or at least that hills so denominated, are never mere ridges, but must have a well-defined summit. Thus they speak of Shepherds' law, Sheep-law, Greenlaw, Houndlaw, Hindlaw. When the first member of the compound is not distinctly intelligible alone, and the name is not so clearly significant to the popular ear, or again, where the composition is more intimate and complete, and the accentual stress has been thrown back upon the first member, then has commenced a process of corruption, by which *law* has been converted into *ley*, and thus confounded with an element of very different signification, which we shall have to examine in its turn. Thus *Brislaw*, in Huln Park, a very lofty eminence, commanding the whole district about it, is vulgarly called *Brisley*, as if it were mere ordinary lea-land. Throcklaw, which was, in all likelihood, so denominated from a law or barrow in honour of some Danish warrior, (Thorcytel being a well-known personal name,) has become Throckley, as if the lea-land would be so honoured. Crau-law, a township and tower in the Parish of Eglingeham, and occupying the commanding site of a Roman fort (still very prominent) which overlooked the whole country, is too often degraded into *Crawley.* From the existence of the Roman fort, (and Watling-street within a bow-shot,) together with the old documentary orthography of Crau-law, it is impossible to doubt that the late Mr. Smart and Mr. Hedley were right, when they referred the derivation to *caer* and *law;* caer being the ordinary term applied, by our ancient British ancestors, to Roman forts; of which Carlisle, Caernarvon, and very many other instances might be cited. This element, not being an Anglo-Saxon one,

was easily converted by the country people into *Cra* or *Crau*, when they came to annex to it their own element *law*, in order to form a compound name. As we find *Craulaw* among the earliest forms of the name, it appears to me the proper one to receive the preference in an orthographical map.

I remember only one instance, in Northumberland, where *law* has taken the form of *low*, which is in Harlow, this being manifestly *Here-hlœw*, the *mount of the army;* just as Harwich was Here-wic, the village of the army, and Harrow, Here-howa, the hill of the army. Harlow was the scene of many early military operations, as Harwich was a formidable Danish camp and garrison, and Harrow a height of the utmost importance to every army operating in the country near the Metropolis.

I may observe that, in Domesday book, the names of places, in the Southern counties, now written with *low*, are found under the same form as now prevails in the North, namely, with *law*.

In Derbyshire, that midland region, where the whole nomenclature of localities bears a striking resemblance to that of the North, we find the following places adverted to in Domesday book,—Bredilawe, Bornelaw, Patelaw, Coldlawe, Draeklawe, (the Dragon's law,) and some others.

Cliff. This word in composition as the substantive member, is by no means identical with our ordinary word *cliff*, a precipitous rock. In A. S. clif, (pl. clifu,) is a cliff or steep rock, as in Germ. klippe. On the other hand, we have the Icelandic or Old Norse *klif*, a *steep, difficult path*, and, in A. S. clif, with the same sense. If I mistake not, our term cliff, as used in terminal composition, has reference to an ascending road or path more or less steep. It is well translated by the Latin *clivus* or *acclivitas*. It is not simply a hill, but a hill with reference to its ascent by men or animals. Thus, most of the places, having names terminating in cliff, in Yorkshire and elsewhere, are situated on or near nothing more than rising ground, up which runs a road or path.

Cleedon, near Whitburn, on the old authority of Boldon book, was Clivedon; pronounced probably Clevedon, and longer than the Southern Clifton. The latter, at least, has good claim to

have been formed from *clif*, a precipitous rock, for its precipices overhanging the Avon are tremendous. Yet, after all, our forefathers may have adverted merely to its steep streets. I am disposed to think that a steep street in Alnwick, forming the western outlet from the town, and now known by the name of Clayport, must have been called Cliveport by our ancestors, and that Cleiport might be the better orthography; but the evidence of old writings is needed on this point, ere we can decide with certainty. A parallel instance is that of Claypath, a street in Durham, leading up a similar steep acclivity. Compare also Cleveland.

Howe,—how,—or hoe; a frequent terminal element in names of places. Its Anglo-Saxon original has not descended to us, as a separate word; but in Spelman's Glossarium we find it preserved, in precisely the form that might be looked for, as occurring in the composition of the names Grenehoga and Stanhoga, that is, Greenhow and Stanhow, (or Stanhoe,) situated in Norfolk. As to its substantial signification there can be no doubt, when the characteristic features of the following sites in Northumberland are considered. If I mistake not, they all either stand upon heights, or have, close to them, some hill or *heugh* bearing the same appellations. They are Sandhoe, Duddhoe, Stokehoe, Cambhoe, Inghoe, Swinhoe, Shaftowe; in which last the *h* cannot be conveniently retained. To these may be added, as one of many from other counties, Foxhow, on Windermere, the residence of the late Dr. Arnold, which occupies a high rocky promontory, running out into the lake. The foregoing names have been written, as I think they ought to stand upon such a map as has been contemplated. With their modern corruptions of *Duddo*, *Cambo*, &c., we have here no concern.

There is, I think, no reason to doubt that this termination *hoe* or *how* is the same as our well-known northern word *heugh*. This has passed into *hoe* or *how*, when it has entered into close composition with a definitive term placed before it, and has so lost the safeguard of the tonic accentuation. The *heughs* are, for the most part, those rugged outbreaks of rock, partially covered with green-sward, which show themselves in so many parts of Nor-

thumberland, but more especially along the remarkable line of basaltic rock which traverses the county from south-west to north-east. Such is The Heugh near Stamfordham, Embleton Heugh, and Howick Heugh. Indeed the name of this latter township appears to owe its first syllable to the same element used as a definitive.

Edge, A. S. ecg, is applied to ridges of moor and other elongated heights. When it enters into close composition, as the substantive term, and consequently is pronounced as an unaccented syllable, it is not exempt from being mistaken and misspelt. Thus, in certain maps and in certain writings, the Colledge Burn, which flows from the northern side of Cheviot, will be found written as College Water; a spelling assuredly more academical than scholarlike.

Swire, A. S. Swira, Old Norse, Swiri, *the neck.*—The conformation of ground, to which this designation has been applied on the Border Moors, is that which is met with where there is a *sinking* or *depression* in the ridge of a continuous line of hill, or between two somewhat higher points or summits, which last the swire serves to connect.

The same idea is expressed among the Alps and the Pyrenees by the word *col*, (Lat. Collum,) which will be remembered by all who have travelled in those magnificent regions, in connection with many of their most celebrated passes. It is sufficient to adduce the *Col de Tende*, which is a lowering in the chain of the Maritime Alps, affording a passage to a line of road of great celebrity, both from the difficulties that were surmounted in its construction, and from the grandeur of the scenes which it discloses. I am enabled even to add, from the information of an Icelandic Friend, that the word *hals*, which exactly corresponds to *col*, is applied in Icelandic to similar conformations of ground, among the mountains of the remote Northern isle.

In Northumberland, the Reedswire was a well-known pass, frequented by the Moss-troopers, between Reedsdale and the banks of the *Jed*.

There is a White-Swire, I believe, on the skirts of Cheviot, though I am not exactly acquainted with the spot.

And, in Wallis's history of Northumberland, when the Author is describing the district near Ford Castle, he observes, "At a place called Haltwell-Swire, near Fenton, half a mile from Broom-ridge, Sir Henry Percy was defeated by the Scots, under the Earl of Bothwell, in the year 1558."

Swire, though so interesting and expressive a remnant of the old Border speech, has been absurdly metamorphosed into *squire* and *square;* so prone are men to pervert what they do not comprehend, rather than confess their want of information, and wait for better.

XIV.—*The Polished and Scratched Rocks in the neighbourhood of Alnwick, viewed in connection with the Boulder Formation in Northumberland.* By GEORGE TATE, Esq., F.G.S.

[Read Wednesday, December 12th, 1849.]

THE objects of this paper will be to describe the polished, scratched, and grooved surface of a Limestone bed in the neighbourhood of Alnwick; to shew the connection of these phenomena with the Boulder Formation; and to consider the agencies by which they may have been effected. Under the term Boulder Formation, I include the series of superficial deposits of sand, gravel, and clay, with large and small blocks, overlying the stratified rocks. The subject may not be devoid of local interest; for though such phenomena are not uncommon in other parts of Britain, and particularly in the North of Europe and in North America; and though, also, detached Rocks scratched, and to a certain extent polished, have not unfrequently been met with in the superficial deposits of Northumberland, yet Rocks, *in situ*, exhibiting such appearances, have very rarely been noticed in this county.

The polished and scratched surfaces now to be described, were found in a Limestone Quarry, on Hawkhill Farm, belonging to Earl Grey, about one quarter of a mile south of the Basaltic Cliff at Ratcheugh, and $2\frac{1}{2}$ miles E. by N. from Alnwick. The rocks in the neighbourhood, belong to the Carboniferous or Mountain Limestone formation, and are much disturbed and broken up by the eruption of basalt which occurs, as an injected dike, and also as an overflow, shewing successive volcanic outbursts, both during and subsequent to the carboniferous era. The metamorphic action of the basalt is very marked; not only are the sedimentary rocks contorted and jointed in structure, but also the limestone is changed into crystalline marble, and the shale into porcelain jasper. The section presented at the Hawkhill Quarry, is as follows, beginning with the uppermost bed :—

	ft.	in.
1. Red tough clay, with some large and many smaller boulders	12	0
2. Five beds of blue carboniferous limestone, with thin shale partings	19	0
3. Coarse shale, with mountain limestone (marine) fossils	0	6
4. Coal of a poor quality	3	0
5. Coarse shale, with mountain limestone (marine) fossils.		

This Quarry is situated on the high ground which runs nearly parallel with the Coast, and which has apparently been elevated by the Basaltic protrusion; the slope is towards the river Aln, and on the opposite bank of the river, nearly a mile distant, the same clay bed, as lies at the top of Hawkhill Quarry, is found, but at a lower level.

Now immediately below the Red tough Clay, the surface of the Limestone bed is polished, scratched, and grooved. An area of 20 feet by 6 feet, has been bared in this state; and the same polished and scratched surface extends under the clay. One part of this surface was flat and even, presenting a smooth bright face, like marble artificially polished; other portions were rounded and undulating, but still exhibiting the same mirror-like polish. One part, in particular, was one foot below the general level; but in this and similar cases, the angular corners of the higher portions were removed, and a smooth and rounded outline was formed. It is important to notice that the polishing of this surface

is very different from the rounding and smoothing of rocks, arising from their attrition on each other by the driving action of tides and currents. I have carefully examined the condition of surfaces exposed to heavy seas, and of rocks which have, on the neighbouring coast, been rolled about, or driven onward by currents and the strongest tides; but though these rocks, particularly Limestones and Basalts, were smoothed and rounded, they never presented a bright and polished surface.

Besides being polished, the Hawkhill Limestone was more or less scratched; the scratches varying both in depth and in length, some being very fine striæ, and a few being grooves $\frac{1}{4}$ of an inch in depth. These grooves were parallel, one inch apart, and from 6 to 12 inches long. Many of the scratches were 1-10th of an inch in breadth, and from 1 to 6 inches in length, having a general direction of from North to South, pretty nearly in the dip of the Quarry; but there were also other scratches, several being broad and deep, which were more or less oblique to the general direction; those on the rounded corners of the higher parts of the surface, had a tolerably regular direction of from North West to South East. Notwithstanding, however, the exceptionable cases, the general direction of the scratches, when observed over the whole surface, could not be mistaken.

The appearances described are undoubtedly connected with the boulder formation of the district; for, in the bed of clay, above the polished limestone, there are polished blocks and fragments. A large block of limestone, measuring 3 feet long, by 2 feet broad and 2 feet thick, and embedded in the clay, three feet above the limestone bed, was scratched and polished on its under surface; the scratches having a direction, as it lay, of from N.E. to S.W.; this block was not rounded like a water-worn stone. Smaller polished and scratched rocks are numerous in the clay, near to the limestone bed; but the number of such polished fragments, proportionally diminish as we ascend higher in the clay deposit. On the opposite side of the valley of the Aln, the railway cutting through the clay, has exposed several blocks of limestone and basalt, similarly scratched and polished. In Scotland, in the Isle of Man, and other parts of England, and also in Scandinavia, the

same connection is manifested: where the polished and striated surfaces are, there is also the boulder formation. It is necessary, therefore, to determine the nature and conditions of that formation, before venturing to speculate on the agencies which produced the phenomena.

In North Northumberland, the boulder formation has modified the physical features of the country, particularly on the East side of the range of sandstone hills, which extend from Kyloe onward by Belford, Chatton, Eglingham, and Alnwick Moor, and thence crossing the county in a South West direction. The peculiarities of the formation are best seen at Holy Island, Budle, and Hoppen. It forms, here and there, long hills with steep ascents—some of them standing alone, and rising like huge artificial tumuli, to the height of more than 30 feet: those at Chathill and Newham seem the same in form, character, and origin as the Osars in Denmark.

A brief notice of one or two sections will show the peculiar character of the formation in Northumberland:—

At Holy Island, we find clay with large and small boulders, partly overlying a carbonaceous shale, and irregularly abutting against beds of sandstone and coal; this deposit is separated into parts by singularly interposed stratified fine sand, in which layers of carbonaceous matter mark the lines of stratification; above the clay is a loose mass of gravel, and of smaller boulders embedded in sand; and above this again is a bed of clay without boulders. This section, besides affording evidence of successive deposit, also indicates that some force has acted on it laterally subsequently to its deposition, and caused the strange commingling and intercalation of the different strata with each other.

At Budle, the formation is similar but less irregular. Here the clay, with large boulders, with here and there a streak of carbonaceous matter marking stratification, and having a height varying from 10 to 20 feet, rests on the Posodonia Schist which overlies a carboniferous limestone. Above this clay is a bed of gravel, varying from 6 to 12 inches in height; and above this again are beds of fine sharp sand, distinctly stratified, and having a height of from 5 to 20 feet.

The railway cutting near the Lesbury station exhibited a section having at the base four distinctly stratified gravel beds, consisting of rolled smooth stones, chiefly porphyries, limestones, and sandstones, about the size of ordinary paving stones; above these was a bed of stiff clay, 8 feet high, without boulders; and above this again was another bed of clay, 8 feet high, with large boulders. In this section, as well as in several others where gravel beds are seen, the layers were arched, dipping away on both sides from a central axis.

The gravel beds differ from the boulder clay bed as to the source of their rocks; in the former, the rocks are chiefly those which are not found, *in situ*, in the immediate neighbourhood: in the latter the boulders are chiefly of local origin. In the gravel beds are red and dark coloured porphyries, hornblendic, and quartz rocks, such as are found in the Cheviots, mingled with a smaller number of sandstones, and a very few pebbles of limestone and coal: all of them are rounded and water-worn. The Hawkhill boulder clay contained a number of blue limestone blocks from 6 inches to 18 inches in diameter, basalts from 6 inches to 2 feet in diameter, and sandstones and shales generally of a small size; these rocks are the same as appear, *in situ*, in the neighbourhood. There were, however, a few rocks which cannot, as yet, be identified as of local origin; among these was a block of light cream coloured and fine grained, almost compact, limestone, containing 18 cubic feet, not rounded, but polished and scratched on the under surface. A similar rock, *in situ*, I have observed at Beal, at a distance of 20 miles N. by W. from the quarry. Another limestone of a bright red colour, which is not uncommon in the boulder clay further north, was also found in the Hawkhill Clay; the original source of this rock I have not been able to discover—it is said to occur in Scandinavia; red Limestones are found in the West of Scotland and in Herefordshire, but their colour is much duller; it may, however, be of local origin as the fossils show, that it belongs to the mountain limestone, and as, moreover, limestones, when near to basalts, are, as I have observed, occasionally red in colour; these fragments may therefore have come from some bed in the neighbourhood which had derived its peculiar character from

basaltic action, and been subsequently broken up and scattered by denudation. The most decided case of far-travelled blocks in the Northumberland boulder beds is granite, which has, however, been but rarely observed. One large block of granite I have met with, measuring 8 cubic feet, neither worn nor rounded, embedded in clay on the western acclivity of Alnwick moor, at an elevation of upwards of 600 feet above the sea level, and of about 500 feet above the vale of the Aln below: this granite is identical with that, *in situ*, at Aberdeen. It is also important to notice that not one fragment of rock, of more recent age than the carboniferous formation, is to be found in the Northumberland superficial deposits.

From comparing a number of sections, it may be generally inferred that the superficial deposits of Northumberland have been formed under water, for the marks of successive deposit are distinct, and the evidence of the moulding action of water is conclusive. But these deposits are not separable into different eras: that is, it cannot be affirmed that the boulder clay is of a different age from the gravel and sand beds; for it is sometimes found above and sometimes below them. Nor could one great debacle or wave of translation, or even a succession of them, have been the agents capable of producing the complicated phenomena; for the finely laminated sands, which indicate tranquil deposit, are interstratified in various forms with the boulder clay. The whole indeed would seem to constitute one group, formed under water, during a long era, which was pervaded by the same general conditions, and acted on by the same mechanical agencies, subject to local modifications.

Evidence of the conditions of this era, as to climate, must be had from organic remains. In Northumberland, I have carefully sought for this evidence, but hitherto without success. Reference, however, can be made to other districts where the same deposits are to be found. In Scandinavia there is a similar deposit; in the Isle of Man, the boulder formation overlies limestones of the same age as those in Northumberland; and in the Valley of the Clyde, the formation is largely developed. Now, from all these districts organic remains have been found; some in a rolled and

broken state, but others in a perfect condition, showing that the animals had lived and died on the spot where they lie entombed. Professor Edward Forbes reckons the total number of species of mollusks, found in these beds in the British Islands, to be 124: all are marine; and the general facies of the assemblage, and some particularly distinctive species, evidence that the fauna of this ancient sea was of a sub-arctic character. The researches of Sir Charles Lyell, Sir R. Murchison, and others show that the boulder formation extended over the greater part of Northern Europe, as far down as the 40th degree of latitude, and that a similar formation, in North America, extended 10 degrees nearer to the Equator.

Mr. W. J. Carr, who examined the Hawkhill quarry along with myself, informs me that the polishing and scratching of the rocks there are the same as what he has seen in the Alps, produced by glacial action. It is therefore necessary to consider whether ancient glaciers may not have protruded from some neighbouring mountains, and by their motion and weight polished and scratched the rocks over which they passed, and moreover transported large blocks from the higher regions to the valleys. The distinct indications of successive deposit under water, throughout the whole series of beds already referred to, appears to me conclusive against the former existence of glaciers in this district. Nor could glacial action have taken place with the present physical conformation of the country; for there are neither high mountains rising above the line of perpetual snow, nor vallies with sufficient inclination down which the frozen river could be impelled onward. There is a more fatal objection; the Cheviot and Lammermuir Hills are the highest in the district, and these are the only ones from which, supposing the outline of country had been so altered as to admit of glacial action, from which glaciers could have descended; but that no glaciers protruded either from the Cheviots or the Lammermuirs is evident from the mineral character of the boulder rocks. The Cheviots are porphyry, the Lammermuirs are greywacke; but no large blocks of porphyry nor of greywacke are to be seen in the boulder clay; in the gravel beds rounded porphyry pebbles are common, but they are obviously water-worn; angular blocks of

porphyry I have never seen; greywacke of any size is rarely to be met with.

While, however, it may be concluded that the boulder clay sand and gravel beds of Northumberland were not the result of sub-aërial glacial action, there are residual phenomena to be accounted for. It may be questioned whether even great waves could bear onward, over steep vales and high hills, for the distance of above 100 miles, the large granite blocks found in the formation. Granting that this could be effected, is it probable that these blocks could travel over so rough a road, and yet retain all their sharp corners? Though waves of translation might sweep onward, as has been represented, with resistless force, large blocks and immense masses of gravel and sand, yet whatever may be their powers of transport, they could not produce the bright polishing and the regular striations of rocks; for rocks, having their weight much lessened when under water, do not supply the pressure necessary to bring out a polished surface. No such effect has as yet been observed to result from the actions of tides or currents, and the effect of a powerful current, on a mass of loose rocks or debris, would not be to move the whole in mass, but to break it up and to scatter the fragments.

The agents which seem most likely to have transported the far travelled blocks, and to polish and striate rocks, are icebergs. Glaciers, it is well known, protrude into the sea in high latitudes, both in the northern and southern hemispheres; ceaselessly moving onward, they bring down from the higher grounds the rocks which have fallen upon them; and as large masses of ice are from time to time detached, they are floated away by the marine currents. Sir John Ross saw one of these stone-laden ice-floes in 66° S. lat., on which there were not only stones and mud, but also a large basaltic block weighing many tons; another tabular mass of ice laden with rocks, three quarters of a mile in circumference, and rising 130 feet above the water, was observed in 58°36 S. lat. These enormous masses move with a force which nothing can resist: even the ice-floes, which are carried down the river St. Lawrence, snap with ease the strongest chain cable. When, therefore, an iceberg grounds in shallow water, or

on a submarine hill, the force with which it will move over the surface beneath, and the gravity with which it will press on that surface will be amply sufficient to polish and striate any rock however hard.

Another modification of the same agency has probably played a still more important part in the ancient sub-arctic sea. The coasts of Scandinavia, Nova Scotia, and more northern regions are bound by ice of considerable thickness ; the shingle and mud upon the beach are entangled in this ice ; rocks fall upon it from the coast cliffs, and when it is broken up, separate masses are floated away by marine currents and tides, carrying with them the debris of the coast, and as they are driven along the shore, they polish and scratch the rocks with which they come in contact. Where the rocks, embedded in the boulder formation, exhibit polishings and scratchings, and are of local origin, the phenomena may be best accounted for by this kind of agency.

To attribute, however, too much to any single agency would very imperfectly explain the varied phenomena connected with the Northumberland Boulder formation. They are the result of the complex action of several agencies. Viewing the whole of the facts, and deriving additional evidence from other districts, I am led to conclude that the boulder formation era, in Northumberland, extended over a long period of time, during which the climate was of a sub-arctic character, and that the whole of the county was under the sea excepting the higher hills, which would form islands in the midst of the waters; the tides and currents, acting on the shores and sea bottoms, broke up the rocks, reducing to small particles the softer sandstones and shales, and redistributing them as beds of sand and clay; the harder limestones and porphyries rounded by long attrition on each other, and eventually arrested by inequalities of the sea bottom, would be irregularly heaped up in gravel beds : strong tides and currents, sweeping along with increased fury by gales of wind, may have detached larger masses of rock from their native beds, and these after being rolled about, may have been plunged into and retained by the stiff clay in which they are usually found ; the diversified nature of the coasts

and the irregular outline of the sea bottom would give a local character to each separate accumulation, and hence, though contemporaneously formed, and consisting of similar materials, these accumulations, do not exhibit the same sequence. Concurrently with these movements, icebergs detached from glaciers protruding into the sea, in more northern latitudes, and laden with the rocks and debris of these northern lands, appear to have floated into the Northumberland sea, and, in their course occasionally dropt their rocky burdens; at other times they have grounded, and by their gravity and force polished the rocks over which they moved, the particles of hard minerals, embedded in the ice, acting as gravers and striating and grooving the surface; nor does it seem improbable that these bergs have sometimes struck against the accumulations of gravel, sand, and clay, and forced the different beds over each other, and given to them the complicated and irregular arrangement exhibited in the sections at Holy Island, and in the neighbourhood of Alnwick. But as the blocks in the boulder clay are chiefly derived from rocks, *in situ*, in the neighbourhood, I attribute most of the phenomena, not referable to water-agency, to the action of coast ice, which would be formed around the Island shores, and in which rocks from the cliffs and beach would be enclosed; portions of this ice may have, from time to time, been detached and floated away to short distances, carrying with them and depositing as they melted, local blocks and debris, and when driven violently on submarine hills, producing similar effects in polishing and scratching surfaces, as result from the stranding of bergs.

