

PROCEEDINGS
OF THE
NATURAL HISTORY SOCIETY
OF GLASGOW.

VOL. IV.

1878-1880.



GLASGOW: PUBLISHED BY THE SOCIETY,
AT THEIR ROOMS, 207 BATH STREET.
1881.

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PROCEEDINGS
OF THE
NATURAL HISTORY SOCIETY OF GLASGOW.

SESSION 1878-79.

THE TWENTY-NINTH ANNUAL GENERAL MEETING,
ANDERSON'S COLLEGE BUILDINGS,
SEPTEMBER 24TH, 1878.

Mr. James Barclay Murdoch, Vice-President, in the chair.

The Treasurer submitted his Annual Financial Statement, which showed a balance in favour of the Society of £73 13s. 5d.

The Secretary read the Report of the Council on the business of last Session. Since last Annual Meeting the death of four members had been recorded, viz., Mr. Charles Malloch, a life member; Mr. Thomas S. Hutcheson, Dr. James M'Pherson, and Mr. James Wingate, ordinary members. During the Session 26 members were admitted, one of whom paid the life composition, as did also four who were formerly on the roll. The total number of members last year was 150, and, making allowance for deaths, resignations, and removals, the roll at present numbers 166, being an increase of 16 since last Annual Meeting. No Special Meetings were held during the Session, but the eight ordinary Monthly Meetings were all well attended, and the business throughout was varied and interesting. Several important papers were read, and many specimens of interest were brought forward for exhibition. Full Reports of all the Meetings appeared in the *North British Daily Mail*, and the work of the Society was thus kept before absent members, as well as before those of the general public who might take an interest in Natural History pursuits. Part 3 of Vol. III.

of the Proceedings, embracing the work of last Session, being nearly through the press, will be in the hands of members by next Meeting, and, as it contains many original papers, it will doubtless be appreciated by the members. A beginning has been made with the Catalogue of the Fauna of the West of Scotland, the first portion of the Hymenoptera, by Mr. Peter Cameron, being included in the part above referred to, while other lists are in progress, for future issue. A series of nine excursions to places of interest was arranged for the recess, and two of these, taken in concert with the Geological Society in the early part of the season, were well attended; but the others set down for the summer months were not successful so far as attendance went, the members to a large extent being resident at the coast or in the country. The last excursion of the series, on 31st August, was successfully carried out, as there was a good attendance, and the day was fine throughout, although previously the weather had been wet and ungenial. The district chosen was Craigenglen, a small ravine or glen of erosion, of about a quarter of a mile in extent, running north and south along the southern slope of the south hill of Campsie, and about a mile and a quarter north of the village of Torrance. The glen has been long known to and often visited by members of the Natural History Society and Geological Society of Glasgow, on account of the abundance and variety of the Carboniferous limestone fossils obtained from its strata, and from the excellent state of preservation in which many of the specimens are found. The strata here exposed belong to the lower limestone series, and in the neighbourhood of the glen, as well as at other points along the south hill, the limestone and coal of the Campsie and Hurlet series were at one time extensively worked, both by open cast quarries and by mining the strata into the hill; but of recent years little or nothing has been done in developing the mineral wealth of the district. It is to be hoped, however, that the new Kelvin Valley Railway, which passes through the village of Torrance, little more than a mile south of the old workings, will be the means of inducing the resumption of operations, as it will afford an easier and cheaper method of transit to the centres of industry than that by which the traffic was formerly carried on.