Independently of the interest surrounding even a stray fragment of the physical history of the earth, the highest gratification must be felt by every intelligent mind on observing the beneficial influence on the present era, arising from the repeated changes which have occurred during past geological epocha. Progression may be seen marked on the physical as well as on the moral history of the world. The hard intractable primary rocks could yield little, in their original state, for the support of animal life; these have been broken up and reformed by the manifold revolutions of the past; the new products have again and again been

subject to the same process; and as the farmer repeatedly ploughs over and harrows the stubborn soil, so has nature, in the course of ages, ploughed over the earth's surface by the action of the elements—by currents of water—by volcanic forces—by glacier and iceberg—breaking up the rocks and grinding and commingling the materials in order to form a surface-covering adapted to the wants of humanity.

XV.—*Additions to the Mollusca of Northumberland and Durham.*

By Joshua Alder, Esq.

[Read Wednesday, December 12th, 1849.]

Since the publication of our Catalogue of Mollusca in the spring of 1848, a few additional species have occurred of which I now propose to give an account. These have been principally got during three days' dredging off Whitburn last summer, in which I had the assistance of Mr. Howse, who kindly went out with the fishermen on two occasions. My own share in the transaction was, for the most part, confined to an examination of the mass of submarine products dredged up, which was brought on shore in order that the treasures it contained might be selected out carefully and at leisure. The result of these dredgings was very satisfactory. One hundred and seven species of Mollusca were obtained, including several rarities, amongst which were six species not before observed on our coast: one of them I consider new and undescribed.

Besides the Mollusca, several crabs, star-fishes, and zoophytes were brought in, of which no account was preserved. The depth dredged in was between twenty and thirty fathoms, at a few miles' distance from the shore, and the space did not extend beyond Marsden on

the north and Ryhope on the south. I am bound to state that much of the successful result of these dredgings was due to the intelligence of the fishermen employed, William and Ralph Hutchinson, who entered cordially into our views on the occasion.

I subjoin a tabular list of the species dredged. The following are either new to the coast, or, from their rarity or other circumstances, thought worthy of a separate notice :—

Bullæa catena, *Mont.* Several living examples were brought in by Mr. Howse from the third day's dredging. The shell only had been previously found on the coast.

Bullæa pruinosa, *Clark.* Three specimens of this very rare shell were obtained ; one with the animal.

Bullæa strigella, *Lovén.*

Cylichna strigella, Lovén, Index Moll. Scand. 10. No. 66. Three specimens occurred, all dead.

This is a recent addition to the British Fauna ; a few individuals having been dredged on the west coast of Scotland, at different times, by Mr. Barlee, Mr. Jeffreys, and myself. This is the first record of its capture on the east coast of Britain.

Bullæa strigella is distinguished from *B. umbilicata* by its more tapering form, by being striated, and by a small tooth-like fold at the base of the columella.

Chemnitzia fulvocincta, *Thomp.* A living specimen was obtained. It had been admitted into our Catalogue on the evidence of one or two dead and worn shells only.

Chemnitzia Macandrei, *Forbes.* We got some fine specimens of this rare species.

Chemnitzia acicula, *Phil.* Four or five were found ; two quite fresh.

Odostomia conspicua, n.s.

Shell strong, ovate-conical, with the spire rather elongated, of a pale brownish yellow or fawn colour ; whorls 7, a little convex and well defined ; the first somewhat drawn out and set obliquely, the rest tapering gradually to the last, which is rather ventricose and occupies about half the shell : it has a very slight ridge in the centre,

and is obscurely striated spirally. Aperture roundish ovate, a little produced and subangulated at the base; outer lip thin, faintly crenulated inside; inner lip with a strong tooth, placed centrally, and a narrow umbilicus behind it. Length, 3 tenths of an inch; breadth, $1\frac{1}{4}$ tenths.

This new species of *Odostomia* is the largest I am acquainted with. Its nearest ally among described species is the *Odostomia unidentata*, from which it differs in the greater size, the more produced spire, and the crenulations inside the lip.*

One specimen, dead, but tolerably fresh, was obtained from the first day's dredging. I have since found a young individual among some small shells dredged off Douglas, Isle of Man, in June, 1848.

ODOSTOMIA ACUTA, *Jeff.*

Odostomia acuta, Jeff., in Ann. Nat. Hist., 2nd series, v. 2, p. 338.

This has been described by Mr. Jeffreys since the publication of our Catalogue. Two worn shells, found at Tynemouth, which I had there mentioned as probably distinct from *O. unidentata*, Mr. Jeffreys considered to be varieties of his species. The acquisition of a few better specimens by dredging enables me to say that the shell found on this coast will probably prove to be distinct and new. It is intermediate between *O. unidentata* and *O. acuta*, but the whorls are more rounded and the umbilicus much larger than in either species. I should propose for it the name of *O. umbilicata*.

RISSOA VITREA, *Mont.*

Turbo vitreus, Mont. Test. Brit., 321.

One specimen of this rare shell occurred. The first found on our coast.

* Since writing the above, I find Mr. Jeffreys has expressed an opinion in the Annals of Natural History, that this shell, which I sent him for examination, under the name of *O. fulva*, is a variety of his *O. alba*, in which opinion I can by no means agree. *O. alba* is a thin shell with a very small and obscure tooth: this is a thick shell with the tooth very large and conspicuous. There are other differences, such as general form, size, colour, and striation. Few species of the genus appear more distinct from each other than these.

PLEUROTOMA NEBULA, *Mont.*

Murex nebula, Mont. Test. Brit. 267.

New to our coast. We got three living specimens.

PLEUROTOMA BRACHYSTOMA, *Phil.*

Pleurotoma brachystomum, Phil., Enum. Moll. Sic., v. 2, p. 169.

Mangilia tiarula, Lovén, Ind. Moll. Scand. 14. No. 97.

This is one of the rarities lately added to the British Fauna from the enterprising dredging excursions of Mr. Barlee, Mr. M'Andrew, &c., in the north and west of Scotland. Its occurrence on this coast makes an interesting addition to our local list. Three specimens were found.

TRICHOTROPIS BOREALIS, *Sow.* Some good specimens were obtained.

CHITON HANLEYI, *Bean.* We got a single specimen of this rare Chiton which was originally found at Cullercoats in 1837.

MODIOLA PHASEOLINA, *Phil.*

Modiola phaseolina, Phil., Enum. Moll. Sic., v. 2., p. 51, t. xv., f. 14.

Several living individuals of different ages were obtained. This species had been already observed on our coast by Mr. King and Mr. Howse, who had obtained specimens from the deep-water fishing boats.

LEPTON CONVEXUM, *Alder.* I ventured to describe this species in our Catalogue from a single valve found in sand. We have now been so fortunate as to obtain by dredging two or three perfect specimens and several odd valves. The minute puncturing of the surface does not appear to be constant in the species. A few had the punctures extending over half the shell, and some were entirely plain. It is possible, therefore, that this may prove to be identical with the little-known *Lepton nitidum* of Turton. The surface is beautifully iridescent when fresh. The largest specimens measured $\frac{1}{8}$th of an inch across.

NEÆRA CUSPIDATA, *Olivi.* One living example was got.

PLEUROTOMA TERES, *Forbes.* Two or three additional examples of this fine and rare species were obtained.

In addition to the above, all obtained by dredging, two species of TUNICATA have been met with, not previously included in our local list. One of these is undescribed.

CYNTHIA ECHINATA, *Linn.*

Ascidia echinata, Müll. Zool. Dan., t. 130, f. 1, Forbes and Hanley, Brit. Moll. v. 1, p. 35, t.C.f. 4.

Three specimens of this pretty species were got from the fishing boats at Whitburn.

MOLGULA SIPHONATA, n.s.

Body roundish or ovate, inflated, with prominent non-retractile tubes; adhering to marine substances by its base. Outer tunic soft, smooth, yellowish brown, or nearly colourless; closely and uniformly covered with a thin coating of sand, which adheres firmly to its surface. Inner tunic smooth, transparent, of a lilac colour, shewing the viscera through, particularly the ovaries, which form whitish crescent-shaped lines on each side. Branchial sac deeply folded, with about six plaits on each side, a little festooned. Apertures tubular, nearly terminal, set a little apart; branchial tube about a quarter of an inch long and nearly as wide, without colour, having six points, with sometimes slight intermediate ones surrounding the aperture; tentacular fringe branched. Anal tube rather longer and narrower than the branchial one, with four points at the margin of the aperture. Length, including the tubes, $1\frac{1}{2}$ inches; breadth variable, but generally nearly equal to the length.

Two or three specimens of this Ascidian were found on the fishing lines at Cullercoats in October last. It approaches nearest in form to the *Ascidia tubularis* of Müller, but differs in size and the smoothness of the surface. It is readily distinguished from the *Molgula arenosa* of our Catalogue by its projecting tubes, less regular shape, and more even surface.

MOLLUSCA DREDGED OFF WHITBURN, 1849.

	Alive.	Dead.
Doto fragilis	3	-
Bullæa pruinosa	1	2
pectinata	-	a few.
catena	a few.	2 or 3
Bulla Cranchii	-	1
cylindracea	1 or 2	a few.
strigella	-	3
truncata	-	2 or 3
Amphysphyra hyalina	-	2
Actæon tornatilis	-	2 or 3
Scalaria Trevelyana	1	2 or 3
Eulima bifasciata	-	a few.
Chemnitzia fulvocincta	1	-
Macandrei	4	6
acicula	1	3
Odostomia conspicua	-	1
unidentata	-	5 or 6
acuta ?	1	4 or 5
interstincta	2	a few.
spiralis	-	a few.
pallida	-	5
obliqua	-	1 broken.
Rissoa striata	-	several.
parva	-	several.
inconspicua	-	1
semistriata	-	3
punctura	-	several.
vitrea	-	1
ulvæ	-	2
Littorina littorea	-	1
Lacuna vincta	-	2
Trochus tumidus	-	3 or 4
zizyphinus	a few.	a few.
Turitella terebra	several.	many.
Aporrhais pes-pelecani	-	2
Pleurotoma teres	-	3
costata	-	2 or 3

	Alive.	Dead.
Pleurotoma linearis	-	a few.
nebula	2	1
brachystoma	1	2
Trevelyana	1	a few.
Fusus turricula	a few.	a few.
clathratus	a few.	several.
propinquus	2	3
antiquus	2 small.	-
Trichotropis borealis	-	a few.
Buccinum undatum	2	-
Nassa incrassata	many.	many.
Cypræa Europea	3	a few.
Natica catena	1	-
Alderi	a few.	a few.
Montagui	a few.	several.
Velutina lævigata	-	2
Emarginula fissura	-	3 or 4
Capulus Hungaricus	-	3 young.
Chiton Hanleyi	1	-
cinereus	2	-
Dentalium entalis	many.	many.
Anomia cylindrica	-	1 or 2
aculeata	-	1 or 2
Pecten tigrinus	-	a few valves.
maximus	-	2 valves.
similis	-	several valves.
opercularis	1 or 2	odd valves.
Arca cardissa	-	a valve.
Nucula nucleus	many.	many.
nitida	-	a valve.
tenuis	2 or 3	-
Modiola vulgaris	a few young.	-
phaseolina	a few.	a few.
nigra	4	-
discrepans	a few.	-
marmorata	2	-
Crenella decussata	2	3 valves.
Cardium fasciatum	many.	many.
nodosum	-	2 or 3
Artemis lincta	-	a few.
Lucinopsis undata	2 or 3 small.	-
Venus gallina	-	a few.
ovata	a few.	a few.
fasciata	-	valves.

	Alive.	Dead.
Pullastra virginea	-	2 or 3
Cyprina Islandica	a few young.	valves.
Astate compressa	a few.	a few.
Danmoniæ	-	a valve.
Donax anatina	-	a valve.
Psammobia Ferroensis	-	2 or 3
tellinella	-	a valve.
Syndosmya prismatica	-	2 or 3 valves.
alba	-	1
Mactra elliptica	a few.	-
Crytodon flexuosum	2 or 3	a few.
Lepton convexum	-	several.
Kellia suborbicularis	2	a few.
Montacuta bidentata	-	several.
ferruginosa	-	several.
Neæra cuspidata	1	-
Corbula gibba	a few.	a few.
Thracia convexa	-	broken valves.
villosiuscula	-	a valve.
distorta	-	a valve.
Lyonsia Norvegica	3	-
Mya truncata	2 young.	a few young.
Solen pellucidus	1 broken.	-
Saxicava rugosa	a few.	several.
Pelonaia corrugata	2 or 3	-

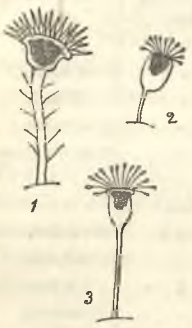
XVI.—*An Account of three new Species of Animalcules.*

By Joshua Alder, Esq.

[Read Wednesday, December 12th, 1849.]

While examining a specimen of *Sertularia pumila*, taken from the rocks at Whitburn, under the microscope, I was struck with the appearance of what seemed to be a very minute parasitic zoophyte, several specimens of which were attached to different parts of the Sertularia.

The body was of a vase or cup form, expanded at the top (fig. 1.), and set round with numerous pointed tentacles, abruptly thickened towards the base, and forming more than one row: they had very little motion, but were occasionally bent forwards, and the whole were sometimes slowly retracted. The body was attached to the Sertularia by a tolerably stout stem.



Other specimens of the Sertularia were examined and found to have the same parasite, which was itself infested by still more minute parasitical bodies of the family *Bacillaria*. In addition to the first species of supposed zoophyte, another, rather smaller, was also detected, (fig. 2). Its body was of an ovate form, with a very slender and shortish stem: the tentacles were capitate, or knobbed at the end, not so numerous as in the first species, and placed in a single row round a narrow disk. Under the impression that these animals belonged to the class of zoophytes, I sent drawings of them to my friend Dr. Johnston, who informed me that they represented something with which he was not acquainted, and that possibly I had got a new form of Campanularian zoophyte. A more careful examination, however, of these delicate little creatures, which were so minute as to be only just visible to the naked eye, convinced me that their organization was much more simple than is to be found in the true polypes, and that they must be considered to belong to the class *Infusoria*. I afterwards found both these species on Sertulariæ at Cullercoats.

I have since met with another species of these polype-like animalcules inhabiting fresh water, (fig. 3). It occurred in Crag Lake, on the stem of the new species of *Paludicella* found there, and somewhat resembles the smaller marine species already described, but is perfectly distinct from it as its habitat would lead us to expect. The body of this lacustrine species is pear-shaped, or, perhaps, rather bell-shaped, with a distinct rim round the top, and a single circle of delicate capitate feelers, which, as in the former instances, were retractile. The stem was long and slender.

The British Animalcules are very imperfectly understood. With the exception of the beautiful tribe of *Vorticellæ*, whose relationship is very remote, there are not any published native species bearing the least resemblance to those here described. The genus *Acineta* of Ehrenberg comes nearest to them. *Acineta mystacina*, found near Berlin, somewhat resembles our lacustrine species, but its form appears to be much more simple, and the tentacles rise irregularly from different parts of the body. It is probable, therefore, that these animalcules are undescribed, and their discovery is not void of interest, on account of their forming a more perfect link between the Infusoria and the Campanularian zoophytes than any hitherto known.

The great class Infusoria, in its present form, includes a heterogenous assemblage, which at some not very distant period must be broken up; and it will then probably be found that the infusory animalcules contain the first rudimentary forms of nearly all the invertebrate types.

XVII.—*On the Anatomy of the Freshwater Bryozoa, with descriptions of three new species.* By Albany Hancock, Esq.

[Read Wednesday, December 12th, 1849.]

During a ramble made last July, in company with the Club to the Northumberland lakes, I was fortunate enough to find two or three species of *Bryozoa*. Since then I have revisited the locality twice, and on each occasion additional species occurred. Thus six or seven forms of these interesting animals have been found to inhabit two of these lakes, namely, Bromley Lough and Crag Lough. Three of the species appear to be undescribed; these I propose to characterize towards the close of this communication, giving previously an account of the anatomy of the freshwater *Bryozoa* so far as I have been able to determine it.

Amongst the known species was a fragment of *Alcyonella*, most probably *A. stagnorum;* but its characters could not be determined on account of the imperfection of the specimen. *Fredericella sultana* occurred abundantly, and of very luxuriant growth, spreading over the under surface of stones in patches of three or four inches' extent. Of the new species, two belong to *Plumatella* and one to *Paludicella*, a rare genus, of which there was but one species previously known, and that, I believe, had been found only in Ireland, and in two or three localities on the continent.

The anatomy of the freshwater *Bryozoa* had been very little studied, on this side of the Channel, before Professor Allman took up the subject, and he has handled it so well that little is left to be done. Indeed so complete are the results of this naturalist, that, perhaps, the publication of my own may appear almost unnecessary. My investigations, however, carried on, as they have been, perfectly independent of the researches of others, may not be without some value even where novelty is wanting. Microscopic investigations conducted by the aid of transmitted light are liable to error. Frequent examinations in such cases are therefore necessary, and observations independently prosecuted are of peculiar value. Consequently, I do not hesitate to give the result of my own labours on this subject, fraught as it is with difficulty, not fearing to mislead in a path already so well trodden.

Of the anatomy of these animals I shall have to confine myself almost entirely to that of *Plumatella*, *Fredericella* and *Paludicella*. Of *Alcyonella* I can say but little, having seen only an imperfect specimen, and none of the other freshwater forms have come under my notice.

Plumatella and *Fredericella* resemble each other very closely in their anatomical structure, notwithstanding the external difference of their polypes. *Paludicella*, however, shows some very interesting modifications, particularly in the muscular system: but before entering on the internal anatomy, it will be necessary to examine the characters of the polypidom, and to trace its relationship to the polype.

The polypidom of *Plumatella Allmani*, Pl. VI, figs. 3, 4 and 5, and of *Fredericella sultana* is tubular, branched and carinated

on the upper surface; the walls opaque, tough, and membranous, inclining to horny. Those of the latter, when examined through the microscope, exhibit a sort of dendritic structure; the divisions or branches passing in an irregular spiral direction round the tube, are flattened, and extensively anastomosing, form for the most part a dense tissue, nowhere more open than just to display the branched character. The walls of *Plumatella* do not in the least exhibit this structure. In *Paludicella* the polypidom, fig. 2, is likewise branched and tubular, but not carinated; it is membranous or horny, and becomes enlarged and contracted at certain intervals, dividing the whole, as it were, into cells or compartments, the external surface being smooth and very glossy.

All these genera have the polypidom lined with a delicate membrane—the tunic, Pl. IV. figs. 4 *b*, *b* & 5 *k*, and Pl. V. fig. 1 *b*, which is attached only at certain points to the inner surface of the external tube or cell-wall. This, in *Plumatella* and *Fredericella*, becomes excessively delicate towards the orifice, where it apparently blends with the tunic. But in *Paludicella* the union at this point of the horny wall and tunic cannot be mistaken, though the blending is so gradual that it is impossible to say where one ends and the other begins. And when this polype is exserted, there is a delicate membranous cup, Pl. V. fig. 1 *d*, projecting upwards from the inner surface of the mouth of the cell. This cup is the homologue of the circle of setæ surrounding the aperture of *Bowerbankia* and other marine genera. In *Paludicella*, the tunic is sprinkled with large nucleated cells, fig. 4 *m*, and at certain intervals bends abruptly inwards, figs. 1 and 2 *u*, *r*, dividing the polypidom into cells at the points indicated by the constrictions in the horny tube. Thus each polype is isolated, is contained in fact within a distinct membranous cell, the end-walls of which abut against the end-walls of the adjoining cells. The divisions are therefore double, and being of living membrane, and in contact, it is probable that all the inhabitants of the polypidom are in some degree connected in vital action. The end-walls are considerably thickened in the centre, forming a bulb or boss projecting into the cell. The polypes of *Fredericella* are not separated the one from the other,

though a few divisions appear to exist at distant points. Thus it would seem that groups of animals are associated together as it were in one tube. Neither in *Plumatella* are the polypes separated.

The polype lies in the longitudinal axis of the cell, Plates III. and V. figs. 2, 2, being provided with numerous muscles for protrusion and retraction. It is held in its place principally by a membranous tube—the tentacular sheath, Pl. III. fig. 2 *m*, *n*, and Pl. V. fig. 2 *d'*, *d'*, which blends with the inverted lips of the tunic, Pl. III. fig. 2 *l*, a little below the orifice of the cell, and continuing downwards within the cell encloses the bundle of retracted tentacles, and is attached round the tentacular disc *a'*.

Digestive System.—The organs of digestion, comprising nearly the whole of the polype, float freely in the visceral cavity. The entrance to the alimentary canal is furnished with tentacles, Pl. III. fig. 1 *b*; these arise from a margin surrounding the oral opening in two different fashions; in the one they form a complete circle round the mouth, in the other they are arranged in a crescentic manner, the limbs of the crescent being two arms, Pl. IV. figs, 1, 2 & 3 *c*, *e* & *c*, extending from the sides of the mouth, fig. 3 *a*, having their bases confluent and with a row of tentacles on their inner and outer margins. *Paludicella* and *Fredericella*, Pl. V. fig. 1 *f*, and Pl. III. fig. 1 *b*, are examples of the first mode of arrangement; and *Plumatella*, Pl. IV. figs. 1. 2 & 3, and *Alcyonella* of the second. In *Paludicella* the tentacles, when spread out, form a very exact inverted cone, closely resembling the shape they assume in some of the marine species. The base or disc supporting the tentacles is not exactly circular in *Fredericella;* in this genus it is a little flattened at the point corresponding to the space between the oral arms in *Plumatella;* and there is also a delicate transparent membrane, Pl. III fig. 1 *c'*, *c*, uniting the bases of the tentacles. In these respects *Fredericella* shows an approximation to those with oral arms, or as it is generally termed, a crescentic disc. In these there is always a similar membrane, Pl. IV. figs. 1, 2 & 3 *e*, *f* & *d*, at the base of the tentacles, and in all of them, as well as in *Fredericella*, this membrane is attached to the external surface of the tentacles, and is much wider at the margin than the spaces between

them, and, consequently, it bags out, giving to the upper portion a flounced appearance, particularly in the latter, Pl. III. fig. 1 *c*.

The tentacles themselves, in all these genera, are rather stout and linear with the end obtuse; they have the appearance of being tubular, as have likewise the oral arms of *Plumatella*: the tentacles are clothed with long cilia, which vibrate upwards on one side, and downwards on the other, in the same manner as described in the marine species; and as in them, when the polype is retracted, the tentacles are drawn down in an erect position, having first been brought together into a compact linear bundle, Pl. III. fig. 2 *a*, and Pl. V. fig. 2 *d*. They do not appear to be at all contractile, and in all the species are transparent and almost homogeneous in their structure. There can be little doubt that they are not merely tentacles, but that they are likewise respiratory organs: food is brought to the mouth by their ciliary currents, and also by the action of the tentacles themselves, one or more of which may frequently be seen bending suddenly inwards, and securing such particles as come within their reach. They occasionally act in concert in the capture of animalcules, by bringing their tips together, thus forming, in those with a circular disc, a very elegant oval cage, within which the imprisoned prey may be seen for an instant or two dashing about, previously to passing into the œsophagus or to liberation, which not unfrequently happens, the captive proving distasteful to the polype. The tentacles then may be considered prehensile, labial, or oral appendages, notwithstanding their respiratory function, and as such they are a portion of the alimentary system.

The oral orifice of *Plumatella* is semicircular, Pl. IV. fig. 3 *a*, and protected by a strong, rounded, fleshy valve, *b*, which, arising from the side of the mouth at the point on the inner margin of the cresent, where the two arms unite, projects upwards and slightly overhangs the opening. This valve is completely under the control of the animal, and can be made to act as a sort of operculum, closing the orifice to prevent the admittance of food; or it can be used to force food into the pharynx. The mouth, Pl. III. fig. 1 *d*, of *Fredericella* is likewise semicircular, and is also provided with a similar valve, *e*. It is immediately behind

it that the tentacular disc is a little flattened, proving that this point corresponds to the space between the arms in *Plumatella*; indeed, in some points of view, the angles formed by this flattening have not a little the appearance of rudimentary arms just sprouting.

The œsophagus descends at once in a straight line from the oral opening. In *Fredericella*, Pl. III. figs. 1 *f* & 2 *b*, it is rather short and wide, and the walls, which are thick and fleshy, are parallel throughout, except at the commencement, where they are a little bulged, forming a sort of pharynx which is lined with vibratile cilia: the other extremity communicates with the stomach by a distinct valvular orifice, Pl. III. figs. 1 *g* & 2*c*, the cardiac, projecting downwards. The whole surface is covered with minute circular cells resembling very much the peculiar structure observed in the marine species, and pointed out by Dr. Farre, in his valuable paper on the Marine Ascidian Polypes published in the 'Philosophical Transactions' for 1837.

The stomach, figs. 1 *h* & 2 *d*, is more than twice the length of the œsophagus, tapering slightly downwards and truncate above; the lower extremity being obtuse: the walls, like those of the œsophagus, are thick and fleshy, and are covered with numerous, minute, close-set cells of a glandular character. The pyloric orifice is circular and well marked, and has the appearance of being guarded by a sphincter muscle; it is likewise supplied with vibratile cilia which extend some little way into the stomach. This orifice is situated above, at one side and a little below the cardiac opening. The intestine, figs. 1 & 2, *i*, *e*, is straight, and a little longer than, and nearly as wide as, the œsophagus, with which it lies in contact, and to which it is apparently attached; the pyloric extremity is obtusely pointed, and communicates by the side with the stomach; from thence the intestine tapers a little upwards towards the anal extremity, which, turning outwards, passes through the tentacular sheath just below its attachment to the disc supporting the tentacles, and there terminates in an obtuse perforated point, figs. 1 & 2 *j* & *f*, which can be either protruded or retracted, to a considerable extent, at the will of the animal. The whole of the alimentary

canal is highly irritable, particularly the œsophagus and stomach, in the walls of both of which, minute, transverse striæ are distinctly visible, probably indicating the presence of muscles. The stomach is perpetually in motion when the animal is displayed, contracting in an undulating or vermicular manner from above downwards. The contractions of the œsophagus, too, are very decided on receiving food, which for a second or two rests in the enlargement, and is then hurried into the stomach with great rapidity.

The alimentary canal of *Plumatella* and *Alcyonella* does not vary in any important manner from that of *Fredericella*. In the two former, however, both the œsophagus and stomach are shorter than they are in the latter genus.

In all these genera no disturbance of the parts of the alimentary canal takes place on the retraction of the polype : the animal sinks into the cell with the œsophagus, stomach and intestine erect as they were when the tentacles were exserted and in full play. Not so, however, in *Paludicella*, Pl. V, fig. 2 ; in this genus the alimentary canal is doubled upon itself when the polype is retracted ; and, moreover, the parts are somewhat modified, approximating this form more closely to that of the marine species.

When the animal of *Paludicella* is protruded, the œsophagus, fig. 1 *h*, is observed to be long and slender, and to have a distinct pharyngeal dilatation at the commencement, where vibratile cilia can be seen in vigorous action. It communicates with the upper extremity of the stomach by a circular orifice, fig 2 *f*. The stomach, fig. 1 *i*, is rather short, considerably enlarged above and tapering to the inferior extremity, where it is rounded : the walls are thick, and apparently filled with yellowish brown coloured granules, probably hepatic as in the marine species. The intestine, *j*, arises from the superior extremity close behind and a little above the cardia. The pyloric opening is well defined and circular ; soon after its origin the intestine is suddenly enlarged, forming an oval swelling, *k*, in which the fæces may be seen collecting ; it contracts above this swelling, and continues afterwards for nearly its whole length of equal diame-

ter; it passes upward in a straight line parallel with the œsophagus, but unattached to it, and terminates in a rounded anal extremity, *l*, immediately below the base of the tentacles where it perforates the tentacular sheath. The upper end of the stomach, close to the pyloric orifice, is furnished with vibratile cilia, and here the alimentary matters may be seen rapidly rotating by their influence. The fæces are formed into small pellets, which, coming from the enlarged portion, pass up the intestine and are expelled at the anal orifice. The whole of the canal is as highly irritable as in the other species; the stomach undulating from above downwards in the same manner, and the œsophagus is equally expert in transmitting food to the stomach. But neither in *Paludicella* nor in the species before alluded to does the pharyngeal swelling exhibit in any marked manner, the sudden puffings and contractions so conspicuous in the marine species, and noticed originally by Dr. Farre.

On retraction of the polype, the alimentary canal of *Paludicella* is doubled upon itself in much the same way as in *Bowerbankia*. The basal disc of the tentacles is then brought down as far as the upper extremity of the stomach, and the consequence is that the intestine, fig. 2 *h*, is doubled upon itself a little above the enlargement, *i*, and the œsophagus, *e*, is forced down by the side of the stomach, *g*, and turning upwards again is bent into the form of an S.

Vascular System.—This appears to be entirely wanting in these animals: a species of circulation nevertheless exists. I have seen, on two or three occasions, a pretty regular flow of the fluid in the visceral cavity of *Plumatella* and *Fredericella*. Under ordinary circumstances no fluid can be recognized in this cavity, from the apparent deficiency of blood-globules or corpuscles of any kind. Such however probably exist, but the thickness and opacity of the cell-walls are sufficient to prevent the detection of minute bodies of this nature. On the occasions alluded to, some of the tissues of the animal appear to have been ruptured, and small fragmentary particles, mingling with the contained fluid, were perceived moving in certain directions. By the aid of these particles, which were numerous and of various

forms and sizes, it was easy to ascertain that the fluid which bathes the polype circulates in a regular manner within the cavity in which the viscera float. There can be no doubt that this circulation is caused by the action of cilia which cover the inner surface of the lining membrane or tunic, and also clothe the external wall of the retracted tentacular sheath. The current flowed regularly and steadily; but when the floating particles approached the surface of the tunic or tentacular sheath, their motion became accelerated in a manner that sufficiently evinced the presence of vibratile cilia. Those on the tunic chiefly determined the direction of the current, which went with great regularity up one side, crossed over at the top of the cell, and then went down the other side; it crossed again, in an opposite direction, a little below the stomach, and so completed the circuit. It was not difficult to ascertain that the cilia of the tunic on one side of the cell vibrate upwards, on the other side downwards; and that all those, on the tentacular sheath, vibrate upwards. On one side therefore the currents of the sheath and tunic oppose each other; and consequently an eddy was visible near the top of the cell.

It is quite evident then that fluid circulates within the visceral cavity. What is the nature of this circulation? Is it merely respiratory, or is it nutritive? It can scarcely be considered an aërating current, as there is no visible communication between this cavity and the external water; and indeed if an orifice exists, it must be minute and under the control of the animal, or the protrusion of the polype could not be effected in the manner to be afterwards described. It is more likely to be for the purpose of nutrition,—standing, indeed, in the place of a vascular system. The fluid must therefore hold in suspension the products of digestion. These may be supposed to exude through the walls of the intestinal canal, probably from the enlarged portion of it in *Paludicella*, and perhaps also from the upper portion of the stomach; and passing into this circulation will go at once to nourish the various organs of the animal, all of which are bathed with this vivifying fluid, except the tentacles, which we shall afterwards see, in all probability, receive

blood into their interior, for the purpose of aëration. In this way, too, we can understand the nourishment and growth of the tunic and the maintenance of the buds (which germinate from it) until they are able, by the aid of their own tentacles, to procure food. In no other way can the development of these buds be so easily explained. The membrane in which they take their origin must either be supplied with the nutritive fluid in this way, or by the agency of vessels; but none can be discovered either in the tunic or elsewhere. The external cell-walls, whilst in a growing state, must also be nourished by the tunic, which we have seen is united to the external walls at the orifice of the cell.

The respiratory function we have stated to be exercised by the tentacles, but there can be no doubt that all the exposed parts will assist in aërating the blood. The tentacles are hollow, and though I could not detect any fluid within them, it is probable that the blood finds its way into their tubular cavities through the basal disc; and as they are clothed with strong vibratile cilia which keep a constant flow of the oxygenating medium, over their surfaces, they would appear well adapted for breathing organs. It is, however, difficult to understand how the oxygenation of the blood goes on when the polype is retracted; for, at this time, the orifice is completely closed by the folding in of the lips of the cell, and by muscles provided for the purpose. Professor Allman has supposed that the tube retractors of *Paludicella* exercise the function also of opening the aperture, when in this state, for the purpose of admitting the surrounding fluid. But I have seen nothing to warrant such supposition; and indeed the tentacles being then packed close together within the sheath, the cilia cease to vibrate, and there is no room in which the water can flow around them, even supposing an opening to be so maintained. The tips of the tentacles, too, of *Paludicella*, and of several of the marine species when retracted, are generally bent down in a manner to forbid the flow of any fluid whatever amongst them. It would therefore seem clear, that when not in action the oxygenation of the blood must almost, if not entirely, cease in these polypes, as it must do in most of the Mollusca when closed up in their shelly armature.

Nervous System.—Some years ago Professor Allman discovered a ganglion in these animals, and has more recently ascertained the existence of nerves. I have also detected a large ganglion, Pl. III. fig. 1 *k*, in *Plumatella* and *Fredericella*. It is situated just below the entrance to the œsophagus, on the external surface, close to the base of the tentacles and just above the anal orifice. It is therefore placed between the oral arms in *Plumatella*, and in *Fredericella* at the corresponding point. In the latter I have observed two or three nerves passing from the ganglion upwards in the direction of the tentacles, and one apparently going to embrace the œsophagus; another that comes from the lower extremity of the ganglion may also be seen passing downwards close to the œsophagus. This is all I have been able to make out respecting the nervous system, though undoubtedly more is to be learnt.

Muscular System.—There are three distinct set of muscles in *Plumatella* and *Fredericella*: one for the retraction of the polype, another to assist in the act of protrusion, and the third probably accessory in closing the orifice. The first and most conspicuous set of muscles, the polype retractors, Pl. III. figs. 2 *g*, *g* & 4 *f*, and Pl. IV. figs. 4 *g* & 5 *i*, *i*, is divided into two equal bundles, one passing on each side of the polype. These bundles are composed of numerous, stout, isolated fibres, having their origin in the walls of the cell a considerable way below the retracted polype; and passing upwards have their superior extremities inserted at the tentacular disc or base of the oral arms and at the upper portion of the œsophagus. There are also two similar bundles of muscular fibres in *Alcyonella*, but in this genus they have their origin at, or close to, the bottom of the cell. When the animal of *Plumatella* is exserted, two or three of the stoutest, Pl. III. fig. 4 *g*, of these fibres are seen to be attached on each side further forward than the rest at the base of the oral arms. Also in *Fredericella* similar fibres are inserted at the corresponding parts of the tentacular disc. These stout fibres have their origin a little lower down the cell than the rest.

The function of these two bundles of muscular fibres cannot for a moment be mistaken: they are for the purpose of drawing

the polype back into the cell; and when it is so withdrawn, the fibres of this, the most powerful muscle of the animal, may be seen in a relaxed state and bent upon themselves in a loose undulating manner about the tentacular disc, and downwards to their origin. The few strong fibres alluded to, undoubtedly assist in the retraction of the polype; but are also apparently the principal agents in rotating the head, so to speak, of the polype when exserted.

The second set of muscles, Pl. III. figs. 1 & 2 *m*, *h*, is composed of a circle of stout, isolated, radiating fibres, all placed in the same horizontal plane, considerably apart from each other, and attached by their outer extremities to the inner surface of the tunic, some way below the opening; their inner extremities converging towards the tentacular sheath, are attached to it about one-third from its superior termination. *Plumatella* has fifteen or sixteen of these fibres, *Fredericella* about fourteen. Their arrangement is perfectly symmetrical. They are for the purpose of preventing the inversion of the whole of the tentacular sheath, on the protrusion of the polype; and thus to confine the oral extremity within a convenient distance above the mouth of the cell.

The true value of these muscles will be fully understood if we refer to the marine genus *Bowerbankia*, in which they are deficient, and of course the tentacular sheath can be completely inverted, and accordingly the animal is enabled to reach to a greater distance than it could otherwise have done. But an apparatus of extraordinary beauty is provided to obviate the inconvenience that must have arisen from the great elevation of the tentacular disc, above the support of the horny cell. This is effected by what may be considered an elongation upwards of the cell. Numerous setæ bound together by a membrane, are attached to the lips of the orifice, so that when the polype is exserted, they stand up in a circle surrounding the lower part of the exposed portion of the animal, and give support to it. By this means, the far-outstretched tentacular disc is brought completely under the control of the muscles for directing its move-

ments.* We thus clearly see that this set of radiating muscles is a compensation for the deficiency of the circle of setæ in the freshwater polypes.

The third set of muscles, figs. 1 & 2 *n*, *i*, consists of numerous, separate, fine thread-like filaments, placed considerably apart, without order, but in the same radiating manner as those last described, immediately above them and extending upwards to the termination of the cell. These filaments have their outer extremities attached to the inner surface of the tunic; and converging towards the axis of the cell, their inner extremities are attached to the upper portion of the tentacular sheath and the inverted margin of the tunic. These fibres are equally numerous and fine in both *Plumatella* and *Fredericella*, and appear to be for the purpose of assisting in closing the orifice, acting in harmony with the contraction of the upper portion of the tentacular sheath and the inverted lips of the orifice. They may, acting in the opposite direction, also assist in opening the channel, but the tentacles themselves would appear quite adequate to force a passage on the relaxation of the contractions about the orifice. The function of these fibres is in fact to keep in unison the tunic near the opening, and the upper portion of the tentacular sheath.

The upper portion of the tentacular sheath and inverted lips of the tunic are highly contractile, and it is by their agency principally that the orifice is closed when the animal is retracted. I have not, however, been able to detect any muscular fibres for the purpose, though at the point, Pl. III. fig. 2 *n*., where the inverted lips of the tunic join to the tentacular sheath, it is

* Dr. Farre has described this apparatus in his paper so frequently referred to, but seems scarcely to have arrived at a full knowledge of its function. He considers that it is "for allowing of the freest possible motion to the upper part of the body, in its expanded state, to which it affords at the same time support and protection." On examining the animal in action, it is evident that the use of the apparatus, is, as I have pointed out. The circle of setæ is then seen to compress the lower portion of the extended polype; and when the tentacular disc moves from side to side, the neck always bends from the top of the setæ, at a decided angle, and does not gradually arch away from the lips of the cell, as might be expected, were this contrivance for the purpose of giving flexibility. The delicate membrane uniting the setæ, is strengthened with numerous, minute, transverse fibres, forming the whole into a powerful sphincter, thus giving great firmness to the part. By this arrangement, *Bowerbankia* is enabled to raise the tentacular disc far above the polype-cell, and yet to remain as perfectly under the control of the rotatory and retractor muscles, as is the tentacular disc of *Fredericella* and *Plumatella*, in both of which it is confined close to the orifice of the cell by the action of the radiating muscular fibres.

suddenly constricted as if by a powerful sphincter muscle. In fact the whole of the tunic is undoubtedly contractile, yet in no part of it have I detected muscular fibres. By the contraction of this lining membrane, the capacity of the visceral cavity is diminished; and thus, by the pressure of the contained fluid, the protrusion of the polype is effected. This matter, however, will be discussed more fully when we come to speak of this portion of the anatomy of *Paludicella*.

To understand the combined action of the various sets of muscles in *Plumatella* and *Fredericella*, we have only to watch the animal when about to issue from the cell. The first change observed is the contraction of the tunic, Pl. III. fig. 4 *j*, *j*, and Pl. IV., fig. 4 *b*, the walls of which are brought nearer together towards the lower portion of the cell. The pressure thus occasioned, on the contained fluid, compels the polype to begin its ascent; at the same time the sphincter contraction of the upper portion of the tentacular sheath relaxes, so that the bundle of tentacles can force their way without difficulty. As the polype gradually advances upwards, the circle of strong radiating muscles comes into play, and it is a sight of no little interest to watch them drag upon the tentacular sheath, allowing the inferior portion of it to roll upwards attached to the tentacular disc. As soon as the ascent is arrested by these muscles, the sheath being inverted as far as they will permit, protrusion is complete, and the tentacles at once assume their proper arrangement.

The muscular apparatus of *Paludicella* differs in some respects from that of *Plumatella* and *Fredericella*. In the former there are six sets of muscles—three in connexion with retraction, two with protrusion, and one for closing the orifice on the retreat of the polype. Of the retractors, one set acts directly upon the animal, the other upon the tubular orifice of the cell. The former set, Pl. V. fig. 1 *o*, the most powerful in the animal, is similar to the tentacular retractors of Dr. Farre: it differs only from the polype-retractors in *Plumatella*, and the other genera already spoken of, in not being divided into two bundles. It is composed of numerous, stout, long, linear fibres, originating from the inner surface of the anterior wall of the cell, more than half-way down;

then passing up in front of the polype, the superior extremities are inserted around the base of the tentacular disc. These fibres draw the polype down into the cell, and like those of the same muscle in the other *Bryozoa*, when unemployed, lie in a somewhat cramped and disordered state, fig. 2 *l*, *l*.

The second and third sets of muscles are the tube-retractors; the former or inferior, figs. 1 *p* & 2 *m*, *m*, is much the larger; it is composed of four compressed bundles of stout, linear fibres placed close together, but distinct from each other. These bundles are associated together in pairs, one on each side of the tube; the inferior ends of these pairs of bundles arise wide apart from the posterior wall of the cell opposite the orifice. As they pass up the tube, the bundles converge, and reaching within a short distance of the lips of the orifice, they are inserted upon the inner surface of the tube-walls at four opposite points; the fibres of each bundle being attached one above the other in the same longitudinal plane. This peculiar arrangement causes the margins of the orifice to fold into four portions on the retraction of the tube; and its end, fig. 3, consequently assumes a square form, the angles corresponding to the insertions of the muscular bundles.

The third set of muscles, figs. 1 *q* & 2 *n*, *n*, the superior tube-retractors, are made up of only four fibres, two on each side of the cell, having their origin immediately below that of the set just described; their other ends are attached to the inner surface of the tube above the insertion of the inferior set, and at the base of the membranous cup, fig. 1 *l*, before alluded to, at the mouth of the cell. The inferior and superior tube-retractors are homologous to the double set of opercular muscles described by Dr. Farre, in the marine species, differing only from those in *Bowerbankia densa* by being divided into four bundles instead of into three, as they are in that species. The action of these muscles is obvious. The superior retractors, having their insertion at the base of the membranous cup at the mouth of the cell, draw it down base first in the axis of the tube, at the same time folding in around it the lips of the cell. The inferior set then taking up the work, complete the inversion of the tube. Dr. Farre, however, supposed that the opercular muscles were not merely for drawing the tube

in after the retreating animal, but also for the purpose of closing the orifice. Professor Allman has pointed out the error of this opinion, and endeavoured to explain the closing of the orifice by the pressure of the fluid within the cell, against the walls of the inverted tube. We shall directly see, however, that this theory is unnecessary, there being special muscles provided for the purpose. Professor Allman is likewise disinclined to believe that the opercular muscles are really tube-retractors, as he supposes the muscles for drawing in the polype are sufficient for the purpose also of drawing in the tube. Were these latter muscles used to invaginate the tubular orifice of the cell, we should expect to find find them in action so long as the animal was retracted; but we have already seen, that when the polype is in this state, they are invariably relaxed and lie in a disordered undulating manner, perfectly at rest. The tube-retractors, on the contrary, are always tense and in vigorous action during the retracted state of the polype, evincing, I think, in a satisfactory manner, that their function is to retract the tube, and to maintain it in an invaginated state—unless we are to suppose that they are constantly employed in keeping open the channel, as suggested by Professor Allman. They will certainly have a tendency to pull asunder the walls of the inverted tube, yet I have never seen the channel thus opened, although these muscles are never otherwise than as represented in Pl. V. fig. 2, when the polype is retracted. And, moreover, the tips of the tentacles, as exhibited in this figure, are frequently doubled down, showing that the tentacular sheath must be to some extent relaxed, and that there is no stress whatever on it, as there would be were the polype-retractors used to draw in the orifice.

The fourth set of muscles to be described is for closing the orifice. This set is composed of two sphincters: one, fig. 2 *o*, of these, is made up of several fibres passing round the tube at the place of insertion of the inferior tube-retractors, and is of considerable breadth; the other, *p*, is formed of only two or three fibres, which encircle the same tube at the insertion of the superior tube-retractors. The action of these sphincters cannot be mistaken: they effect the closing of the orifice on the retraction

of the animal, being at the same time antagonistic to the opening tendency of the tube-retractors, which, diverging from their insertions, must, in some measure, bring the walls of the inverted tube asunder. These sphincters are not readily distinguished, but, having seen them in several individuals, I have not the slightest doubt of their existence. Deeming, however, that it would be satisfactory to see whether a similar apparatus, for closing the orifice, could be found in the marine species, I examined specimens of *Bowerbankia*, and had the satisfaction of detecting sphincter muscles in the same situations. At the point of insertion of the inferior tube-retractors—according to Dr. Farre, of the upper set of opercular muscles—the circular fibres are very distinct and numerous, forming a large portion of the inverted tube into a broad sphincter. These fibres are so conspicuous that it seems strange how they could have escaped the notice of so close and accurate an observer as Dr. Farre. It is possible enough, however, that they might be less developed in the species examined by him.* The sphincter, at the point of insertion, of the superior tube-retractors is not readily observed; but when the polype is exserted there can be no doubt of its existence.

The fifth set of muscles, Pl. V. figs. 1 & 5 *t*, *h*, is in connexion with the tunic or lining membrane of the cell, and is precisely similar to the parietal muscles described by Dr. Farre, in the marine species This set is formed of short, transverse belts, arranged in pairs, considerably apart from each other, which are to be found almost from end to end of the cell, but most conspicuously towards the lower extremity. There appears to be two sets of these fibres, one down the back, the other down the front of the cell; but I could not arrive at any satisfactory conclusion respecting

* In the species examined by Dr. Farre, and named by him *Bowerbankia densa*, the tube-retractors have a "triradiate arrangement," and, consequently, the orifice is puckered into three folds, when the polype is retracted. The species referred to, in the text, we have seen, has four such folds, the tube-retractors being divided into as many bundles. The circle of tentacles also assumes a different form in the two species: in that examined by me, the tentacles rise from the disc in a straight, slightly diverging line, and arch considerably outwards at the tips. In Dr. Farre's species they arch outwards immediately above the disc, and are very little recurved at the tips. It is therefore pretty evident that there are two species, and that *B. densa* should not be merged in *B. imbricata*, which is most probably the form that I have seen.

their arrangement, neither could I determine their exact relationship to the tunic—whether they were attached to it by their extremities only, as supposed by Dr. Farre, or connected with it throughout their entire length. Professor Allman appears to be of the latter opinion, and certainly I saw nothing in confirmation of that expressed by Dr. Farre; though I am not sure that the extremities are not attached to the cell-walls, thus giving to these muscular belts fixed points of action. Howsoever this may be, these parietal muscles undoubtedly have the power of contracting the tunic, and so lessening the space within which the polype is confined, the contained fluid is made to press on the surface of the polype, constraining it to pass upwards, and thus to effect its protrusion much in the same manner as in *Plumatella* and *Fredericella*. In these, however, there is some little difficulty, the cells being continuous; but in *Paludicella*, in which they are all separated, this act can be clearly understood. I have certainly observed in *Plumatella* and *Fredericella* the appearance of divisons here and there, forming, as it were, the cells into groups or systems, but nothing to warrant the belief that each cell is isolated. It might, therefore, be thought that protrusion of a few of the polypes would necessitate that of the others, or at least would cause an inconvenient pressure on the other members belonging to the same group.