Besides the coal and limestone referred to, the clay-band ironstone in the banks of Craigenglen was worked by mining in the earlier years of the present century, and from the fossiliferous

shales in connection with the ironstone a rich harvest of organic remains was formerly obtained in the old shale banks and in the bed of the stream. So abundant were crinoid stems then that the stream was known to the people of the district as the "witch whorl burn," these remains being known in various districts of the country as pulley stones, screw stones, fairy stones, or St. Cuthbert's beads, before their real organic structure was understood. Of recent years these fossiliferous shale banks have become very much overgrown by whin, thorn, broom, and rose bushes, as well as by grass and herbage, and few good exposures of the shale are now to be seen; still, by digging into the banks, by examining the bed of the stream, or by washing the weathered shale for the smaller organisms, many interesting specimens are yet to be found by the patient investigator. Upwards of 150 species of Carboniferous fossils have already been recorded from the strata of Craigenglen, the list having been much enriched during recent years by members of the Society in their search for the microzoa of these old deposits. All the groups of fossils characteristic of the limestone districts of other portions of Scotland are represented in the strata of the glen to a large extent, while the number and variety of spiral or univalve shells in a fine state of preservation has seldom been equalled in any other beds of the same age.

In connection with the marine deposits of Craigenglen, it was pointed out by Mr. John Young, F.G.S., that here there are alternations of fresh-water deposits with those formed or laid down over the old sea bottoms, the fresh-water beds being characterised by the absence of marine organisms and by the presence of entomostrea, and fishes, found in similar strata in other portions of the Scottish coal-field; such alternations of marine and fresh-water conditions implying extensive upheavals and depressions of the earth's crust during the formation of the limestone series.

Craigenglen having a southern exposure, and being sheltered from the east and west winds, affords a fine field for the botanist. In the early months of the year the slopes are brilliant with a profusion of primroses and other spring flowers, and farther in the season the Adders-tongue fern, *Ophioglossum vulgatum*, may be found in abundance on the eastern bank. A distinctive feature of the glen is the profusion of rose bushes, which flourish more particularly on the right bank, the prevalence of *Rosa villosa* imparting a striking and picturesque aspect to the view. The long, straight stems of

this species, measuring six or seven feet, profusely loaded with the fully ripe fruit—of a rich red colour, globose form, and large size, in many instances having a circumference of nearly three and a half inches—arrested the attention of the members, such a fine display never having been observed before.

This locality presents a favourable field for the investigations of the entomologist, the shady nooks and quiet resting-places of the glen affording suitable shelter for the objects of his pursuit.

Several captures of spiders, &c., were made, and, after some points of interest were explored, the party proceeded to Torrance Hotel, where dinner had been provided, and where a happy and instructive evening was spent.

The Librarian reported that during the Session the library had been made good use of by the members. The books were all in good condition, and the volumes requiring it had been bound. Eight volumes had been added by donation; in exchange with other societies, fourteen complete volumes and about fifty parts of Transactions; while six volumes had been purchased. Eleven societies were added to the exchange list, among them being some of the most important on the Continent and in America.

The Reports were all approved of and adopted.

The following gentlemen were elected office-bearers of the Society:—Professor John Young, M.D., F.R.S.E., &c., President; James Barclay Murdoch, John Young, F.G.S., and John A. Harvie-Brown, F.Z.S., Vice-Presidents; Robert Mason, Secretary; Robert J. Bennett, Treasurer; Henry C. Young, Librarian; D. Corse Glen, C.E., F.G.S., Francis G. Binnie, George J. Combe, Archibald Robertson, David Robertson, jun., Joseph Somerville, John M. Campbell, Arthur Pratt, and John Kirsop, Members of Council.

Messrs. D. M. Fleming and F. Fergus were elected ordinary members of the Society.

SPECIMENS EXHIBITED.

Mr. James Coutts exhibited a fine large branching specimen of one of the Alcyonoid Corals, belonging to the *Gorgonidae* family, from the collection of Mr. George Thomson, of Victoria, Western Africa, one of the Society's corresponding members. In this species the cortical layer is of a brilliant orange colour, the polype cells being of an oval shape and placed on the top of small wart-like

tubercules. According to Professor Dana, the colours of the cortical layer in all the alcyonoid corals, which may be orange, crimson, scarlet, or purple, are due to the colour of the minute calcareous spicules of which it is composed, and which form beautiful and interesting objects for microscopic examination.