It is difficult to arrive at a full explanation of the propulsion of the polype in these cases; but there can be no doubt that in them, as in other *Bryozoa*, the contraction of the tunic is the sole agent. Dr. Farre believed that the act of protrusion did not so much depend on the contraction of the tunic, as on the straightening of the alimentary canal, which, in the marine species and in *Paludicella* is doubled upon itself when the polype is retracted. But in *Plumatella*, *Fredericella*, and *Alcyonella*, it is always straight; in these genera, therefore, protrusion cannot in the least be assisted by the alimentary canal. Professor Allman has referred to this fact to prove the error of Dr. Farre's opinion; and, indeed, if it be allowed, and I suppose it must, that the pressure of the fluid maintains the protruded animal in its position, it is more than probable that the same power would be

sufficient to perform the act of protrusion. From the movements of the alimentary canal, it is pretty evident that it has the power of straightening itself: but when quite straight, only a portion of the tentacles would be protruded beyond the cell; and here they would remain, for it is very clear that whether straight or bent, the alimentary canal will displace the same quantity of fluid, and that there would be no increase of pressure to force the animal upwards. It is, at the moment, when the alimentary canal is being straightened that the parietal muscles come into play, and compel the animal to rise above the cell: these acts are perfectly simultaneous. The protrusion, therefore, of the polype, with a bent œsophagus and intestine is effected in the same manner as that in which these organs are straight; only that in the former it is accompanied with the straightening of the alimentary canal.

The sixth and last set of muscles to be described, is for the purpose of preventing the entire eversion of the tentacular sheath. This set, Pl. V. figs. 1 *r*, *r* & 2 *q*, *q*, is the homologue of the strong radiating muscles in *Plumatella* and *Fredericella;* but the fibres are much less numerous. In *Paludicella* they are only four in number, and take their origin from the inner surface of the cell, two in front immediately below where the tube joins the cell, and two behind in a line with the upper wall of the tube; hence the fibres are placed in front of, and behind the polype, and are inserted into opposite points of the tentacular sheath a little way below its summit, having on each side of them the two bundles of the tube-retractors. In the retracted state of the polype, these fibres are seen passing downwards towards their insertion. When the polype is protruded, these muscles cause the sheath to double upon itself, and thus retain a portion of it within the tube; but not to the same extent as in *Plumatella* and *Fredericella*. It has already been pointed out that in these genera, this set of muscles compensates for the want of the circle of setæ which surmounts the orifice in the marine species. In *Paludicella*, however, we have already seen that there is a wide, delicate, membranous cup, which rises from the inner surface of the tube, a little within the orifice. This cup is undoubtedly the homologue of the circle of setæ alluded to, but in a very rudimentary state, and probably of

little or on functional utility: consequently, these muscles are still present, though, as might be expected, not so fully developed as in those genera entirely deprived of this appendage.

We have now gone through the whole of the muscular apparatus for retraction and propulsion, and to verify the use of the various sets of muscles, we must once more observe the animal while issuing from the cell. The first symptom indicative of the polype's inclination to come forth, is the contraction of the parietal muscles, causing the tunic in certain places to leave the walls of the cell, particularly towards the lower portion; on this the polype commences to move up the cell, and at the same instant the tube-retractors relaxing the inverted lips of the orifice, begin to be evolved, and as the contraction of the parietal muscles goes on, the polype advances upwards, and more and more of the tube is turned out, in the manner of the eversion of the horn of the common snail; at length the membranous cup makes its appearance, not doubled upon itself, but in an erect position — the margin first, just as the circle of setæ is exserted in *Bowerbankia*. The cup at first is laterally compressed, having been packed longitudinally in the axis of the tube: the tips of the tentacles now emerge through the centre of this cup, and as they pass upwards, pressed together in a line side by side, its lateral folds give way, and by the time that the tentacular disc has reached the mouth of the cell, the cup is perfectly expanded. The muscles preventing the entire eversion of the tentacular sheath, may now be seen in action near the upper extremity of the tube, holding back the membranous sheath, and causing it to roll upon itself. The polype is now fairly above the mouth of the cell, and as the tentacles expand it has attained its greatest elevation; the cilia then commence to play, and all kinds of particles are hurried towards the mouth.

The retraction of the polype is instantaneous, so rapid indeed, that it is quite impossible to follow with the eye, the actions of the muscles;—such is the velocity with which this feat is performed, that from complete protrusion to invagination, nothing can be perceived but the settling of the polype upwards, after having apparently been dragged too far down the cell. It is not

difficult however to understand how the act of retraction is accomplished; the operation of the muscles will be reversed. First the parietal muscles must relax, allowing the tunic to assume its place close to the cell-walls; at the same instant the polype retractors will contract, and as the animal sinks into the cell, the superior tube-retractors will also contract; next the inferior tube-retractors will come into play; and, finally, after retraction is complete, the sphincters will close the orifice.

On comparing the muscular system of the freshwater *Bryozoa* with that of the marine forms, a great similarity is observed; some interesting modifications however are deserving of notice. The most remarkable of these are found in connection with the orifice. In *Plumatella* and *Fredericella* there is no tubular inversion on the retreat of the animal; the tunic is certainly doubled upon itself for a short distance within the orifice, but it remains permanently so. *Paludicella*, on the contrary, has the walls of the tubular orifice invaginated to a considerable extent when the polype is retracted, and when protruded nearly the whole is evolved. But *Bowerbankia* and other marine forms differ from the freshwater species, in having the mouth of the cell completely unrolled when the polype is protruded, the same having been invaginated to a great extent when it was retracted. Thus in the first and last modifications we see the extremes of variation, and consequently the most extensive alterations in the muscular arrangements of these parts. *Paludicella* being in a middle state has the muscular apparatus to some extent of both; and in this respect connects the freshwater with the marine forms.

The tube-retractors are wanting in *Plumatella* and *Fredericella*, and are present in *Paludicella* and in all the marine species, being most developed in the latter. Neither in these nor in *Paludicella*, however, is there anything like the small radiating muscles near the orifice in *Plumatella* and *Fredericella*; and the marine species, too, are destitute of the large radiating muscles in connexion with the tentacular sheath. These, though present, we have seen are less developed in *Paludicella* than in *Plumatella* and *Fredericella*, the former resembling *Bowerbankia*, in having a cup at the mouth of the cell. The polype-retractors are very

similar in all the *Bryozoa*, only those at the inferior extremity of the stomach in the marine species appear deficient in the freshwater forms. They all have, however, one or more appendages to this part, but these we shall afterwards see are most probably connected with the reproductive system. The parietal and sphincter muscles are common to both *Paludicella* and the marine forms. On the whole, then, in the muscular system as well as in the digestive apparatus, *Paludicella* shows a close relationship to *Bowerbankia* and its congeners; and is, in fact, an intermediate link between them and the other freshwater *Bryozoa*. Even the minute structure of the muscles themselves would seem to confirm this. In all, they are composed of transparent, linear fibres separated from each other and apparently homogeneous. When broken they become irregularly nodulous; but I have not succeeded in detecting transverse striæ observed by Professor Allman, probably from having used insufficient magnifying powers. The small knot-like swelling, so remarkable in the centre of the fibre of the marine species, is not to be found in either *Plumatella* or *Fredericella;* in *Paludicella*, however, I have observed it in the parietal, but in no other muscles.

Reproductive System.—In the freshwater, as in the marine *Bryozoa*, there are two methods of reproduction,—one by buds, the other by eggs. The buds always germinate from the same part of the cell, hence the definite form of the polypidom. In *Fredericella* the germ is found in connection with the inner surface of the tunic, not far below the orifice of the cell on its lower side. As the bud enlarges the wall bulges, showing externally the appearance of a new shoot. At first the bud, Pl. III. fig. 3*a*, is small and oval, and is attached for nearly its whole length; it, fig. 2 *o*, soon becomes irregular in form, with the upper portion broad and somowhat bifid, the lower extremity prolonged: the upper portion then gradually exhibits a circle of short rudimentary tentacles. fig. 4 *l;* and the lower end is seen to be divided longitudinally into œsophagus and intestine, fig. 5 *b*, *d*, continuous at their lower extremities, which still elongating, form the stomach, figs. 4 *m* & 5 *c*. To this is seen an appended filament binding it below to the wall of the cell. Imbedded in this

filament there is a large, distinct globule with nucleus and nucleolus: this we shall afterwards learn is the incipient ovum, figs 4 *o* & 5 *e*, lying in the ovary. The polype-retractors, figs. 2 *q* & 4 *n*, now make their appearance, passing from the tentacular base to the side of the cell formed apparently out of the lower portion of the original attachment of the bud; the upper portion of this attachment dilating, becomes the tentacular sheath, fig. 2 *p*, into which the tentacles are gradually insinuated as they are developed. The polype being now, as it were, sketched out within the cell of the parent, its own chamber rapidly forms, and in the course of a day or two, the muscles in connexion with the orifice being added, the fresh-born member of the community bursts from the extremity of its cell, and is ready to take upon itself the work of its own maintenance.

The development of the bud in *Plumatella* differs in no respect from that of *Fredericella;* and in *Paludicella* there is no very important deviation, except at the commencement of the process. In this the first apparent step in the growth of a new polype, is the preparation of a distinct cell for its reception. If the top of the last-formed cell be carefully examined, even before its tenant is fully grown, the lining membrane may be seen terminating in a blind sac, Pl. V. fig. 4 *b'*, a little below the extremity. Within this extremity will also be observed a membranous sac, *l;* at first the base of this sac is moulded on the convex blind termination of the lining of the old cell. The convexity however soon flattens, and the sac rapidly increases in size, the external horny covering becoming, at the same time, elongated and attenuated. After awhile, an oval, somewhat opake body, the new bud, fig. 5 *m*, germinates from the inner surface of the lining membrane, *l*. This body is attached by its side to the front wall of the cell, and resembles the young bud in *Fredericella*. A long and very delicate membranous sac, fig. 6 *d*, afterwards the tentacular sheath, is now observed to be forming in contact with and above the oval bud; whilst from the lower extremity, filaments, *e*, are seen to be produced which form the polype-retractors. From the upper end of the bud, the tentacles, fig. 4 *d*, soon make their appearance within the lower part of

the membranous sheath, *i*; at first very short, no more than the scalloped margin of the cup-formed disc; but rapidly lengthening, fig. 5 *a*, they soon advance more than half way up the sheath. The polype-retractors, figs. 4 *j* & 5 *g*, by this time are considerably developed, and the retractors, *k*, *i*, of the tube are distinctly visible; the tube, fig. 5 *j*, now begins to bulge, and the inverted margins of the orifice are seen within, united to the upper end of the tentacular sheath: the parietal muscles, *h*, also make their appearance at this time, and the stomach, *c*, intestine, *d*, œsophagus, *b*, and tentacles having all assumed their proper forms, the young animal is ready for protrusion. The buds of *Paludicella*, however, do not all originate from the extremity of the old cell; some sprout from the side, and then a slight swelling takes place on the inner surface of the tunic. The horny sheath soon afterwards begins to bulge, and an external cell being formed with its lining membrane, an oval bud makes its appearance, and development goes on as just described.

It has been long known that these animals propagate by eggs as well as buds. Raspail appears to have described the anatomy of the egg and the hatching of it, and the subsequent growth of the young polype has been minutely investigated by Sir J. G. Dalyell. But the generative organ remained unrecognized until it was pointed out by Professor Allman. The appendage to the lower extremity of the stomach, considered by Trembley to be muscular, Professor Allman believes to be an ovary: that it is so there can be no doubt, as eggs may occasionally be seen in connexion with it. Appendages of this kind exist in *Alcyonella*, *Plumatella*, *Fredericella*, and *Paludicella*, and will probably be found in all Ascidian polypes. In *Plumatella* and *Fredericella* there are however three of these appendages or filaments, Pl. IV., figs. 4 *f*, *d*, *d*, & 5 *e*, *e'*, *h*, *h*, which are all attached to the lowest part of the stomach, and passing down have their other ends attached to the wall of the cell, not far from the insertion of the polype-retractors. It is difficult to say whether all three are connected with the generative function, or whether some of them are not muscles for the retraction of the stomach. A bundle of such retractors has been described by Dr. Farre, in the marine species

attaching the inferior end of the stomach to the base of the cell; but one of them is generally thicker than the rest, and may probably be connected with the reproductive system. *Paludicella* has two such filaments; one, Pl. V., figs. 1 & 7 *n, g,* passing in the usual manner from the lower end of the stomach; the other, *m, d,* from the upper. These two filaments are inserted upon the posterior wall of the cell, one a considerable way above the other. When the polype is retracted, these insertions are found to be a little above the gastric attachments, and the filaments, fig. 2 *j k,* doubled upon themselves. These are thick, cylindrical, and apparently tubular, and do not at all resemble muscles, and indeed, from the relative position of their attachments, they seem ill adapted for retraction.

In *Plumatella* and *Fredericella,* one, Pl. IV., figs. 4 *d, d,* & 5 *e, e'*, of the filaments is generally stouter than the other two, and this has frequently an egg, *e, f,* attached to it. When the ovum is much developed, it is difficult to make out its relationship to the filament or ovary; but when quite young, it has all the appearance of originating from the interior. On one occasion, I observed two eggs in connexion with the ovary, one almost mature, the other only forming. The former, fig. 5 *f,* was attached rather below the middle of the generative organ. When the polype was protruded, this organ dragged forward the upper end of the egg; the other end of it was then seen to be attached to the wall of the cell by the continuation of the filamentous ovary *e'*. A little below the egg there was a slight oval swelling, in the interior of which was seen a nucleated cell, *g,* undoubtedly an ovum in a very early stage of development, and apparently in the interior of the ovary.* In *Fredericella,* a similar nucleated cell, Pl. III., figs. 4 *o* & 5 *e,* has been observed in the appendage to the stomach, while the polype was yet in a very rudimentary state as exhibited in the bud before alluded to. In this genus, I have likewise seen the ovum in a considerably advanced state, in which also its relationship to the ovary could not be mistaken. In this instance, the lower portion of the generative organ had dilated

* I have also seen a similar nucleated cell in the enlarged filament from the lower end of the stomach of *Bowerbankia.*

into a sort of capsule, within which the egg, Pl. III., fig. 6 *a* and Pl. IV., fig. 4 *e* was enveloped. The portion of the ovary, Pl. III., fig. 6 *c*, below it was short and thick, having the appearance of a pedicle, by which the egg was fixed to the side of the cell; above the capsule, the ovary, *c'*, was much thinner, contracting suddenly upwards. This would seem to demonstrate that the egg is developed in the interior of the ovary.

I have also seen what I take to be the ovum of *Paludicella*, but as it differs considerably from the egg of the other freshwater *Bryozoa*, we must not pronounce with certainty. This supposed egg was first observed in the cell of the dead polype; two or three occurred; they were attached to the upper portion of the interior of the cell. Afterwards one, Pl. V. fig. 7 *e*, was found in connexion with the living animal, and in this case was fixed by a delicate membranous sac, *f*, to the side of the cell, at the point of attachment of the filament coming from the upper end of the stomach, the base of the filament being apparently surrounded by the sac. This filament then, in *Palucidella*, is probably an ovary; and if so, the egg must pass in a very early stage from it, into the membranous sac at its base, and there be matured. And, judging from analogy, the other filament is also probably connected with generation.

In *Plumatella* and *Fredericella* however there can be no doubt of the ovarian character of one of the filaments attached to the stomach; but the nature of the other two, Pl. IV., figs. 4 *f* & 5 *h*, *h*, is not so easily determined. They certainly do not look altogether unlike muscular fibres; but from their attachments close to that of the ovary, and from their resemblance to it, they are most probably connected with the generative function. It may be that each filament is a separate ovary, and that one or two of them is the male organ. These polypes are most probably hermaphrodites—at least, in all the specimens of *Plumatella Allmani* that I have examined, there was scarcely a cell that did not contain one egg or more. It may therefore be presumed that each individual is provided with male and female organs. Dr. Farre discovered moving bodies in the visceral cavity of *Valkeria* and some other of the marine forms, and described them as re-

sembling *Cercariæ*. I have detected similar bodies in *Bowerbankia* with large rounded heads and long tails; they were very numerous, and moved rapidly about in the interior of the cell in the manner of tadpoles, that is, with a lateral undulating motion, and are assuredly *Spermatozoa*. A testis may then be expected to exist in the freshwater *Bryozoa* coextensively developed with the ovary, and from analogy to be associated with it. It is not unlikely therefore that these additional filaments from the stomach, may be really the male organ.

Each polype does not appear to produce more than two or three eggs; in *Plumatella* frequently only one. In *P. Allmani* they, Pl. IV., fig. 5 *f*, are considerably depressed, of an oval form, sometimes very long with the sides almost parallel; they are very large, being sometimes almost as wide as the diameter of the cell, within which they are placed lengthwise; the margins are reticulated, yellow, pellucid, thin, and sharp, forming a well-defined rim about the central portion, which is opake and black; the covering is smooth, tough, and membranous. In *Fredericella*, the egg is broader and more regularly oval, of a brownish colour with the margin narrow, plain and of a paler hue. The egg, Pl. V., fig. 7 *e*, of *Paludicella*, if egg it be, differs considerably from the above. It is of an irregular oval shape, about half as wide as the cell, colourless and pellucid; the surface is marked with a few indistinct, irregular, nucleated cells; one larger and much more conspicuous than the rest, with a distinct round nucleus in the centre, is always to be seen on one side. The circumference of the egg exhibits a double margin indicating an enveloping shield.

The great size of the egg forbids the possibility of its escape without the destruction of the polype.* In *Plumatella*, the ova

* The polype of the marine species must also perish on the escape of the gemmule. On examining some specimens of *Bowerbankia* in August, almost every cell was found to contain a large, round, opake, bright yellow corpuscle. These corpuscles were, for the most part, in the lower portion of the cells; some however were half-way up, and others not far from the top: those lowest down were the smallest, and as they approached the top they increased in size until their diameter was nearly equal to that of the cell. As long as the corpuscle remained near the lower extremity of the cell, the polype was alive and active; but was invariably dead when it had advanced far upwards. At first the corpuscle does not appear to have any envelope, but as it increases in size a distinct margin makes its appearance, which afterwards becoming wider and perfectly transparent, the corpuscle can be seen rotating within, by the aid of

or maturity become attached to that side of the cell which is connected with the substance sustaining the polypidom. And here they remain fixed, indicating the track of the various branches of the Bryozoon long after its decay and disappearance in autumn. The free branches however must scatter their eggs. Most likely in *Fredericella*, too, they are dispersed, and borne away by the currents on the destruction of the polypidom, which is very freely branched; and in no instance have I seen its eggs left adhering to the surface of its attachment.

Having now gone through the details of the anatomy and development of the freshwater *Bryozoa* so far as I have been able to study them during a very short but laborious investigation of the subject, it is quite evident that these animals are as highly organized as the marine Ascidian polypes. *Plumatella* and *Fredericella* certainly show some interesting deviations from that type; but in *Paludicella*, we perceive an almost complete resemblance to it; proving the close affinity that exists, and the propriety of uniting the whole into one group. The approximation of this genus to the marine forms is evinced not only by the muscular system, but likewise by the digestive apparatus; and by the bright, pellucid, horny character of the external polypidom. It is also equally evident that the organization of this group is very much above that of the typical *Radiata*. This Professor Allman has already clearly demonstrated; and yet perhaps we ought to hesitate before removing the *Bryozoa* into the subkingdom *Mollusca*, as proposed by this naturalist.

The immediate relationship of these animals to the *Ascidiæ* is too obvious to be called in question,—a relationship which has long been acknowledged, though the homology of the parts does not appear to be correctly understood; at least it will bear ano-

the long cilia that clothe its surface. While watching one in this state under the microscope, I observed it gradually elongate itself and pass with a slow gliding motion to the top of the cell; then forcing its way through the previously closed orifice, and passing into the surrounding fluid, commenced to rotate with extraordinary velocity: in an instant after this its enveloping membrane was torn open and cast aside, and the little being, a broadly ovate gemmule, dashed at once beyond the field of view. It afterwards kept moving about in various directions, and evinced great activity, cilia densely clothing it from end to end. The cell, after the escape of the gemmule, continued gaping; and the polype, which before was indistinctly visible, had now quite disappeared, nothing but slight traces of the retractor muscles remaining.

ther interpretation, which I am inclined to look upon as the true one. Dr. Farre observes in his paper, that "in *Tunicata* the tentacles are reduced to mere rudiments at the entrance of the respiratory sac, and the cilia are distributed over the surface of this cavity, which is in proportion magnified, and is analogous to the pharynx of *Ciliobrachiata*. The more immediate entrance to the alimentary canal, thence called mouth, being situated at the bottom of this sac, corresponds with the part that I have called cardia."

This view of the relationship of the parts has, with some modifications, been generally followed by subsequent writers. In all the Ascidians however, there is a well-defined œsophagus, which in *Clavelina* is frequently of great length. Why then should the entrance to it be considered to correspond to the cardia in *Brgozoa*? These, as well as the *Ascidiæ*, have a well-marked stomach with cardiac and pyloric orifices; in both, too, there is a distinct œsophagus; then should not the orifice leading to it be assumed to be the mouth, or analogous to the mouth in both? In the polype a series of respiratory tentacles, in the *Ascidiæ* the branchial sac, surrounds this mouth; should not these then be considered homologous? The affirmative of this would appear to be the natural inference in the first instance. But we are referred to the tentacular filaments, at the entrance of the respiratory sac, as the true representatives of the tentacles of the polype. With the view to ascertain how far this is correct, I examined, with much care, *Ascidia sordida* and *Molgula arenosa*, and found that these tentacular filaments are not anatomically connected with the branchial sac, but are developments from the tunic. The sac terminates a little way below these filaments, and they fringe the inner circumference of the belt of sphincter muscles which guard the respiratory orifice. These tentacular filaments, then, originating in the tunic, cannot possibly be the homologue of the tentacles of the polype, as these undoubtedly belong to the alimentary canal; but are in fact a new development in connection with the sphincter of the tunic, and share its function. The tentacles then of the polype and the branchial sac of the Ascidian would appear to be homologous;—unless

indeed the tentacles of the one have died out, and the branchial sac of the other is altogether a new development, which is not by any means likely.

In confirmation that the former is the fact, we have only to look at the growing bud of the polype. which so closely resembles an Ascidian, particularly when young, that it might at first sight be taken to be one. The tentacles at this time, all lying parallel to each other within the membranous sheath, have quite the appearance of a branchial sac; and when we take in connexion with it the alimentary canal, the resemblance is almost complete. Indeed, all that is wanting to turn the polype into an Ascidian, so far as the alimentary and respiratory organs are concerned, is the union of the tentacles by a vascular membrane. And we have already seen that such an union has commenced in *Fredericella, Plumatella,* and *Alcyonella.* We have seen that in all these genera the tentacles are united at the base by a delicate membrane; and in the former this membrane is so extensive as to suggest the idea of a rudimentary form of the branchial sac of the *Tunicata.*

Taking this view of the homology of the parts, the longitudinal laminæ in the interior of the branchial sac of the *Ascidiæ* will represent the tentacles of the *Bryozoa;* and the membrane at the base of the tentacles, being external, corresponds exactly in position to the vascular membrane of the *Ascidiæ,* which is also external to the laminæ. The position of the nervous ganglion in the two forms might at first sight appear to favour the contrary opinion; but, on closer inquiry, it is evident that the ganglion of the *Bryozoa* is not homologous with that of the *Ascidiæ:* in the former it is a cerebral ganglion resting on the œsophagus immediately behind the mouth; in the latter, if it has relationship to any of the nervous centres of the *Mollusca,* it is apparently analogous to the branchial ganglion of the *Lamellibranchiata;* but its position in the mantle is anomalous.

We thus see how very intimate is the connexion between the *Bryozoa* and the *Ascidiæ;* and as the latter are generally supposed to be as closely connected with the *Lamellibranchiata,* no great distance would appear to divide them from the former.

They are not, however, so closely related as might be supposed. At first sight, an Ascidian undoubtedly seems very closely to approximate to a bivalve, shell; but this similarity, on careful investigation, would appear to be more that of analogy than homology—a mere resemblance rather than a true relationship. The branchial sac of the Ascidian is frequently assumed to be the same organ as the gill-plates of the *Lamellibranchiata* somewhat modified;—in function there is no difference; but anatomically they are distinct. The former is a development from the alimentary canal; the latter, according to Professor Owen, "are essentially internal folds of the pallial membrane." The breathing organs then of these animals are not homologous. To turn therefore an Ascidian into a Lamellibranchiate mollusk, a new branchial organ must be developed. The vascular system, too, if not anatomically different in the Ascidian, is in a remarkable manner functionally so. In this the heart is at once systemic and pulmonic. And it is worthy of remark, that thus, on the first appearance of the vascular apparatus in this type of animals, it should shadow forth the peculiarities of both the molluscan and the piscine heart; and this, too, in connexion with a pharyngeal gill. The test or outer sac, and the inner sac or tunic of the *Tunicata* are not related to each other in the same manner as the shell and mantle of the mollusk. In this the shell is extra-vascular, and is secreted by the mantle; in the former the test is vascular, and its growth is therefore not dependent on that of the inner sac or tunic. The reproductive system of the *Lamellibranchiata* is likewise very different from that of the *Tunicata*. In these it is formed on the type of the *Radiata;* another and very striking proof of the relationship that exists between the former and the *Bryozoa*. These, and other points of difference, led Professor Milne-Edwards, in his valuable memoir on the 'Ascidiens Composées,' to propose the separation of the *Tunicata* from the *Mollusca*, and the formation of them into a distinct group to be placed between the bivalves and the polypes.

We then cannot find a passage from the *Bryozoa* through the *Ascidiæ* into the *Lamellibranchiata*. There are however two distinct branches of the Ascidian polypes,—one with the tentacles

arranged in a circle about the mouth,—the other having them supported on two lateral oral arms. The former of these branches passes into the Ascidian,—the latter, I shall endeavour to show is connected with the *Brachiopoda*.

This connexion is at once suggested by the resemblance that exists between the oral arms of *Plumatella* and *Alcyonella* and the characteristic brachial organs in the *Brachiopoda*, particularly of those in *Lingula*. In both the *Brachiopoda* and the *Bryozoa*, the arms rise from the sides of the mouth in the same manner, the bases of the arms being confluent; and the tentacles or cirrhi forming a continuous series. In both the arms are hollow, and the tentacles and cirrhi are tough and non-contractile; and in both they are prehensile organs after the same fashion. The digestive organs of both are very similar; and the whole of the *Brachiopoda* are fixed, and so are the *Bryozoa*, with but one exception.

But what is still more remarkable, the muscular systems of both are arranged much in the same manner, particularly as respects *Terebratula* and *Paludicella* with most of its marine congeners. In *Terebratula*, as the animal is fixed within the shell, of course there can be nothing resembling the polype retractors; but the shell muscles of *Terebratula* will be found to work exactly on the same principle as those provided to draw in the margins of the cell-orifice in *Paludicella* and *Bowerbankia*, and called by Dr. Farre, opercular muscles.

There are four sets of muscles in connexion with the shell in *Terebratula chilensis* as dissected by Owen, two from each valve; and they all pass diagonally downwards, and with one exception go to be inserted in the pedicle; so that when they contract the valves will be closed. These muscles then have in fact their origin in the pedicle, as stated by Owen, and acting from thence upon the moveable points of their insertions, operate precisely in the same way as the tube-retractors of the polypes last mentioned do on the lips of the orifice. The action is the same in both; and were the cell-walls of *Bowerbankia*, for instance, calcified and divided longitudinally into two portions or valves, they would be made to close just as the valves do in *Terebratula*.

The set of muscles alluded to, as not passing into the pedicle comes from the perforate valve, and, inclining downwards, is attached by the other end, to the base of the imperforate valve binding the parts of the hinge-joint together—a substitute in fact, for a ligament. In some species, this set assumes in part, the function of an adductor muscle.

We have then evidently some reason for supposing that the *Brachiopoda*, as well as the *Ascidiæ*, are related to the *Bryozoa;* and it is in this way that these latter are connected with the *Lamellibranchiata*. After a careful examination of the *Brachiopoda*, it is impossible to doubt the connexion that exists between the two great divisions of the testaceous *Acephala*. Indeed this is evident, whether we look to the digestive organs, the vascular system, or to the reproductive apparatus. It is in these animals, too, that the respiratory organ is first found in connexion with the mantle, in *Terebratula*, quite rudimentary, in *Lingula*, to some extent specialized. On comparing *Anomia* with *Orbicula*, this relationship is best seen. In both, the mantle is completely separated, and in both it is connected with the ovary; the large oral palpi of the one form the homologue of the branchial organs of the other; and we see this relationship in the deficiency of pedal organ in *Anomia*, and in the extensive union that still subsists between its breathing apparatus and the mantle: the perforation of the under-valve of both is also remarkable; but not more so than that the great muscle of both should be divided, part forming the adductor, part the adhesive disc.

We have now endeavoured to trace the affinities of both branches of *Bryozoa;* one appears to pass at once into the *Ascidiæ*, which, how closely soever related analogically to the *Lamellibranchiata*, are nevertheless removed far from them, by the nature of their vascular, respiratory, and re-productive systems. In the *Mollusca*, the heart is always systemic, and the gill is universally an appendage to the mantle. In the *Ascidiæ*, the heart is as much pulmonic as systemic, and the breathing apparatus is a development from the alimentary canal—is in fact pharyngeal. In these respects the Ascidian deviates from the Molluscan type, and approximates to that of the lower *Vertebrata*,—the fishes, in

which the heart is pulmonic, and the breathing organ pharyngeal. The reality of this relationship is revealed by the anatomy of the Lancelet, so ably described by Professor John Goodsir, who has pointed out the resemblance of its respiratory system to that of the *Tunicata*. Indeed the branchial sac and vascular apparatus of this curious fish almost completely resemble those organs in the Ascidian.

The other branch of the *Bryozoa*, comprising those with oral arms, passes into the *Brachiopoda*; or, at least, this is rendered more than probable by the resemblance of the brachial organs of the latter to the arms of the former, and by the similarity of the muscular arrangement. Thus the *Bryozoa* become related to the *Lamellibranchiata*, which are apparently closely related to the *Brachiopoda*. We may conclude, then, if we have arrived at a right understanding of the affinities of these animals, that both the *Mollusca* and *Vertebrata* are connected with the *Bryozoa*. It would be well, therefore, to pause before including the *Bryozoa* in the *Mollusca*, and consider the propriety of uniting the former with the *Tunicata*, and perhaps with some of the higher forms of *Rotifera*, into a group to be placed at the head of the *Radiata*.

DESCRIPTIONS OF NEW SPECIES.

Plumatella punctata. Pl. VI. figs. 6 & 7, and Pl. IV. fig. 1.

Polypidom adhering throughout, coriaceous, pellucid, of a pale watery green colour, irregularly but not much branched, seldom extending more than half an inch; branches composed of a series of large, conical cells tapering upwards towards the aperture, sometimes considerably and rather suddenly dilated at the base; resembling in form some of the Ascidians; the upper portion of the cell almost colourless and freckled with minute opake white spots, most crowded towards the orifice. Tentacles white, not more than sixty in number; membrane, at their origin, rather wide, scalloped, the points of the scallop extending for some distance up the back of the tentacles, in the form of broadish laminæ arched outwards. Œsophagus and stomach appearing through

the transparent walls of the cell, of a pale yellow colour. Egg perfectly black, large, broad, and oval.

Upwards of a dozen specimens of this fine species occurred in Bromley Lough, adhering to the underside of stones; it was likewise taken in Crag Lough. None of the individuals much exceeded in size, that represented in the figure, nor did they vary in any remarkable manner either in form or colour. It is not, however, without hesitation that I have ventured to characterize this as a new species, as Professor Allman informs me that it may perhaps turn out to be *P. repens;* but that form is stated to be large and of luxuriant growth, and to have the polypidom tubular with the cells dilated at the orifice—characters which do not at all agree with *P. punctata.* Indeed it can scarcely be considered a true *Plumatella.*

P. Allmani. Pl. VI. figs. 3, 4, & 5, and Pl. IV. figs. 2 & 3.

Polypidom attached to the underside of stones, adhering throughout, membranous, opake, yellowish brown, slightly branched, extending in patches sometimes three or four inches wide, the patches being made up of several polypidoms; the branches composed apparently of a series of tubular cells, tapering to their origin, and attached for more than half their length; the enlarged extremity being free and bending upwards, inclines a little to one side, and is occasionally bifid, forming two cells; an obtuse ridge or keel extends the entire length of the cell, increasing imperceptibly in thickness upwards; orifice somewhat constricted, the walls immediately below being pellucid, and suddenly dilating become abruptly opake, and thickly covered for some distance downwards, with agglutinated sand. Tentacles forty-two in number, slightly tinged with yellow, the colour best seen when they are formed into a compact bundle; membrane at their base distinct, scalloped, the points being prolonged a little up the tentacles. Egg black, long, oval; sides nearly parallel; margins pellucid, yellow, sharp, broad, and reticulated.

This species was procured rather abundantly in Bromley Lough, and does not appear to vary much. At first sight large patches of it have the appearance of being formed of a single polypidom;

but, on close examination, are found to be composed of many, and rarely to number more than six or eight cells in each. The commencement of each polypidom has the black envelope of the originating egg adherent.

Two or three specimens of a more branched form of carinated *Plumatella*, were taken in Bromley Lough, which may probably prove a distinct species; more individuals, however, are necessary before it can be characterized.

Paludicella procumbens. Pl. VI. figs. 1 & 2, and Pl. V.

Polypidom membranous, subhorny, pellucid, smooth and glossy, of a brownish horn-colour, much and irregularly branched, forming large patches on the underside of stones, for the most part adhering, with rather numerous, short, free, almost simple branches; the branches composed of a single series of narrow cells arranged longitudinally, contracting towards the base and widening upwards; aperture lateral, near to the upper extremity of the cell, forming a rather long and somewhat constricted tube inclining upwards; margin entire, surmounted by a widish, delicate, hyaline, membranous cup. Tentacles sixteen in number, arranged in a complete circle, and when spread out forming a very exact inverted cone.

This, the second species of the genus, resembles very closely *P. articulata* of Allman, but that form appears to have about twenty-six tentacles, and is likewise more densely and luxuriantly branched; the cells, too, are larger and of a different colour.

The *P. procumbens* occurred in both Bromley and Crag Loughs, but most abundantly in the latter, where it spreads over the under surface of stones in patches of 5 or 6 inches diameter.

EXPLANATION OF PLATES III., IV., V., AND VI.

PLATE III.

Fig. 1.—Upper portion of *Fredericella sultana* seen as a transparent object very much magnified: *a*, tentacular disc; *b*, tentacles; *c'*, membrane at base of ditto; *c*, flounced margin of ditto; *d*, mouth; *e*, oral valve; *f*, œsophagus; *g*, projecting lips of cardiac orifice; *h*, stomach; *i*, intestine; *j*, anus; *k*, nervous ganglion giving off

nerves; *l*, tentacular sheath doubled upon itself; *m*, strong radiating muscles for preventing complete inversion of ditto; *n*, delicate radiating muscles in connexion with the orifice of cell; *o*, outer wall of cell; *p*, inner wall or tunic; *q*. inverted lips of orifice; *r*, the point where the same unite to the tentacular sheath, immediately below which is the sphincter for closing the cell.

Fig. 2.—Retracted polype of *Plumatella Allmani* seen by transmitted light and much magnified: *a*, bundle of tentacles enveloped in membranous sheath; *a'*, tentacular disc; *b*, œsophagus; *c*, projecting lips of cardiac opening; *d*, stomach; *e*, intestine; *f*, anus; *g g*, muscles for retracting the polype; *h*, large radiating muscles for preventing complete inversion of tentacular sheath; *i*, delicate radiating muscles in connexion with the orifice of cell; *j*, outer wall of cell; *k*, inner membrane or tunic; *l*, inverted margin or lips of orifice; *m*, tentacular sheath; *n*, sphincter contraction of ditto; *o*, bud in second stage of development; *p*, tentacular sheath of ditto forming; *q*, retractor muscles in an incipient state.

Fig. 3.—Upper portion of the cell of *Plumatella Allmani* much enlarged: *a*, bud in first stage of development attached to the inner surface of lining membrane of cell.

Fig. 4.—Cell with exserted polype of *Fredericella sultana* much enlarged and seen as a transparent object: *a*, tentacular disc; *b*, oral valve; *c*, œsophagus; *d*, stomach; *e*, intestine; *f*, the two bundles of polype retractors; *g*, two fibres of same for rotating tentacular disc; *h*, egg in connexion with ovary, attaching it to lower end of stomach and wall of cell; *h'*, appendage to the lower end of stomach, probably generative; *i i*, outer wall of cell; *j j*, lining membrane or tunic; *k*, bud in third stage of development; *l*, tentacles of ditto as they at first appear; *m*, stomach of ditto; *n*, retractor muscles of ditto; *o*, nucleated cell—the incipient egg in connexion with the ovary.

Fig. 5.—Bud in third stage of development more highly magnified: *a*, tentacular disc; *b*, œsophagus; *c*, stomach; *d*, intestine; *e*, incipient egg in enlarged portion of ovary; *f*, wall of cell.

Fig. 6.—Egg and ovary much enlarged of *Fredericella sultana*: *a*, egg imbedded in ovary; *b*, wall of cell to which lower end, *c*, of ovary is attached; *c'*, upper portion of ovary leading to stomach.

Plate IV.

Fig. 1.—Side view of exserted tentacular apparatus much enlarged of *Plumatella punctata*: *a*, œsophagus; *b*, oral valve; *c*, tentacular or oral arms; *d*, tentacles; *e*, membrane at base of ditto; *f*, laminæ at back of ditto.

Fig. 2.—Enlarged view of underside of tentacular apparatus of *Plumatella Allmani*: *a*, margin of orifice of cell; *b*, intestine; *c*, œsophagus; *d*, oral valve; *e e*, oral arms; *f*, membrane at base of tentacles.

Fig. 3.—Enlarged view of the upper side of tentacular apparatus of *Plumatella Allmani*: *a*, mouth; *b*, oral valve; *c c*, oral arms; *d*, membrane at base of tentacles.

Fig. 4.—Much-enlarged view of the reproductive organs of *Fredericella sultana*: *a a*, outer wall of cell; *b b*, lining membrane or tunic; *c*, lower portion of stomach; *d d*, ovary; *e*, egg imbedded in same; *f*, two filaments attached to the lower end of stomach, probably connected with the reproductive system; *g*, retractor muscles.

Fig. 5.—Enlarged view of a cell of *Plumatella Allmani* exhibiting reproductive organs: *a*, base of oral arms; *b*, œsophagus; *c*, stomach; *d*, intestine; *e e'*, ovary; *f*, egg nearly mature, still attached to ditto; *g*, an egg just forming likewise attached to ovary; *h h*, two filaments attached to the stomach, probably connected with the reproductive system; *i i*, the two bundles of retractor muscles; *j*, outer wall of cell; *k*, lining membrane or tunic.

Plate V.

Fig. 1.—Enlarged view of a cell of *Paludicella procumbens* seen as a transparent object, the polype being exserted: *a a*, outer wall of cell; *b b b*, lining membrane or tunic; *c*, tubular orifice; *d*, membranous cup surmounting ditto; *e*, tentacular disc; *f*, tentacles; *g*, pharyngeal swelling; *h*, œsophagus; *i*, stomach; *j*, intestine; *k*, enlargement at commencement of ditto; *l*, anus; *m*, supposed ovary; *n*, filament attached to the lower extremity of stomach, probably connected with the reproductive system; *o*, polype retractor muscles; *p p*, inferior tube-retractors; *q*, two fibres of superior tube-retractors; *r r*, muscles to prevent the complete inversion of tentacular sheath; *s*, tentacular sheath doubled upon itself; *t*, parietal muscles; *u*, end walls of two cells abutting against each other.

Fig. 2.—Enlarged view of a single cell of *P. procumbens* with polype retracted: *a*, outer wall of cell; *b*, lining membrane of ditto; *c*, retracted tubular orifice; *d*, tentacles; *d' d'*, tentacular sheath; *e*, œsophagus; *f*, cardiac orifice; *g*, stomach; *h*, intestine; *i*, enlarged portion of ditto; *j*, supposed ovary doubled upon itself; *k*, filament attached to lower end of stomach, probably connected with reproductive system; *l l*, polype retractor muscles; *m m*, inferior tube-retractors; *n n*, superior tube-retractors; *o*, sphincter muscles for closing orifice; *p*, ditto ditto; *q q*, muscles to prevent complete inversion of tentacular sheath; *r*, end wall of cell formed by the tunic exhibiting enlargement in the centre.

Fig. 3.—End of retracted tube of *P. procumbens* exhibiting the manner in which it folds in.

Fig. 4.—Termination of a branch of *P. procumbens* comprising two cells in different stages of development: *a*, outer wall of cell in fourth stage of development; *b*, lining membrane of ditto; *b'*, blind termination of ditto ditto; *c*, place of future orifice; *d*, tentacles of polype in state of development; *e*, œsophagus; *f*, stomach; *g*, intestine; *h*, lower productive organ; *i*, tentacular sheath; *j*, polype retractor muscles; *k*, tube-retractors; *l*, new cell in first or earliest stage of development, exhibiting lining membrane and external wall; *m*, nucleated cells in lining membrane.

Fig. 5.—Two terminal cells of *P. procumbens* containing buds in different stages of development: *a*, tentacles of bud far advanced or in fifth stage of development; *a'*, tentacular sheath; *b*, œsophagus; *c*, stomach; *d*, intestine; *e*, anus; *f*, lower reproductive organ; *g*, polype-retractors; *h*, parietal muscles; *i*, tube-retractors; *j*, tube just forming; *k*, outer wall of last-formed cell exhibiting bud in second stage of development; *l*, lining membrane of ditto; *m*, bud as it appears at first.

Fig. 6.—Terminal cell exhibiting bud in third stage of development: *a*, outer wall of cell; *b*, lining membrane; *c*, bud; *d*, tentacular sheath; *e*, polype-retractors just making their appearance.

Fig. 7.—Enlarged view of a portion of the polype of *P. procumbens* exhibiting reproductive system: *a*, œsophagus; *b*, stomach; *c*, intestine; *d*, supposed ovary with the egg, *e*, attached; *f*, membranous envelope of the egg; *g*, lower filament supposed to be connected with the reproductive system.

PLATE VI.

Fig. 1.—Polypidom of *Paludicella procumbens* slightly enlarged.

Fig. 2.—A portion of ditto much enlarged, exhibiting two or three series of cells.

Fig. 3.—A patch of *Plumatella Allmani* magnified two times, comprising several polypidoms.

Fig. 4.—Two or three polypidoms of ditto more highly magnified, exhibiting the polypes exserted and the envelope of the originating egg *a a*.

Fig. 5.—A single cell of same still more highly magnified: *a*, keel or ridge on the upper surface of cell.

Fig. 6.—*Plumatella punctata* five or six times magnified, exhibiting polypes exserted: *a*, envelope of originating egg.

Fig. 7.—Three cells of ditto more highly magnified and more produced than usual, with the polypes exserted.

XVIII.—*Notes on a species of Hydra found in the Northumberland Lakes.* By ALBANY HANCOCK, Esq.

[Read Wednesday, December 12th, 1849.]

ON visiting the Northumberland lakes, last August, for the purpose of prosecuting my inquiries respecting the freshwater Ascidian Polypes, I took a very beautiful *Hydra*, abundantly in Bromley Lough. On a subsequent occasion, numerous specimens of the same species were also obtained in Crag Lough. They were found associated with the various *Bryozoa* that inhabit these waters, adhering to the under side of stones which lie scattered by their margins, and in situations where there was neither mud nor vegetation. From the peculiar character of the locality, so different from that of the usual habitat of the *Hydræ*, I was induced to examine the specimens with great care, and find that

they do not exactly agree with any of the known forms, though they come very near to *H. fusca*, of which they may probably prove to be a variety.

On removing from the water, a stone to which these *Hydræ* are attached, they appear as irregular, minute depressed globules of gelatine, of a pale red flesh-colour, dispersed over the surface, sometimes in great numbers on one stone, but never crowded on each other. When placed in a bottle of water, they soon become fixed to its sides, and spreading out their tentacles, display themseves to great advantage. They are now seen to be very variable in form, Pl. VII. figs. 3, 4,—or rather that they have great command over it, contracting themselves until they are almost globular or vase-like, with the tentacles very short and swelled out in the centre; then extending themselves, they become linear, much attenuated, and frequently half an inch long,—the tentacles, fig. 5, being very delicate, and tapering imperceptibly towards the extremity, which is enlarged and rounded, forming a nodule or bulb of no great size, but quite visible to the naked eye. The polype, however, is usually much less extended, and is generally a little bulged in the centre; the tentacles are then somewhat longer than the body, but are shorter than it when the animal is fully stretched out. There are usually six tentacles, occasionally five, rarely seven; they are white, never coloured in the centre like the body, which, as already stated, is a red flesh-colour; it is also sometimes yellowish. The colouring, which is apparently much affected by exposure to light, depends on the granules that line the internal or digestive cavity, and is most intense near the mouth.

When in their native haunts, attached to the under side of stones, the *Hydræ* must be nearly in total darkness; but on being placed in a bottle, they become exposed to the solar rays, and in the course of a few days, are almost completely bleached. Supposing that this loss of colour was occasioned by the want of food, the specimens were supplied with animalcules; but their original hue was not in the least restored.

During the first week or ten days, the captives added greatly to their numbers, by gemmation, the buds sprouting from the

lower portion of the body,—rarely more than one at a time. Afterwards the budding was much less frequent; and in about a month from the time they were taken, most of the specimens had perished. Two or three, figs. 1 & 2, more favourably placed than the rest, continued to live on for some time longer, and thrived well; but they changed considerably in appearance. A short way below the tentacles, two tubercles, *a*, *a*, had developed themselves opposite to each other, and were in every respect symmetrical; and the body was considerably enlarged towards the lower extremity. In this state the animal had a pedunculate appearance, and I was quite at a loss to account for the change. These specimens belonged to the first batch procured in Bromley Lough. On visiting the lakes again, however, in September, and getting a fresh supply, nearly all the individuals exhibited the same appearances; the tubercles being invariably a little below the tentacles, though not always symetrically placed; and occasionally they were three and even four in number: the swelling, too, on the lower part of the body, varied in different specimens.

On placing one of them under the miscroscope, the tubercle, Pl. VIII. fig. 5, was found to be vesicular, of a conical form, with the apex obtuse, and to resemble in texture the general surface of the animal: the basal portion contained an opake, rosy, granular body, *a*, of a glandular appearance, which completely filled the base of the tubercle: the apex, *b*, was pellucid, and on being attentively examined, a crowd of very minute moving bodies were observed within it.