Mr. John Young, F.G.S., showed a number of specimens of *Sphaeria*, a parasitic fungus which attaches itself to the head of the caterpillar of one of the lepidoptera. As the fungus grows it roots itself in the body of the insect, which it ultimately destroys, rising as a narrow stem to the height of two or three inches. It is stated that this parasite presents a rather curious appearance as a crop of them is seen springing from the ground where the caterpillars have buried themselves. It is collected by the Chinese, who use it as a medicine, for which a high price is paid.

Mr. John Kirsop brought forward a series of specimens of Silurian and Devonian corals, &c., from Torquay and Bristol, on which some remarks were made by Mr. James Thomson, F.G.S.

Mr. Walter Burns exhibited a collection of fossils obtained from the calciferous or cementstone beds near the Heads of Ayr, the remarks on which were postponed until the following meeting.

PAPER READ.

On a Group of Fossil Organisms termed Conodonts. By
MR. JOHN YOUNG, F.G.S.

The writer said that these forms had recently been discovered in the Carboniferous limestones of the Ayrshire coal-field by Mr. John Smith, of the Eglinton Ironworks, Kilwinning, a gentleman who has done much good work during recent years in the collecting of the minuter forms of life which had been deposited over the Carboniferous old sea bottoms. Mr. Smith having kindly forwarded his specimens for examination, he had taken the opportunity of bringing them before the members of the Natural History Society, that this interesting discovery might be recorded. The organisms termed Conodonts are minute, slender, conical, tooth-like bodies, of varying forms, of a brownish colour, and having a glistening or enamelled appearance. They were first brought under the notice of geologists in 1856, by Dr. Pander, in a work descriptive of the fossil fishes of the Silurian formation in Russia, in which country they are found ranging from the upper Cambrian

to the Carboniferous deposits. In America they have also been discovered in the Devonian and Carboniferous formations, Professor Newberry having figured and described a number of Carboniferous forms in his work on the Palaeontology of Ohio. In Britain no remains of Conodonts seem to have been noticed in the strata of the several formations previous to this discovery by Mr. Smith, but it is very likely they will yet be found on a more careful examination of the beds. These Conodonts are found in both the lower and upper limestones of the Ayrshire coal-field, upwards of thirty forms having been already discovered, and the number will probably be increased by further researches in the deposits.

Mr. Young stated that he had recently the opportunity of submitting Mr. Smith's specimens to a Canadian Palaeontologist, Mr. Jennings Hinde, when on a visit to this country, and he stated that they were closely related to the American forms, especially to those that Professor Newberry had described from the Carboniferous strata. Although these curious tooth-like organisms have now been known to Palaeontologists for more than twenty years, great doubts still exist as to what group of animals they belong. Dr. Pander, their first discoverer, thought they were the teeth of a group of cyclostomatous fishes allied to the present Lampreys. Professor Owen doubts their fish affinities very much, and says some of them may be the dentated claws of small crustaceans; and that others may be the tooth hooklets or denticles of naked molluscs or annelides. No undoubted fish remains are at present recorded from strata older than the upper Silurian, so, if Dr. Pander is right in referring them to fishes, as Professor Newberry thinks he is, fish life will have to be carried forward to much earlier strata, namely the Cambrian. In the Ayrshire limestones yielding these Conodonts, remains of many genera of fishes belonging to the plagiostomous and lepidoganoid groups have been found. Many of these, especially the minuter forms, have not yet been determined, but amongst them it may be interesting to note the occurrence of the vertebral bones of small fishes, in the most beautiful state of preservation. If the Conodonts are yet satisfactorily proved to belong to the fishes, the vertebral bones may also belong to the same group. The Ayrshire Conodonts are obtained by washing the weathered limestone found in the fissures or nodular cavities of the rock; many of them being in a perfect