Whilst watching, with great earnestness, the motion of these mysterious bodies, all of a sudden the apex of the tubercle burst, and a great number of them, cloud-like, rushing into the surrounding fluid, dispersed in all directions. The rupture appeared to close again, and the apex was seen to be almost empty; but fresh bodies making their appearance, the receptacle was soon as full as ever. I have seen the eruption of these corpuscles on several occasions, and have no doubt that it is a natural phænomenon;—not resulting from any artificial means,—certainly not from pressure, as the animals were always quite free. On examining these moving bodies, which are exceedingly minute,

with $\frac{1}{8}$th of an inch object-glass, they were found to be of an elliptical form, and to resemble spermatozoa; tails, however, were not detected, though with a higher power, it is not improbable that they may be found; for I could not satisfy myself of their non-existence.

The nature of these tubercles or sacs, is a matter of much interest. They were discovered by Ehrenberg, and described by him as the male organ,—the moving bodies being considered spermatozoa. Though I have not seen the original memoir on the subject. I think there can be little doubt of the accuracy of this opinion, How else can we account for the constancy of the appearance of these sacs? for their development at the time the eggs are being produced, as we shall afterwards see is the case?—for their being situated always on the same part of the animal?—for the contained gland-like body, and moving corpuscles?—for the eruption of these latter bodies, and for their resemblance to spermatozoa.?

Having thus detected what I believed to be the male generative organ, I was anxious to watch the development of the egg, which appears to have been already described more than once; but as it has rarely been observed by British naturalists, I will venture to give my own remarks on the subject. The lower portion of the body, as before stated, is enlarged at the time when the male organ makes its appearance. On examining the enlargement, Pl. VII. figs. 1 & 2 *b*, *b*, carefully, it is found to be usually greater on one side than the other; here it is opake and of a pale rosy hue, notwithstanding that the animal is faded under the effect of light. The opake swelling extends nearly round the body, the margins being generally distinct. This is the nascent ovum, as it appears at first; it gradually increases in size, Pl. VIII. fig. 1 *d*, and ultimately becomes very protuberant, bulging the body excessively on one side: the egg, at this time, is confounded with its covering; but it, *d*, is soon seen as a rounded, somewhat flattened body, contained within a transparent envelope, *e*, resembling the general surface of the body, of which it is apparently a continuation. This envelope, fig. 2 *b*, *b*, shortly opens at the highest point of the swelling, and the egg, *a*, gradually makes its way through the orifice, which as gradually enlarges until the egg,

figs. 3 *b*, & 4 *e*, is completely exposed, and rests, as it were within the mouth of a shallow cup, figs. 3 *e*, *e*, & 4 *g*, the contracted envelope. The egg remains in this position for a day, and sometimes longer, attached to the body of the parent by a short, thin pedicle, figs. 3 *d* & 4 *f*: the margins, at first, are generally undulated, as in fig 4; afterwards the egg becomes almost completely globular. It is ultimately detached, and soon fixes itself to some foreign body. On watching one individual through the microscope, the egg was observed to separate from the parent, and to move slowly away. No ciliary action could be detected to account for the motion; but it assuredly passed out of the field of view as often as the instrument was adjusted: in another instance, however, no motion could be observed. The egg, Pl. VII. fig. 6, in the course of an hour or so, became stationary, and several minute globules, *a*, *a*, *a*, which had been noticed sticking to it from the first, Pl. VIII. fig. 3 *c*, *c*, enlarged, and others made their appearance: they soon assumed the character of delicate cells, Pl. VII. fig. 7, filled with globular bodies, with dark margins. These globules are probably composed of some tenacious mucus with which to glue the egg to any substance on which it may happen to settle. Soon after attachment, these bodies disappear, and the egg, which is now perfectly circular, is seen to be surrounded by a narrow, transparent rim, indicating the presence of a distinct chorion; the under side of the egg being flattened, the upper side convex, opake, and rosy as at first.

I have not been able to determine, with precision, how many eggs are produced by each polype, but certainly no great number, probably not more than three or four, and in some instances perhaps only one. On one occasion, after the egg separated from the animal, the latter gradually dwindled in size, and ultimately disappeared. Most frequently, however, the polype is not materially altered on giving birth to an egg; and occasionally two, Pl. VIII. fig. 1 *d*, *d*, are in process of development at the same time, generally from opposite sides, one being more advanced than the other.

The male organ is only developed at the time the eggs make their appearance. In August, shortly after the polypes were pro-

cured, they multiplied rapidly, as we have seen, by gemmation, and at this period none of the sacs containing spermatozoa were observed. It was not until they had ceased to propagate in this way, some time in September, that the male organ was developed, and it was always visible afterwards, though variable in size.

All the individuals apparently produce eggs, and all are alike provided with the spermatic sacs; at least the ovum, in various stages of development, and the male organ are seen at the same time, in most specimens; it is not uncommon, however, to observe the male organ only, the egg probably having just left the body of the parent, though I do not recollect having seen the egg in process of development in individuals unprovided with the sperm-vesicles.

It is worthy of remark, that the buds sprout from the same part of the body in which the eggs are developed; but I have seen nothing to warrant the assertion, that the ova, after impregnation, "sometimes are retained, and then grow out like buds." Indeed it is probable that fecundation does not take place until the egg bursts through the integument, and is attached to the parent only by a delicate pedicle. This would appear more likely than that impregnation should be effected through the skin of the animal. Whilst watching an individual, when the egg was about to separate from the parent, the sperm-vesicle was frequently brought, by the contractions of the body, almost in contact with the ovum; thus fecundation might very easily be effected, and at a moment, too, when, from analogy, it might be expected to take place: more observations, however, are required to settle this point.

I have also observed sperm-vesicles, Pl. VIII. fig. 6, in *H. viridis:* in this species, they are much smaller than in the specimens from the Northumberland lakes, and are generally two or three in number, near the anterior extremity of the body, but without symmetrical arrangement. They are irregularly conical, with the base wide, within which there is likewise a distinct glandular body, of a green colour; the moving bodies are very numerous, and occupy, as in the other species, the transparent apex. The sperm vesicles were noticed in *H. viridis*, after it had ceased to bud, some time early in October.

The tentacles, Pls. VII. & VIII. figs. 5, 7, are of the flesh-coloured species, are very rough and beautiful, exhibiting an imperfect spiral arrangement of the nodular enlargements. There are two kinds of vesicles immersed in the nodules, as have been described in some other species; one being much more numerous and smaller than the other. The former are for touch, the latter for prehension, according to Corda, who appears to have examined these organs with great care, but whose description of one of them is erroneous in several respects: the original memoir, however, I have not seen. Neither have I had an opportunity of consulting Ehrenberg's account of the minute structure of the tentacles of these animals. The smaller vesicles, Pl. VIII. fig. 7 *a*, and fig. 8, seem to agree with Corda's description as given in Johnston's "British Zoophytes;" they are elliptical, being composed of an inner and outer sac, both very delicate, transparent and membranous. These bodies are placed with their long axis perpendicular to the surface of the nodule in which they are imbedded, and have a non-contractile hair-like process projecting from the external end.

The larger vesicles, fig. 7 *b*, are very complicated, and appear to have been only partially understood by Corda, though he had arrived at a full comprehension of their functions. They are not merely prehensile organs, but are undoubtedly also stinging instruments, as supposed by this naturalist, and are at least twice as large as those for touch: they, fig. 9, are of an ovate form, short and stout, immersed in the substance of the nodule, with the narrow end uppermost, and immediately beneath the surface. At the bottom of the vesicle, which, though perfectly transparent, has rather thick walls, is seen a delicate lining membrane, *d*, folded down upon itself, having a cup- or saucer-like appearance. This, according to Corda, is "a saucer-like vesicle." Standing up from the centre of this, is a transparent membranous stalk, *c*, irregularly bulged a little at the sides, and surmounted by a sharp arrow-like head, *b*, with the barbs much depressed. This supporting stalk is described by the naturalist, just quoted, as "a solid, ovate corpuscle." But to get a full knowledge of this apparatus, it must be examined when exserted and ready for

action. The saucer-like vesicle is then seen to have disappeared, and the outer vesicle, fig. 10 *a*, is lined throughout with a delicate membrane, *b*; in fact, the lips or margins of the saucer-like vesicle have unrolled themselves, and now form the upper portion of the lining membrane, the saucer itself being the lower portion of it. And, moreover, the lining membrane is continued through the neck of the outer vesicle, and is seen to be prolonged into the stalk, *c*, supporting the arrow-head; the barbs, *c'*, of which, three in number, are now very much elevated, being almost horizontal; and thus protruded beyond the surface of the tentacle, are ready to lay hold of prey in the manner of a grappling-iron.

The animal would appear, however, to have the power of throwing the whole apparatus from the tentacle. If a specimen be laid on a piece of glass, and examined through the microscope a number of these organs, with the barbs fully extended, will be seen scattered about like as many minute Florence flasks; the bulbous extremity being elegantly rounded. For the purpose of ascertaining if the animal really possessed this power, a small worm was given to a polype when under the microscope, and carefully watched. The animal was exceedingly cautious in using its tentacles, not applying them in their whole extent, as might have been expected, but keeping by far the greater portion of these organs perfectly free, and unattached to its prey. Very few of the arrow-heads were exserted, and, apparently, never till required; occasionally certain parts of the tentacles were brought into contact with the worm, and then, as it was forcibly drawn further into the mouth, the protruded barbs might be seen sticking in the surface of the struggling victim. At other times, as it rolled about in its vain endeavours to escape, the bulbous extremities of several of these formidable weapons were seen protruding from the skin, undoubtedly placed there by the pungent embrace of this deadly and determined foe; while others lay scattered about in every direction, as if just cast from the tentacles. It is therefore evident that these weapons can be used either as grappling instruments for securing food, or, having been plunged into some living prey, can be left half-buried in the wound. Indeed when the barbs have been once fairly immersed,

it is difficult to conceive how they can be withdrawn; and, therefore, it is probable that the tentacles can only be disengaged by moulting these organs, which seem to be very slightly attached by the neck of the flask-like portion.

This, however, may not be the only reason why these weapons are left in the wound. It has been stated that they are stinging as well as captor organs, and if so, may require time to pour the poison into the wounded animal, The deadly fluid is probably contained in the bulbous portion of the instrument, and by the contraction of its walls may be forced through the other extremity which is perforated; at least from the extreme point, a long, delicate filament, fig. 10 *d*, almost invariably protrudes, resembling very closely the appearance of the long process attached to the stinging bodies thrown out of the papillæ of *Eolis*, and from the tentacles of *Actinia*. But other bodies much more closely resembling the stinging organs of these animals, were found strewed about, associated with the captor organs. These bodies, fig. 11, are minute elliptical sacs, with a long, slender filament from one end, like that just mentioned, from the pointed extremity of the captor organ. The filaments of both these bodies have a double margin, and are apparently tubular. Now it is more than probable that these elliptical sacs are thrown out of the captor organ, and that the filament, so frequently seen issuing from its pointed extremity, belongs to one of them about to be exserted.

We thus see that *Hydra* is provided with a most efficient stinging apparatus, which having penetrated the surface of its prey, remains fixed there, discharging into the wound its poison-bearing filaments. No wonder then that the embrace of these animals should be so deadly to the animalcule that comes within their reach; and that the worm, so tenacious of life, should fall paralysed from their touch, and die, as we are told, almost without a struggle.

The captor organs of *Hydra viridis* are exactly similar to those just described, but are scarcely more than half their size. In this species, too, they are cast from the tentacle.

Corda considers the arrow head, and what he calls the ovate

corpuscle, which we have seen is the membranous stalk supporting the barbs, to be calcareous. Acetic acid, however, has no effect on these parts; and they resist nitric acid for some time, but, in the course of an hour or two, almost disappear under the influence of this powerful fluid. It is therefore evident that neither of these parts is calcareous: the arrow-head and barbs are probably composed of horny tissue, or some other substance with which we are unacquainted.

It appears that Corda has also determined the existence of an anal outlet at the posterior extremity of the animal. I have likewise seen what I take to be a similar outlet. On examining a specimen in a highly contracted state, and which was about to discharge an egg, a distinct, constricted, linear channel, Pl. VIII. fig. 4 *b*, was observed passing from the digestive cavity through the substance of the adhesive disc, apparently about its centre. From this channel issued a long, linear mass *c*, of excrementitious matter composed of a tenacious mucus, imbedding a granular substance, resembling both in colour and texture that which lined the digestive cavity.

The true nature of this outlet is enigmatical, since it is known that the refuse of digestion is discharged by the oral orifice. Professor Owen suggests that "it may give passage to certain execrations of the villous lining membrane of the alimentary canal." From the facts just mentioned, it would appear that this conjecture is probably correct.

EXPLANATION OF PLATES VII. AND VIII.

PLATE VII.

Figs. 1, 2.—Two much enlarged views of the *Hydra* from the Northumberland lakes after development of the sperm vesicles: *a a*, sperm vesicles; *b*, ovum in early stage of development.

Figs. 3, 4.—Two much enlarged views of the same before development of the sperm vesicles.

Fig. 5.—Two highly magnified views of the terminal portion of the tentacle, exhibiting nodular enlargements *a*, and terminal bulb or nodule *b*.

Fig. 6.—Egg after attachment to some foreign body much magnified, exhibiting chorion: *a a a*, a few of the mucus-globules contained in vesicles adhering to the egg.

Fig. 7.—A few of the same vesicles containing mucus-globules more highly magnified.

Plate VIII.

Fig. 1.—*Hydra* much enlarged, exhibiting development of ova: *a*, basal portion of tentacles; *b*, mouth; *c c*, sperm-vesicles; *d*, ovum considerably advanced; *d*, ovum just before it bursts through its envelope *e*.

Fig. 2.—Much enlarged view of egg as it appears immediately after it has burst the envelope: *a*, egg; *b b*, margins of envelope; *c c*, portions of the animal.

Fig. 3.—A portion of *Hydra* much magnified, exhibiting the egg when ready to separate from parent: *a*, portion of the animal; *b*, egg; *c c*, mucus globules as they at first appear; *d*, pedicle attaching egg to parent; *e e*, contracted margins of envelope.

Fig. 4.—Enlarged view of *Hydra* much contracted, with egg attached, exhibiting anal orifice: *a*, mouth; *b*, anal orifice as seen through the substance of the adhesive disc; *c*, fæces passing out of same; *d*, sperm vesicle; *e*, egg with undulated margins; *f*, pedicle attaching same to parent; *g*, contracted margin of envelope.

Fig. 5.—Sperm vesicle much enlarged of the *Hydra* from the Northumberland lakes: *a*, gland-like body within the base of same; *b*, apex of same containing spermatozoa; *c c*, a portion of surface of animal.

Fig. 6.—Sperm vesicle much enlarged of *H. viridis*: *a*, gland-like body within base of vesicle; *b*, apex of same containing spermatozoa; *c c*, surface of animal.

Fig. 7.—Much enlarged view of portion of tentacle of the flesh-coloured *Hydra* as seen in the compressor, exhibiting captor organs and organs of touch imbedded in the nodular enlargements: *a*, organs of touch; *b*, captor organs.

Fig. 8.—Two of the organs of touch greatly magnified, exhibiting inner and outer vesicles and cilium.

Fig. 9.—Greatly enlarged view of retracted captor organ: *a*, outer vesicle; *b*, arrow head with barbs depressed; *c*, membranous stalk of same; *d*, inner or lining membrane doubled down upon itself.

Fig. 10.—Captor organ exserted: *a*, outer vesicle; *b*, inner or lining membrane; *c*, membranous stalk supporting arrow head with the three barbs, *c'*, elevated; *d*, filament passing out of the pointed extremity of arrow head.

Fig. 11.—Two enlarged views of elliptical sacs with filaments supposed to be poison organs cast from captor organ.

XIX.—*Descriptions of some New British Homopterous Insects.*

By James Hardy, Esq.

[Read Thursday, April 4, 1850.]

In arranging my collection of Homoptera, preparatory to a Catalogue for the Tyneside and Berwickshire Naturalists' Clubs, of the species found within their respective districts, I have met with several apparently uncharacterized, which, in pursuance of the designs of these Institutions, I intend, in this communication, to describe. From the localities examined being not very remote, many species are common to both; it appears, on this account, advisable, to obviate the disadvantages that attend scattered descriptions, to group the new species together. The species of the branch of the order treated of have been pretty well elaborated by Mr. Curtis, in his valuable work on British Entomology; there, doubtless, however, still remain gleanings to reward a diligent investigator. From the beauty, the occasional singularity, the limited number of its objects, the ease of conservation, and the facility of displaying their forms, this division offers many claims for a more general attention than it has hitherto had accorded to it.

Order.—HOMOPTERA, *Latreille.*
Section.—AUCHENORHYNCHI, *Dumeril.*
Family.—CERCOPIDÆ, *Leach.*
Genus I.—TYPHLOCYBA, *Germar.*

1. T. plagiata.

Narrow, cylindric, yellow; head and thorax yellow, somewhat opaque, the former with a pair of very obsolete spots near the apex above, face long; ocelli extremely minute; eyes tawny, with a white investing coat; bristle of the antennæ short; scutellum tarnished yellow in the centre, margined with fuscous brown, which is more diffused at the base; elytra glossy, of a brighter yellow, fainter beneath the costa, the apex inferiorly slightly fuscescent, a narrowish,

fuscous brown longitudinal stripe drawn along the depression occasioned by the strong nervure, whereat each elytron is deflected, forming at its basal origin a small outlying patch beneath, and terminating on the margin considerably behind the apex; costa near and around the apex, pale orange; wings white, glossy; upper and under surface of the abdomen, breast and legs pale yellow, tips of the tarsi and of the anus minutely black; oviduct brown. Length $1\frac{3}{4}$—Expansion of wings $3\frac{3}{4}$ lines.

Single specimens were found at Gibside, County of Durham; and Penmanshiel Wood, Berwickshire, in August.

2. T. EXIMIA.

Narrow, sub-cylindric, elytra gradually contracting to a point; whitish; ocelli not seen; eyes fuscescent, invested with a white coat; apex of the clypeus, two dots on the thorax, the suture, a stripe on each elytron interrupted before the base and fading out a little after the middle, as well as some of the apical nervures, bright orange, or gamboge yellow; the elytra glossy, their tips and base immediately beneath the costa, yellow; base of the scutellum with two subtestaceous spots; upper and under surface of the abdomen, breast, and legs, yellowish. Length, 2 lines.

A single specimen found in the woods on the Derwent, above Winlaton Mill.

3. T. RUBI.

Resembling *T. Ulmi*, narrow, sub-cylindric; head and thorax whitish; the eyes blackish, with a white, scaly covering; fore margins of the thorax, and sometimes the disc, yellowish; scutellum transversly impressed after the middle, with two yellow ovate longitudinal basal spots, one on each side, which reach to the impression, often wholly white; elytra with the edge under the costa, and the nervures white, a yellowish, or golden yellow glossy broad dash, occupying most of the surface; the nervures where they intersect each other towards the apex, bordered with pale fuscous, as likewise are several of the short apical ones; sometimes the fuscous tint appears in spots, of which three, two at the tips of nervures, and one internally, are darker; wings white, vitreous;

abdomen above, bluish black, the basal segment yellow, with a minute lateral black spot on each side of its base, and a short apical black streak, the posterior edges of the remaining segments, of the fifth and sixth, especially the latter, more broadly, a stripe down the sides as far as the last segment, and the apex, white; beneath fuscous, the apices of the segments white, the last segment rather dusky; the face, breast, coxæ, and femora yellow, tibiæ and tarsi white, the claws of the last black. Length 1½ line.

Found in the end of October, on the bramble, and likewise on the hazel in Penmanshiel Wood, Berwickshire; also occasionally at Gibside.

4. T. LUTEA.

Narrow, sub-cylindric, yellow; head, thorax, and scutellum brightest, the two first but slightly convex; the head rather pointed, its hinder angles a little wider than the thorax; eyes whitish; autennæ short; elytra paler, the tips subhyaline, scarcely tarnished; wings white; abdomen black, with a spot on each side at the base, the lateral margins broadly, the apex and two transverse bands, of which the latter one is broader, yellow, the apices of the other segments narrowly whitish beneath, with the basal segments black, the posterior margins, and the last segment entirely yellow; oviduct tawny; breast yellow, a black patch behind the origin of the fore and middle pair of legs; legs yellow, a row of minute black spots down the outer edge of the posterior tibiæ, tips of the tarsi black. Length 1½ line.

A single specimen found in Berwickshire.

5. T. QUADRA-SIGNATA.

Small, narrow, sub-cylindric, the elytra somewhat expanded near the middle, and only moderately narrowed behind; face and front of the head yellow, the former marked on the upper part with two faint curved, short, longitudinal, the latter near the point with two short transverse, pale testaceous lines, neither always present; on the hinder head are two black or fuscous squares, which are cut out on the anterior edge, narrowly separated from each other by a yellow line, and from the eyes by a similarly coloured margin; eyes fuscous; antennæ with a longish bristle;

thorax opaque black, the back occasionally less deeply tinted, and often showing a very short central line, and four small specks, two anterior, and two posterior, the latter being elongated, yellowish; scutellum concolorous, with a palish spot at the apex; the colour of the elytra is nearly the same with the thorax, but is less saturated towards the apex, and is there diversified by hyaline or paler spots, and by the whitening of the nervures at their junctions or furcations; a conspicuous white or yellowish squarish spot, into which, posteriorly, a short twig of black often runs, on the suture behind the scutellum; the costa bordered with pale yellow, at its origin appearing in a narrow line, but soon entering upon the black ground in a large patch twice sinuated posteriorly, which is then nearly cut off by a salient point of black, deepest tinted at its point, but again encroaches to form a lesser area; a small hyaline spot is situated at the fuscous tint, intervening betwixt this and the apex; wings white, glossy, the three upper nervures dusky, and the apex slightly clouded; the abdomen black above, with lateral stripes, the posterior edges of the segments and a wide band before the apex, yellow; beneath yellow with black transverse bands, or fuscous, with yellow margins to the segments; breast and legs yellow, a spot on the sides of the former and the tips of the tarsi, black. Length 1—1½ line.

Generally distributed in the meadows near Newcastle, and also in deans, in Berwickshire. Autumn.

This is constant to the characters assigned; still, as colours in these insects are liable to vary, it may be identical with the *Eupteryx notata*, of Curtis.

6. T. OCTONOTATA.

Narrow, sub-cylindric, rather shining, considerably tapered behind, elytra somewhat curved upwards towards the tips; the face and head yellow, the former somewhat fulvescent in the centre, with traces of obsolete ribs, and of two minute pale spots above, the latter with two moderately sized black spots on the anterior edge; eyes light brown, with a blackish spot on the hinder angles; bristle of the antennæ of considerable length; thorax and scutellum yellow, the former with two approximated black spots

of the same size as those on the head placed anteriorly, and, posteriorly, two other larger and remote; the latter with a transverse sunk line before its apex, sometimes fuscous, and two, one on each side of the base, triangular black patches, which, at their origin, enter below the thorax, and shine dimly through; elytra glossy, somewhat greenish white near the base, but hyaline posteriorly, a patch towards the base, two ragged fasciæ, in some parts but faintly indicated, that cross them, of which the first trends obliquely forward to the costa on each side, but the second after passing across the back is retroverted, being continued in a narrower oblique branch to the margin, faint fuscous brown, the apices of the fasciæ rather more deeply stained; a line near the base of the costa, the suture near the apex, and the prongs of a furcate nervure, fuscous; abdomen above black, a widish lateral band, and the posterior edges of the segments narrowly, yellow; beneath yellow, with black triangles at the bases of all the segments, except the terminal one, which is yellow with a geminated triangular or linear spot at its base; breast shining black, or somewhat lilac, the margins of its sections freckled or edged, and the sides bordered with yellow; legs white, tarsal claws black. Length 2; expansion of wings $3\frac{1}{2}$ lines.