condition, and quite free from the matrix. They are mostly of a comb-like form, being serrated along one of the sides, as in a comb, with a row of teeth, often of unequal length and stoutness. Some, however, consist of single, round, hollow, conical teeth, tipped with a layer of clear enamel at their points. Few of the organisms exceed an eighth of an inch in length, many of them being much smaller. In this respect they agree with the Conodonts found in other countries. In the upper limestone series at Glencart, near Dalry, as well as at one or two other localities of the same district, Mr. Smith has discovered, along with the Conodonts, a new group of fossil sponges belonging to a different group from that of the *Hyalonema*, which he found in the lower limestone series at Cunningham Baidland, near Dalry. The silicious spicules of this new group of sponges from the upper limestone are of various types, as might be seen from the specimens exhibited; they are also all in excellent preservation. At present these forms were being examined by Professor Young and Mr. Young, who intend to bring them before the Society at a future meeting. In this same deposit Mr. Smith has also found an interesting group of small forms of molluscs, many of which are in a most beautiful state of preservation. Some of the univalve or spiral shells have their mouths quite entire, and several of them are of species not formerly recorded from the Carboniferous strata of the West of Scotland. The limestone in which the varied groups of organisms here recorded are found, is a hard, compact, fine-grained rock of a greyish colour. At its outcrop at Glencart the rock is eroded by weathering into curious nodular-shaped cavities of varying size, and it is from the rotted limestone found filling these cavities that the Conodonts and other organisms are obtained by washing.

OCTOBER 30TH, 1878.

Mr. John Young, F.G.S., Vice-President, in the chair.

Messrs. Edward Laurie Fogo and Thomas King were elected ordinary members of the Society.

The Chairman having referred to the death of Dr. Hugh Colquhoun, an honorary member of the Society, it was unanimously agreed, on the motion of Mr. James B. Murdoch, that a

notice of the event should be entered in the record, and a copy of that portion of the minutes sent to the family of the deceased, with an expression of the sincere sympathy of the members.

The members have heard with regret of the death of Dr. Colquhoun, who from the commencement of the Society until his retirement from Glasgow, actively interested himself in promoting its interests. He was one of eleven who were present at the first business Meeting, and for many years the minute-book shows that he was regular in his attendance. He was frequently engaged in bringing forward material for discussion; and, while botany and entomology were his favourite studies, he took an intelligent interest in all departments of natural science, as appears from often-repeated exhibitions of birds, shells, and other specimens, both native and foreign. When, some years after its establishment, the Society resolved to frame a catalogue of the flora and fauna of the Clyde Valley, Dr. Colquhoun drew up the list of Lepidoptera, an order to which he gave special attention.

He took a deep interest in the formation of the library, and was the donor of some of the most valuable works which it possesses, among which may be named Sowerby's "English Botany," in eleven volumes, and Stainton's "Natural History of the Tineina," in thirteen volumes. For many years he filled the office of vice-president, and on the retirement of Dr. Scoular from the president's chair he was unanimously elected to, and held this honourable position until he went to live at Bothwell, when he was made an honorary member. Being unable, from distance, to attend the meetings, he continued to take an interest in the Society's work, and at his own request was kept advised of its proceedings. Although not personally known to many of the present members, all must respect his memory as one who, during his long connection with the Society, exerted himself in promoting its prosperity and increasing its usefulness. Dr. Colquhoun died at Anchorage, Bothwell, on 24th September last.

SPECIMENS EXHIBITED.

Mr. Walter Burns gave his postponed remarks on the calciferous sandstone fossils he had collected last autumn from the group of strata found on the coast near the Heads of Ayr, illustrating them by an enlarged map of this portion of the county, taken from that of the Geological Survey. The organisms consist

of the remains of a Lepidodendroid plant, scales and teeth of apparently a species of Holoptychian fish, and Entomostracan remains. They are contained in a grey, flaggy micaceous sandstone of the series, somewhat similar to that enclosing plant remains of the same character at the Spout of Ballagan, in the Campsie Hills, from which beds Mr. Burns also exhibited specimens of plant remains in illustration of his subject.

The Chairman also showed some specimens sent by Mr. Denholm Young, the discoverer of the fossiliferous beds at Heads of Ayr. These consisted of clay ironstone nodules, containing a species of *Myalina*, and specimens from a thin band of *Spirorbis helicteres*. He stated that these strata would be found, on close examination, to yield a group of fossils interesting because of their close identity with many forms found in the same division of the Carboniferous strata on the Fifeshire coast.

Mr. James Lumsden, F.Z.S., read some notes communicated by Sir George Leith Buchanan, a corresponding member of the Society, on the occurrence for the second time on the banks of Lochlomond at Ross Priory, on 4th October, of the Wood Sandpiper, *Totanus glareola* (Linn.). Mr. Lumsden stated that, at the meeting of the Society, in October, 1872, he had exhibited a specimen of this species obtained at the same place by the same careful observer. The specimen now recorded was thought by Sir George, when first observed, to be a Dunlin, which shows that one well acquainted with birds may be mistaken in identifying the Wood Sandpiper at first sight, from its close likeness to other species. It is possible, therefore, that specimens may often escape notice, and may be of more frequent occurrence on the West Coast than is generally supposed. Mr. Lumsden stated that since 1872 he had not seen or heard of any certain occurrence of the Wood Sandpiper in the West of Scotland. About three years ago a specimen was reported to have been got in Argyllshire, but on such uncertain authority that it does not deserve record.

Mr. James B. Murdoch stated that, although several specimens of this bird are recorded from the East Coast, it was rarely met with in this district, and that in Gray's "Birds of the West of Scotland" only one specimen is recorded as having been got on the banks of the Clyde, opposite Bowling, in 1853.

The Chairman, in illustration of his remarks at last meeting of

the Society on the interesting group of organisms termed Conodonts, discovered by Mr. John Smith in the limestones of the Ayrshire coal-field, exhibited a series of beautiful plates of Silurian forms from Dr. Pander's monograph of this group, and which had been discovered in Russia in the older Palaeozoic strata. In the plates exhibited, which he owed to the president (Professor Young), he was much interested to find a very close agreement between many of the Silurian and Carboniferous forms of the Conodonts, several of the genera being identical, such as *Cordylodus*, *Gnathodus*, *Otenognathus*, *Prionodus*, and *Lonchodus*. Of these genera there are several species in Mr. Smith's collection which can hardly be distinguished by any difference in their external characters from the drawings of the Silurian forms. Mr. Young stated that, while Professor Owen was very doubtful about all of Dr. Pander's figures of these organisms being referable to the teeth of fishes, yet he believed that one or two of the above genera may have belonged to vertebrates. As the Carboniferous forms are associated with undoubted fish remains, he hoped that ere long their true nature would be identified.*

Mr. James Thomson, F.G.S., in remarking on the discovery of Conodonts by Mr. Smith, said it was one of considerable importance, and expressed his belief that ultimately these organisms would be found to belong to fishes.

PAPER READ.

Apiarian Observations during the successive months of 1878.

By MR. ROBT. J. BENNETT.

The weather during the months of January and February being exceedingly mild, much breeding went on, and stores were

* Since the above was communicated to the Society, Mr. G. Jennings Hinde, F.G.S., has read a paper before the Geological Society of London, entitled "Annelid Jaws from the Cambro-Silurian, Silurian, and Devonian Formations in Canada, and from the Lower Carboniferous in Scotland." In this paper the forms obtained from the above group of strata are referred to the jaws of errant Annelids, and are classified by Mr. Hinde, from their resemblance to existing forms, under seven genera, five of which are included in the family Eunicea, one in the family Lycoridea, and one among the Glycera. In spite, however, of this apparent resemblance to Annelids, great doubts were still expressed as to their true affinities.