Var.—Male: middle compartment of the face and its apex bordered with dark, the central part stained and rudimentally barred with light, fuscous; a large dark patch below the eyes, the eyes themselves, the base of the fore coxæ, a streak along all the femora, and the hinder tibiæ, excepting the spines, a semicircular patch on the thorax, a transverse line before the apex of the scutellum, and a minute spot on the apex, fuscous of variable intensity and hue; wings with some of the nervures nigrescent near the apex; breast and belly black, excepting in the latter some narrow white lines on the posterior edges of the segments, a series of yellow specks along the lateral margins. In other respects conformable to the type.

Beat out of furze, in Berwickshire, in March.

Two specimens beat out of a willow, on the Derwent, in August.

7. T. SEXMACULATA.

Shaped nearly as in the last, but shorter; head, thorax, and scutellum pale yellow; eyes fuscescent, hinder angles darker; a black spot on each side, on the cheeks below the eyes, two large subquadrate ones on the upper part of the head, two, also, large like-shaped ones on the anterior part of the thorax, and two triangular patches at the base of the scutellum, deep black; elytra tinged with yellowish and subhyaline, with two wavy, somewhat obsolete fuscescent bands, which are deepest stained as with a spot, the first at the costa, the second at the termination on the hinder margin; a third fuscescent band also before the apex, leaving the extreme edge uncoloured; under wings white, glossy, the upper part of the apex clouded; abdomen above black, a narrow lateral stripe, the hinder edges of the segments chiefly near the sides, and sometimes a sub-apical band, yellowish; beneath black, narrowly margined with yellow, the last segment yellow, longitudinally clouded with fuscous in the middle; oviduct black; breast yellow, varied with black; legs paler, claws of the tarsi black, a fuscous spot at the tips of the tibiæ. Length $1\frac{1}{2}$—expansion of wings, $3\frac{1}{4}$ lines.

Gibside. This and the next may be varieties of No. 6.

8. T. JUCUNDA.

Of nearly the same shape as the last; head, thorax, and scutellum yellow, the two latter immaculate; face with faint traces of dusky ribs, the hollows whence the antennæ originate, fuscous; on the top of the head are two very minute approximated black points, situated behind two foveæ; the eyes are light fuscous, the margin narrowly white; bristle of the antennæ moderate; elytra more shining, pale, yellowish green, a fuscous obsolete patch composed apparently of three short lines, each commencing near where the preceding terminates, a little behind the base, a small darker spot on the costa in a line above it, and a square, dark fuscous one on the under margin towards the apex, traces of a still fainter one on the suture in a line with the last, behind it the apical portion becomes tarnished with fuscous, a tint acquired likewise by the nervures; abdomen above black, with the hinder

edges of the segments next the sides narrowly margined with white; beneath black, speckled with dusky lilac and tawny, the posterior margin of the first segment, and two small triangular spots at the edges of the penultimate one, pale yellow; the last is black, with a narrow whitish central line; breast yellow, with transverse black patches behind the origins of the first and second pairs of legs; legs yellow, tip of the tarsi black. A male. Length $1\frac{1}{4}$ line.

Beat from a tree at Winlaton Mill, in August, while collecting *T. flammigera*, that abounds on alders there.

9. T. STACHYDEARUM.

Narrow; head with five black spots, the last situated on the posterior margin, and triangular; face yellowish, margined with fuscous down to the apex, which is blackish, sometimes diversified with fuscous or black patches and lines; thorax yellowish, sometimes with eight black spots, and two approximated short fuscous mesial lines, but more frequently the fuscous tint spreads into clouds, and occupies the greater part of the disc, leaving two spots near the middle, a shortened anterior longitudinal dorsal line, and two patches at the base, that sometimes extend forwards along the sides, near which there is sometimes a minute black dot, yellow; scutellum with two triangular dusky spots at its base; elytra yellowish or faint yellowish green, with lines and fuscous specks deepest stained on their edges between the whitish yellow nervures, the tip fuscous, or hyaline with fuscous stripes accompanying the nervures; two rather large ovate clear spaces beneath the costa, and a small one before the apex; legs entirely yellow, with the tarsal claws alone black; or with the hinder tibiæ fuscescent and black at the tip, and the apices of the tarsal claws likewise black; or with the hinder femora at the apex, the tibiæ in the middle and at the apex, and greater part of the tarsi, black. Length $1\frac{1}{4}$—$1\frac{1}{2}$ lines.

Common on *Stachys sylvatica*, at Axwell Park; and on *Lamium album* and *Ballota nigra*, between Redheugh and the Team bridge, even as late as December.

This appears to connect the *Eupteryx hortensis* and *E. tarsalis*, of Curtis. I have still another form, found at Berwick, which appears to be the *E. melissæ* of this author.

Genus II.—DIKRANEURA, *Hardy MSS.*

Head somewhat pointed, triangulate, the crown very faintly ridged; face long; occelli not perceived; antennae moderate; elytra nerved nearly as in aphrodes, the small cell under the costa wanting; wings with the upper nervures disposed in two forks, the upper opening inwardly on the base, the second and shorter pronged outwardly on the apex, no apparent cross nervures.

1. D. variata.

Small, narrow, the elytra tapered to a point posteriorly, light yellowish green; head and thorax yellow, polished and shining; face yellow, but sometimes dusky in the centre, with appearance of faint ribs, sometimes the middle plate is bounded by fuscous lines, which are occasionally produced up to the front, where they form a faint horse-shoe arch, within which there is a curved patch on the peak; sides of the head on the summit faintly duskier, leaving a brighter stripe up the centre, where it is very slightly elevated; eyes subtestaceous, with a whitish coat; bristle of the antennæ short; thorax transverse-lunate, posteriorly of the same breadth as the hinder margin of the head, the disc sometimes greenish, or slightly dusky; scutellum pointed, two impressed approximating punctures behind the base, followed by a sunk transverse stria, and then occasionally by a puncture; elytra pale yellowish, pale greenish yellow, or glaucous green, becoming at length sub-hyaline, and faintly tarnished with fuscous towards the apex, the nervures yellowish, at length whitish; wings slightly darkened, the nervures nigrescent, especially the furcate ones; abdomen bluish black, some of the segments, especially at the sides, narrowly bordered posteriorly with white, a yellowish band at the base, and another, sometimes also a third before the apex, yellow; beneath, with a narrow stripe on the sides, the posterior edges of the segments, and the apical one entirely, yellow, the basal part of the segments pruinose black; breast

speckled with yellow, brown, and black; legs yellow, tips of the tarsi black, the hinder tibiæ very indistinctly freckled with dusky. Length, $1\frac{1}{4}$—Expansion of wings, $2\frac{3}{4}$ lines.

Var.—A semicircular cloud on the hinder part of the thorax, two spots near the base of the scutellum, and at times two before its apex, the greater portion of the elytra, and the nervures, delicately sanguineous.

Abundant in Autumn, among long grass, *(Festuca ovina and Aira flexuosa)* in a wood on the summit of Lobley Hill; also on the coast of Berwickshire, where I met with it late in October, in the sea caverns on *Geranium Robertianum.*

Genus III.—APHRODES, *Curtis.*

1. A. spilotocephala.

Narrowish, elytra tapering to the tip, yellow, polished and shining; head, thorax, and scutellum, especially the first, bright sulphur-yellow; face of considerable length, but broader than in *Typhlocyba*, the central part yellow, or distinguished by rows of faint sometimes coalescent spots, or the rudiments of transverse ribs, its edges, and sometimes those of the clypeus separated from the cheeks, by blackish longitudinal lines; ocelli minute and remote, placed near the eyes on the verge of the forehead, testaceous; four black spots on the top of the head, two approximating on the point, triangular, and two behind them, larger, trapezoidal, only narrowly separated from the eyes; a short fissure on the vertex; eyes fuscous, with a white coat; antennæ with the second joint fuscous at the base, the bristle long and fuscous at its tip; disc of the thorax faintly duskier or greenish; elytra glaucous, or greenish white when closed, with bright yellow nervures, costa and suture, the apex faintly embrowned; yellowish when expanded; wings glossy, the apex superiorly clouded, the nervures darkened; abdomen pruinose black, with stripes down the sides, minute lateral incisions at the posterior borders of the segments, a band before the apex, and occasionally the apex itself, and a basal transverse band, yellow; beneath with narrow white edges to the segments, apex of the last one brownish or yellow, and bristled with white; breast black, with yellow lateral specks, or with a

yellow patch merely on the pleuræ; legs bright yellow, all the tibiæ with an internal dark line, which on the two first pairs, is sometimes composed of dots, besides, there are other spots, especially on the hinder pair; the femora are also spotted, and on the hinder ones these sometimes united to form a shortish line near the apex, and the base likewise is sometimes similarly streaked; the anterior and intermediate tarsi, with the apex of the last joint, and the claws dusky or black; first joint of the posterior with a black line beneath, apex of the second and third, and the claws fuscous. Length $2\frac{1}{4}$—Expansion of wings, $3\frac{3}{4}$ lines.

Meadows near Newcastle, also found in Berwickshire, and I possess a specimen from Dr. Greville, taken near Edinburgh.

This species ranks with *Eupteryx* 6—*notata* of Curtis which, in habits, as well as in modification of character, associates better with *Aphrodes*, than *Typhlocyba*. Can it be *Cicada* 4—*notata* of Fabricius, which is thus briefly designated: "C. virescens capite flavo: punctis quatuor nigris, elytris albidis." *Syst. Rhyng.* p. 78?

2. A. JUVENCA.

Narrowish, yellow, or greenish; head and scutellum bright sulphur-yellow, the former triangular, and anteriorly considerably salient; face sulphur-yellow, its compartments bounded by fuscous lines, the cheeks with a fuscous patch, central part fuscous at the tip, and crossed on the upper portion with fuscous ribs, betwixt which lie yellow spaces of equal dimensions, the last of the dusky ribs borders the fore-edge of the head, and is visible from above; the ocelli are extremely minute, and situated near the eyes; on the summit, two minute fuscous dots are placed near the point, and a small short sunk line divides the vertex; the eyes are dark brown; seta of the antennæ short; elytra short, very little exceeding the apex of the body, light green or yellowish, with the costa and nervures rather brighter; wings white; abdomen above with the sides, adorsal line, the three last segments, some fuscous lateral specks on the two last excepted, and the bases of the segments yellow, the remainder blackish, forming a series of uninterrupted cross bands, apex with yellowish white bristles; beneath

the lateral margin, some fuscous spots excepted, a row of faint lateral spots, sides and tip of the penultimate, and the apical segment entirely, yellow; oviduct brown; breast yellow, with a black patch on its sides, and a larger one posteriorly; legs bright yellow, the anterior and intermediate thighs with a fuscous patch, and a ring composed of lengthened dots; their tibiæ with a very narrow line and some fuscous spots; hinder femora with a fuscous line continued both ways in spots, tibiæ with two rows of minute spots, and an interior dark line; tips of the tibiæ and tarsi fuscescent. Length $1\frac{1}{4}$ line.

This which is from the sides of the Derwent, is evidently an imperfectly developed insect, and I have another of a greener tint from Berwickshire, agreeing with it in this respect. From the latter district, however, I have a third, which I consider to be the true representative of the species. It is a little broader, and the elytra pass considerably beyond the apex of the body; the middle of the face is ribbed with black lines, leaving a triangular yellow space nearest the tip, the upper rib is represented by dots only, the middle of the thorax, and the elytra, are of a light pleasant green, the latter subhyaline posteriorly with a blackish arched streak within and encircling the apex; wings nigrescent with dark nervures; breast and abdomen deep pruinose black, the latter above with a line before the apex, and some specks on the tip above and beneath, yellow; legs yellow, fore coxæ, except at the tip, tips of the tibiæ, the tarsal claws, tip of the basal, and the two last joints of the posterior tarsi entirely, and a spot within the apex of the posterior femora black; in other respects like the preceding. Length $1\frac{3}{4}$ line.

The effects of incomplete developement in blanching the wings, is a curious circumstance, but I have observed it in another species, which, under the forms named by Curtis, *A. sulphurea*, *tæniola*, *craticula*, and *maculipes*, retains the slaty tint of those organs, but in its "half-made up" state, which I consider to be *A. unimaculata*, and *A. lata*, of the author just cited, the colour is entirely discharged from them; in the last forms, the elytra are frequently so much curtailed as to leave a large portion of the abdomen exposed.

3. A. MELANOPSIS.

Minute; head moderately pointed; face entirely bluish black; top of the head, whitish, with an arched row of six fuscous spots round the apex, followed by two larger ones united at the tip of the sunk vertical line, and behind these four others, two on each side, betwixt this line and the eyes; eyes subtestaceous; antennæ moderate, greyish; ground colour of the thorax dirty white, occupied on the hinder part by two lateral, and two middle darker patches, the last disposed in thickish lines, bluish fuscous; scutellum white, a fuscous spot at its base, and another near its tip, behind the transverse impressed line; viewed from before, these form a cross; elytra glossy with fuscous or purplish-fuscous patches, one large near the base, and two others divided by narrow lighter spaces, with a few more minute, the remainder sub-hyaline, and diversified by the pearly whiteness of the nervures, more particularly at the junctions; wings slaty with dusky nervures; breast and abdomen beneath, black, the segments of the latter bordered posteriorly with delicate white lines; legs, base of the fore coxæ, and of all the femora, base of the tibiæ narrowly, their tips, and a line of dots, and the tarsal claws, black, the remainder, yellowish; hinder tibiæ, with the base narrowly, and the spines, as well as the basal joint of the tarsi, dirty yellow, the remainder, black. Length 1 line.

Among short herbage, on barren banks, in Berwickshire. It comes nearest to *A. nitida*, of Curtis.

4 A. MARMORATA.

Shining and polished, elongate; face broad, somewhat flattened, yellow, an elongated spot on the clypeus, the margins of the compartments, an oblique dash across the cheeks, the under margin of the eyes, and two spots on their anterior edge, and the hollow whence the antennæ originate shining black or fuscous, the central plate ribbed with black and yellow, representing in the contour the trunk of a skeleton, towards the lower part of which lies a halbert-shaped yellow space; ocelli remote, placed near the eyes, and within a dark spot, almost on the line of the forehead; the upper part of the head is narrow, almost transverse

lunate, as in *Macropsis*, but with an approach to triangular, the apex obtuse, yellowish, four minute points on the frontal line between the ocelli, and four placed 2 and 2 obliquely, the larger pair anteriorly and most approximated, black; a small sunk line on the vertex, edged as well as the posterior margin, with tarnished orange; eyes liver-brown; antennæ with the second joint dusky, the bristle longish; thorax transverse lunate, the fore part yellowish, the hinder and the disc ashy, the surface varied or spotted with fuscous or black; scutellum large, yellow-varied with fuscescent, two yellow cheques at the base containing each a central black spot, transversely impressed, and somewhat depressed after the middle, with two black spots behind the impression; elytra long, not much expanded after the middle, across which they are rounded, the tips overlap each other, and the sides are rather compressed posteriorly; fuscous-ash, polished, varied between the nervures with numerous black points or atoms, single, united into rows, or abrupt longitudinal and cross lines, and by the pearly whitness of the nervures, especially where they fork or cross each other, apical margin nigro-fuscescent; wings nigrescent with dark nervures; abdomen above, bluish black, posterior edges of the segments narrowly whitish, which colour at the margins extends into minute yellow triangular spots, issuing from a yellow lateral stripe, that towards its termination throws a band across the fifth; the underside is varied with fuscous and yellow, the lateral and posterior margins of the segments being yellow, and the centre fuscescent, with traces of a central yellow line, the apical segment set around the apex with stiff whitish bristles; fore and middle breast black, with the posterior margins, a spot on the pleuræ and hinder breast, excepting the piceous base, yellow; legs whitish or yellowish white, apices of the fore and middle femora with two, of the hinder with six, curved spines, the fore tibiæ pectinated internally, and with five widely set spinules on the outer aspect, hinder ones internally ciliated, externally set with numerous spines; fore and middle coxæ with a black patch at the base, their femora with two bands, the basal broader, and several spots, a line and several spots on the tibiæ, and apices of the penultimate tarsal joint,

lilac or fuscous; posterior femora with a long longitudinal dash, a curved one near the apex, three or four apical spots externally, and one internally, lilac or fuscous; the long slightly bent tibiæ with two lines of minute, and one of large spots, sometimes also an internal line, the tips, spots beneath the first tarsal joint, its apex, those of the two succeeding joints, and the claws, black. Length, 3 lines. It is at once the largest and finest of its species.

A specimen taken in the woods on the Derwent; and another in Berwickshire, beat out of bushes.

As will be observed from the detail, this is a true *Aphrodes*, although the shape of the head would at first sight indicate a different relationship.

Genus IV.—ACUCEPHALUS, *Germar.*

1. A. adustus.

Short, and, contrasted with its affinities, considerably narrowed, pale, or clayey-testaceous; face freckled with a brighter tint, disposed often in the merest rudiments of ribs, a spot in the hollow occupied by the antennæ, and occasionally a line bordering the central part of the face, black; crown above triangular, scarcely wrinkled, with a central ridge, on each side of which it sinks down, and then rises in two indistinct oblique ridges, one on each side, either uniform in line, or often, as well as the thorax and elytra, freckled with atoms and minute specks of light brownish; elytra rather abbreviated, with a row of ill-defined dusky spots along the costa, and turning round the tip, or uniform with the spots near the apex only; wings short, white; abdomen above either wholly pale, or varied with deep fuscous or black, the edges of all the segments pallid, a widish band at the apex of the second, the apical ones, and a stripe down the margins, in which lie several triangular brighter spots, brown; underside concolorous, the centre dusky; legs also concolorous, the tips of the anterior tibiæ, and of the tarsal joints, blackish; apex of the hinder femora with a patch before the apex, and the inner side of the tibiæ, black, the spines brown; apices of the tarsal joints and the claws piceous. Length 2—2½ lines.

Late in Autumn, in fields near Dunston, and also in Berwickshire.

I strongly suspect that this is a dwarfed and imperfect state of *A. rusticus*, Fab., which is confirmed by finding a still less developed form to correspond to *A. cardui*. To *A. rusticus*, also, from observed varieties in specimens, I feel disposed to refer *A. sparsus*, *A. rugosus*, *A. unicolor*, *A. fasciatus*, and *A. pallidus*, of Curtis; and his *A. bicinctus* is, perhaps, not different.

Genus V.—PAROPIA, *Germar.*

1. P. pallidipennis.

Megophthalmus pallidipennis, *Curt. MSS.* Mus. Dom. Greville.

Entirely pallid testaceous, in the elytra fainter, with the nerves and suture more dusky; the eyes and extreme apex of the tarsi, black; face and sides of the clypeus sometimes variegated with light ochreo-brumeous, and occasionally some dusky patches appear on the head and thorax, as well as a dusky spot on each side of the base of the abdomen; the elytra are considerably longer, and less gradually tapered behind than in *P. scanica*, Fallen, (Megophthalmus bipunctatus, *Curtis*). Length $1\frac{3}{4}$—Expansion of wings 3 lines.

From the Bents, at South Shields; a specimen likewise found in Berwickshire. Dr. Greville finds it near Edinburgh, and his specimens, named, he informed me, by Mr. Curtis, bear the appellation I have cited.

Family.—FULGORIDÆ, *Leach.*

Genus. VI.—CIXIUS, *Latreille.*

1. Cixius dorsalis.

Head, eyes, and face fulvous, the ridges fainter, the cheeks and the apex of the face black, two dusky patches on the crown, and two smaller curved ones before the ridge anterior to them, fuscous; thorax black, the anterior segment, the hinder part of the ridges, and a fine dorsal line shortly, fulvous; elytra white, the nervures formed by black punctures, a broad fuscous patch down each, leaving the sutural region narrowly, excepting four outlying patches, and the costal portion gradually extending in width to

the apex, white, three blackish spots before or about the middle of the costa, and another paler towards the tip, with faint clouds on the cross nervures; wings white, with brown nervures; abdomen above black, with two large spots, one on each side, at the base, a stripe down the sides, the posterior edges of the segments narrowly, but wider at the sides, orange; beneath dark fuscous, with the posterior edges of the segments narrowly yellow; a white flaky excreture collected round the apex; breast black, with the posterior edges of its sections, yellow; legs dirty yellowish; fore coxæ except at the tips, middle portion of the femora, continuous to the apex in the hinder, and the tips of the tarsi, more or less fuscous. Length $2\frac{1}{2}$ lines.

Taken at Milne Graden, near Coldstream, Berwickshire, in June.

This is, perhaps, a variety of *Flata serratula*, of Fab., which he says, occurs in England, upon Thistles.

I have not met with any statements relative to the early stages of the insects of this genus. In woods, I often fall in with the larva of one species, which I take for *C. nervosus*, in cavities in the ground beneath large stones, or in the runs of moles or mice, where it may feed on roots or underground stems.

Penmanshiel, by Cockburnspath, N.B.,
March, 1850.

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Page 40, line 2, *for* 99 *read* 100.
„ 41, „ 4, *for* 206 *read* 195.
„ 46, „ 31, *for* pl. vi. *read* pl. vii.
„ 49, „ 16, *for* No. 369 *read* No. 367.
„ 55, „ 3, *for* i., 2, *read* i., 185.
„ 58, „ 22, *for* Marsh. *read* Fab.
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„ 76, „ 14, *for* nanus *read* nanum,
„ 77, „ 7, *for* angustata *read* agilis.
„ 83, „ 30, *for* 51 *read* 50.
„ 86, „ 7, *for* cerylon bipustulatum *read* Rhyzophagus bipustulatus.
„ 215, „ 10, *erase* carex pauciflora.
„ „ „ 11, *for* heterophyllum *read* heterophyllus.
„ „ „ 13, *for* Globularia pilulifera *read* Pilularia globulifera.

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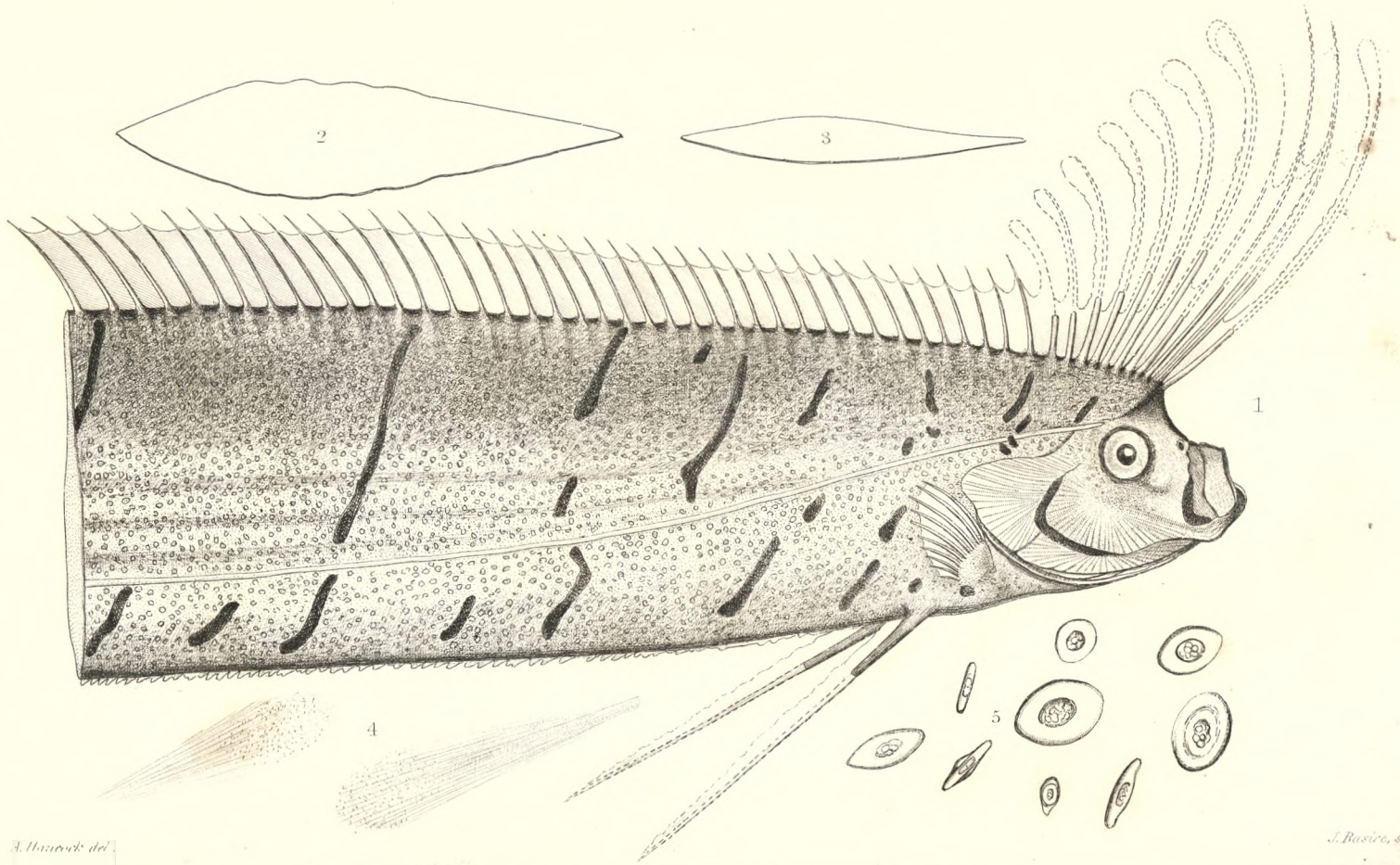

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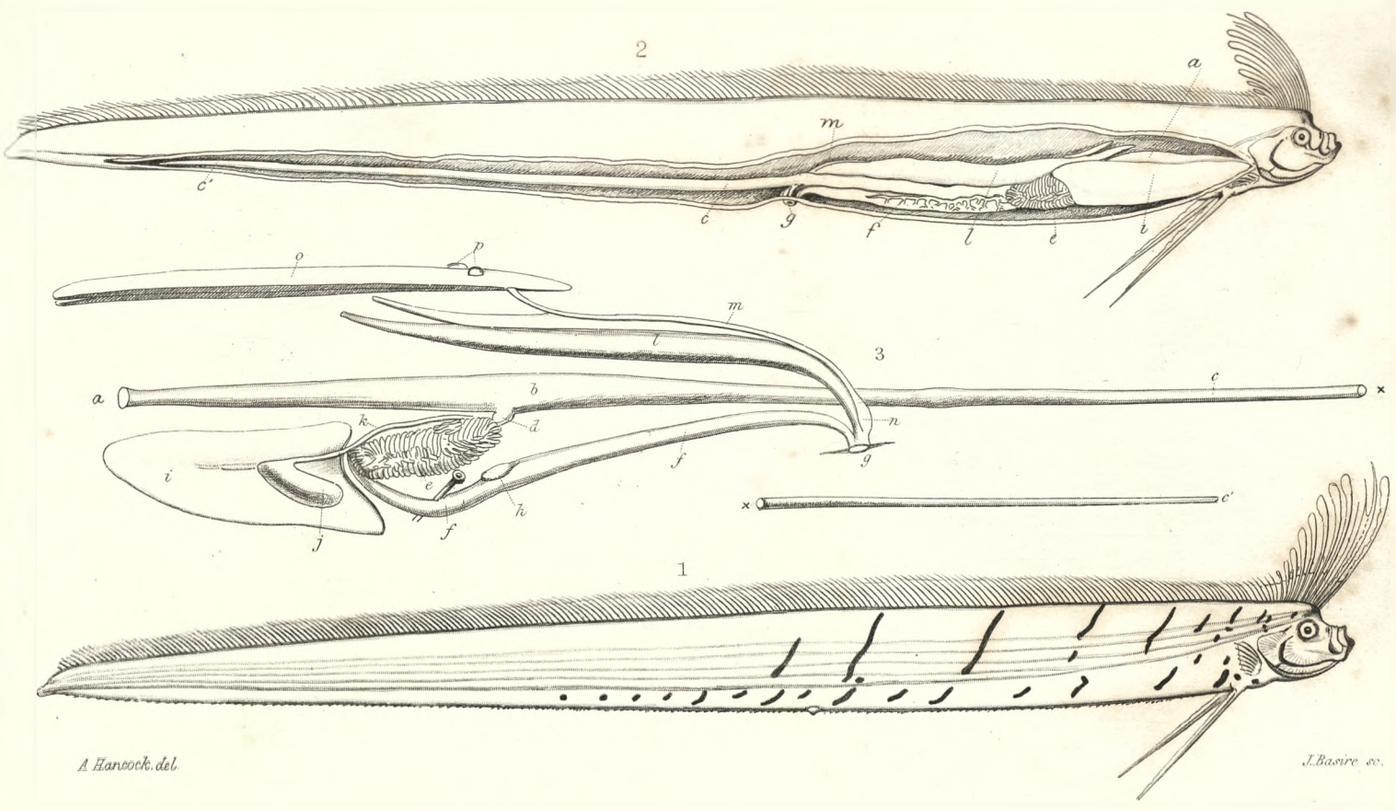

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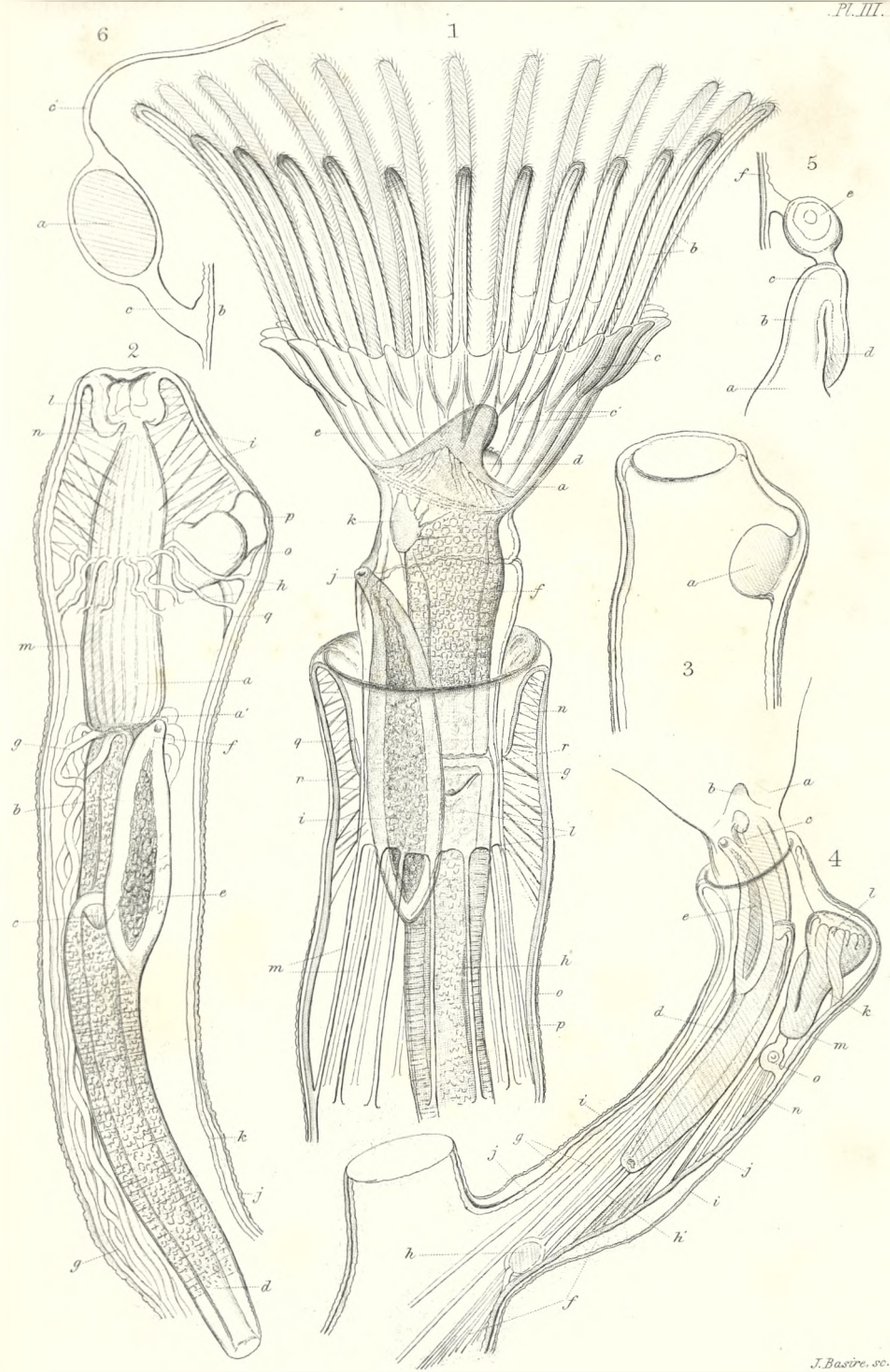
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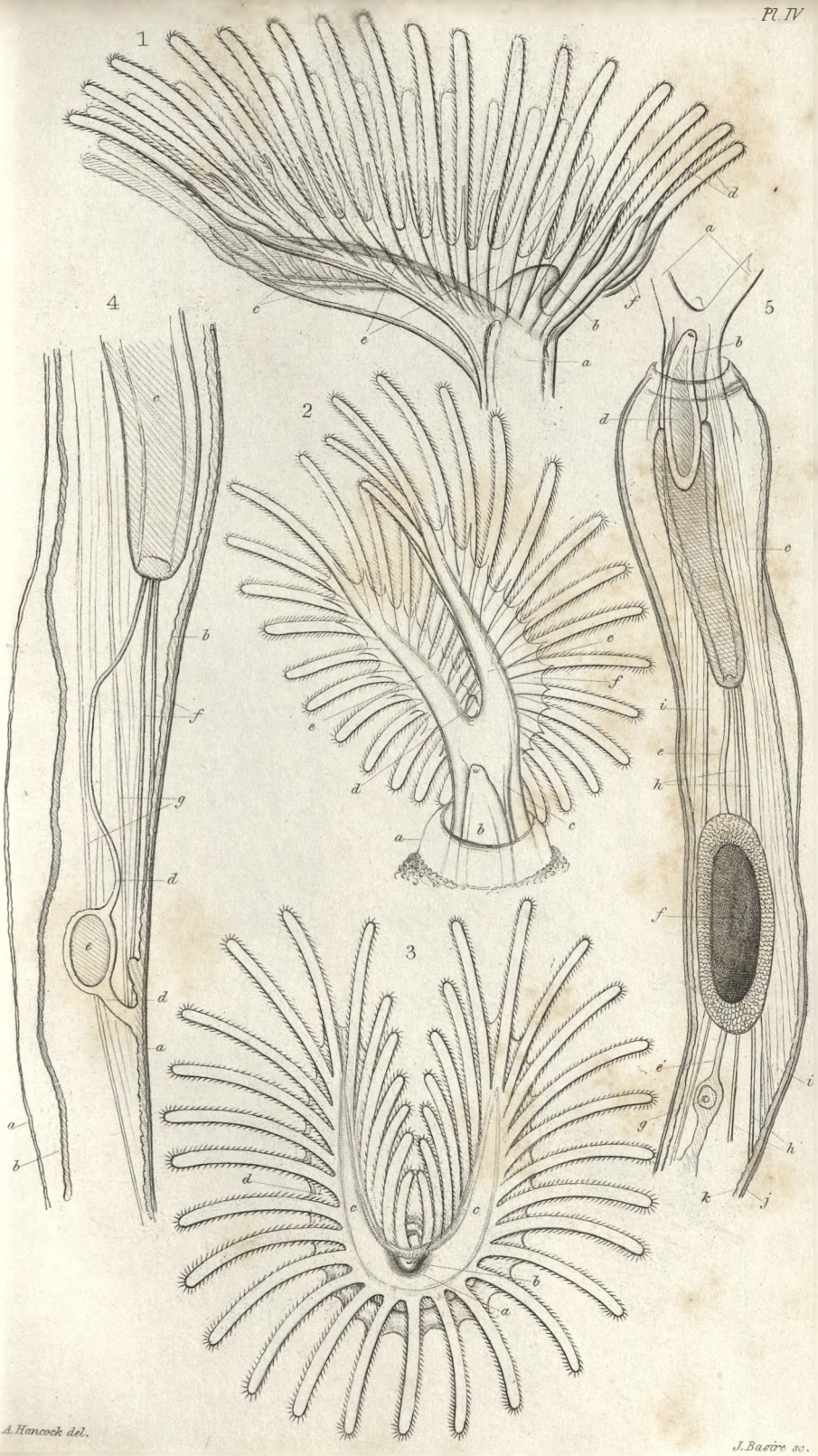

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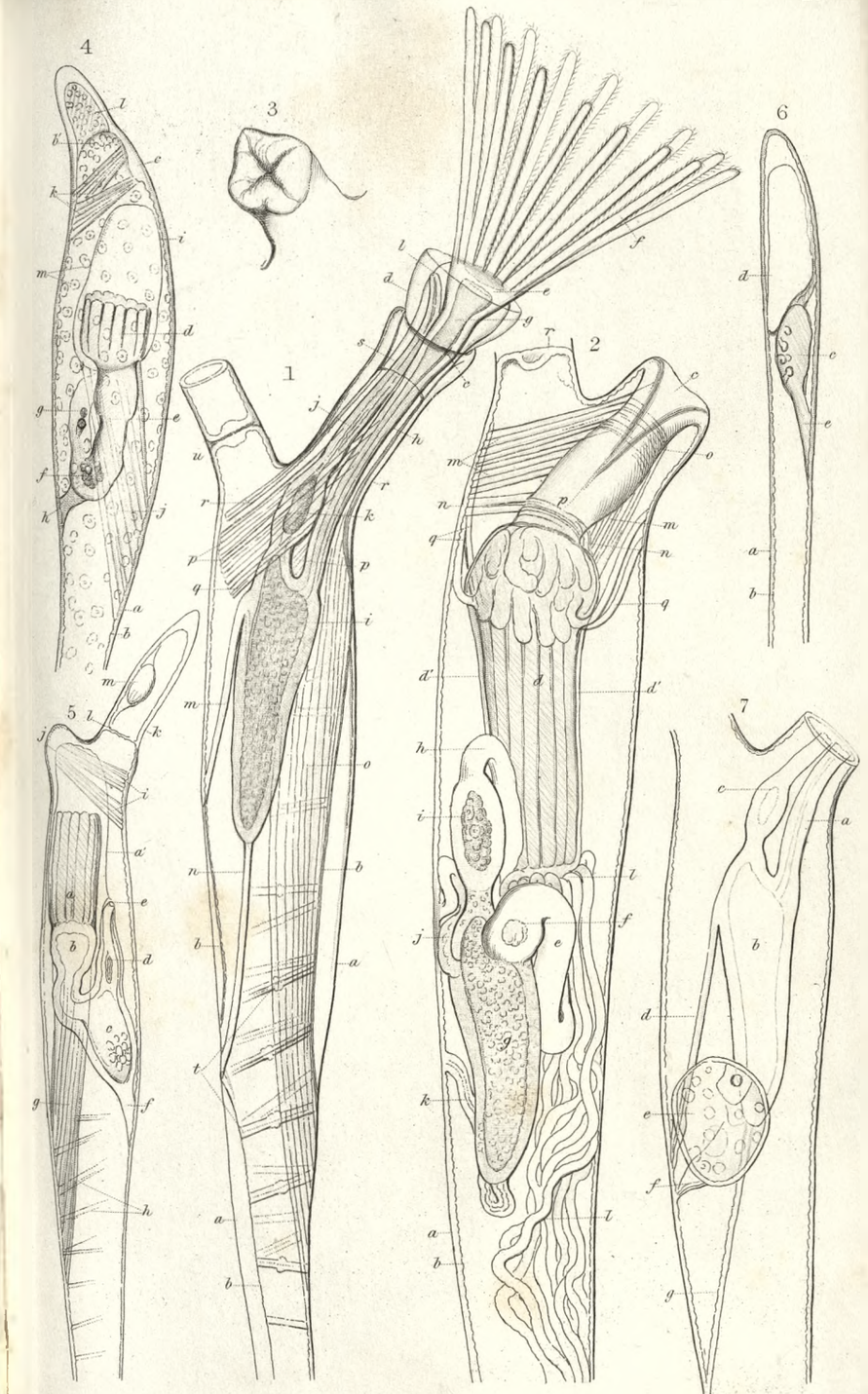

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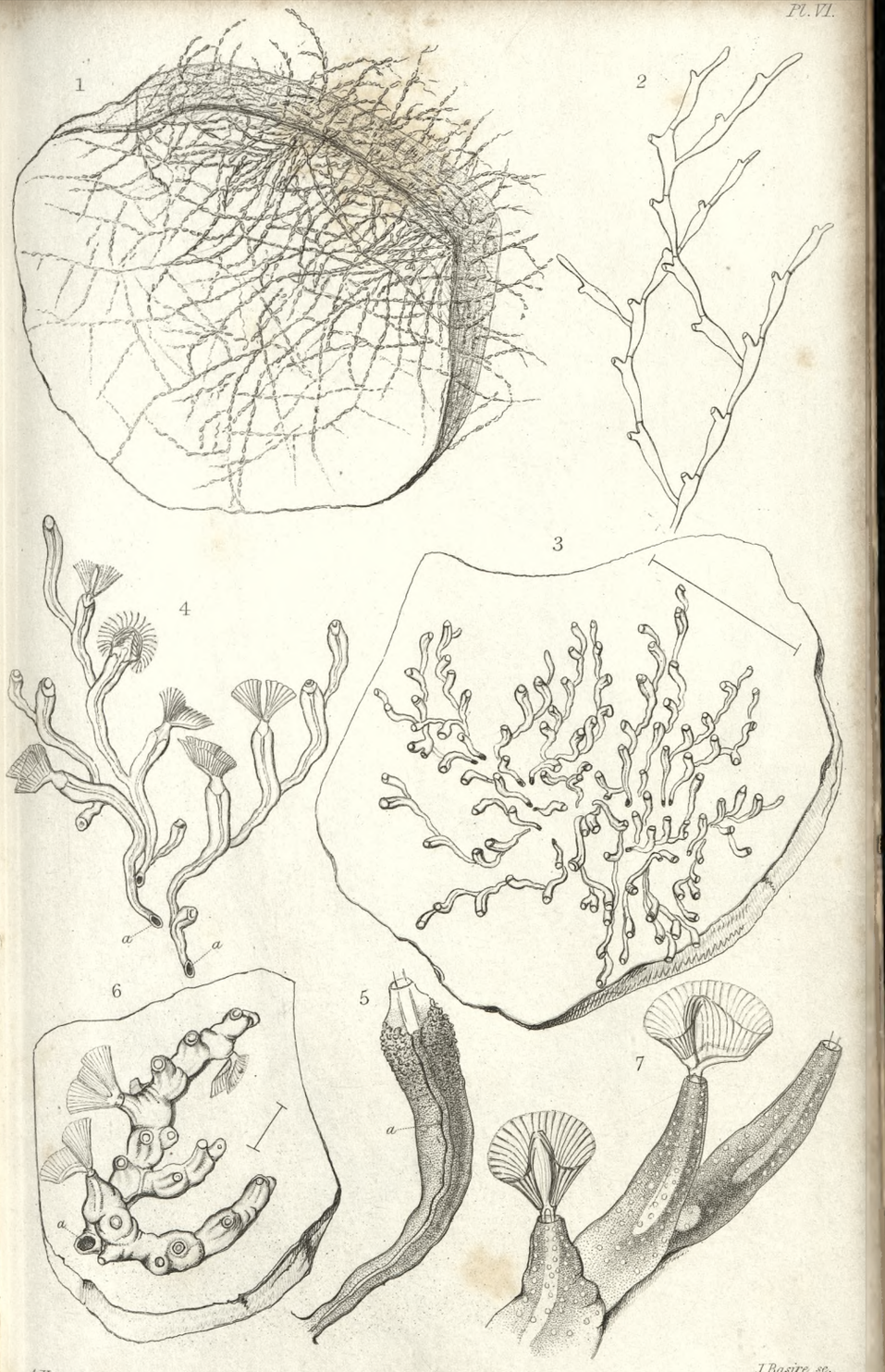

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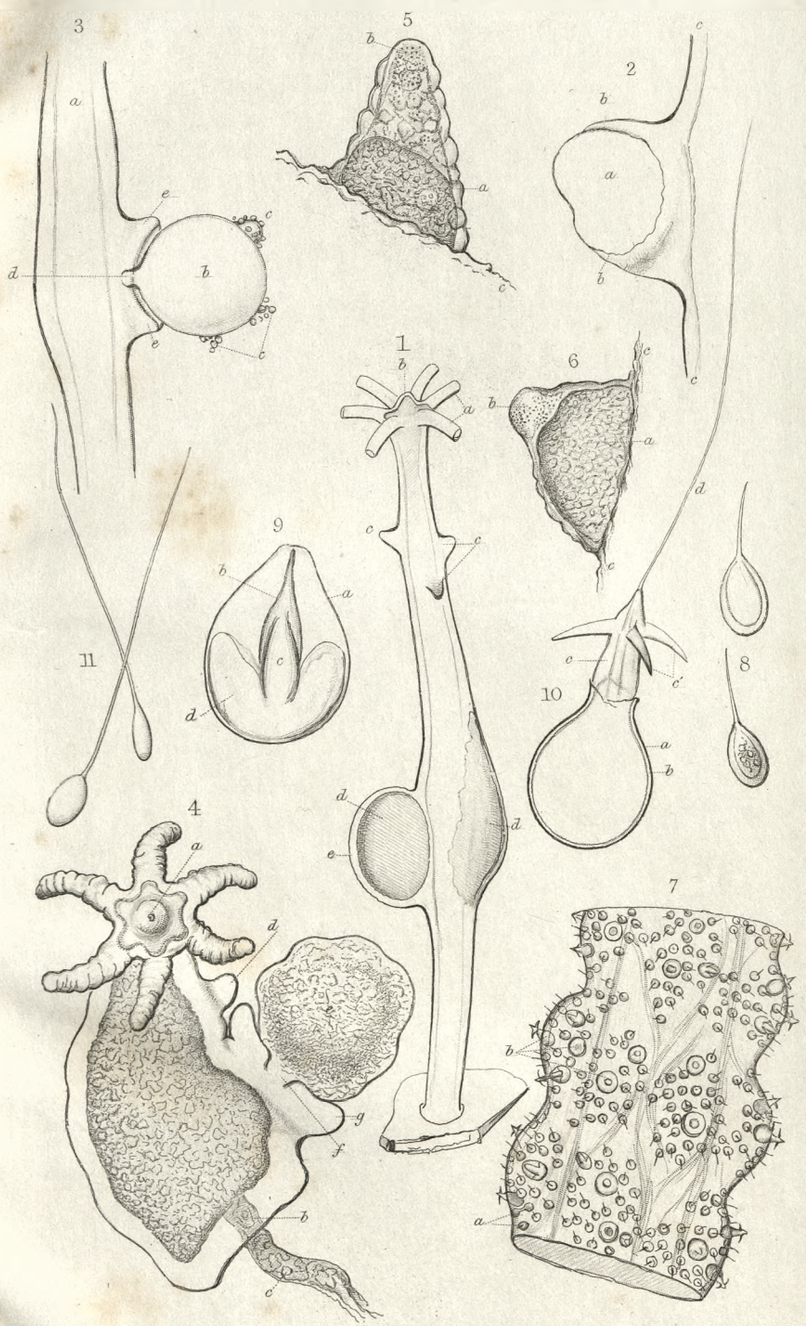

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