greatly diminished; but March with its freezing blasts was a month of disaster which did more harm to the apiary in Scotland than can be remembered by the oldest inhabitant. From its beginning to its close scarcely a bee was on the wing, and, as in the previous month breeding had been going on rapidly, the bees being anxious to increase their numbers, the sudden change of weather prevented them from getting abroad. In these circumstances they were brought to the verge of destitution, and required to be liberally supplied with artificial food. On 2nd April it was found, upon examination of the hives, that two stocks had succumbed, while others followed at a later date, and generally great mortality prevailed. From correspondence with Apiarians in Scotland, it was estimated that 40 per cent. of the bees had perished. The first half of May was very favourable for ingathering, but by the middle of the month wet and boisterous weather set in, and another check took place. On 4th June an examination of the stocks showed breeding going on rapidly; by the 12th swarming had begun, and before the end of the month the apiary, which consisted of eight stocks, had increased to twenty. The fine weather of July was very favourable, and from the white clover blossoms honey was secreted in abundance; but by the middle of the month the heat became so intense that the clover was burnt up, and but for roses and other wild plants in flower the bees would have found it difficult to get a bare subsistence. In August the writer proceeded to London to attend the British Beekeepers' Show, and subsequently he visited Paris with the view of making observations, the result being that, in his opinion, Scotland is ahead of both capitals, the French observatory hives being simply deplorable, as no advance had been made since the former Exhibition. On his return, and on through September, he found all his hives in splendid condition, and after taking 200 lbs. of honey from the stocks, he was able to leave each of them with over 35 lbs. to put through the winter. Mr. Bennett gave some interesting information regarding hermaphrodites and fertile workers, the latter of which he had seen for the first time at Blantyre, in possession of Mr. Thomson. The bees having failed to raise a queen, were noticed to be paying marked attention to a worker, who deposited eggs, which in three or four days produced grubs, and in a short time beautifully marked drones emerged from the cells. In conclusion Mr. Bennett said that in

closing his remarks last year, he mentioned that it had been a year of famine, and hoped the coming one would be a year of plenty. These expectations had been fully verified, as during twelve years' experience he had never taken such an abundant harvest, nor had his bees in such splendid condition as when closed up for this winter.

NOVEMBER 26TH, 1878.

Professor John Young, M.D., F.G.S., President, in the chair.

Messrs. John Munro and Alexander Clerihew M'Intyre were elected ordinary members of the Society.

SPECIMENS EXHIBITED.

Mr. John A. Harvie-Brown, F.Z.S., showed a fine series of skins of northern birds, brought home by the late Arctic Expedition, and made some remarks regarding the variations between certain of them and specimens of the same species from Iceland. He also exhibited a fine specimen of the Esquimaux Curlew, *Numenius borealis*, which was shot in Aberdeenshire on 29th September last, and read a note from Mr. George Sim, Aberdeen, who had forwarded the specimen, giving detailed measurements, weight, &c., and noticing that the stomach contained crowberries, some flies, and a caterpillar.

Mr. James Coutts exhibited a specimen of the Touraco, *Muso-phaga gigantea*, forwarded from Western Africa by Mr. George Thomson, corresponding member. This genus of birds frequents the mountain ranges and perches on the highest trees; feeds on fruits, and is known locally under the name of Plantain-eater. The specimen exhibited was obtained on the high range of the Camaroon mountains, and has been presented by Miss Thomson to the Hunterian Museum.

Mr. James Lumsden, F.Z.S., exhibited a specimen of the Hoopoe, *Upupa epops*, shot at Kilmahew, Cardross, Dumbartonshire, on 1st November of this year. The Hoopoe has several times occurred in Scotland; various instances are recorded in Gray's "Birds of the West of Scotland," and since the publication of that work five or six more have been recorded. In England and Ireland it has also occurred, and is known to have bred at least once in the former. No doubt records of its breeding might

be more common, were it not that its marked plumage has often proved the cause of its destruction. It is found as a regular breeding species in the south and south-east of Europe, and north-east of Africa. In winter it migrates to the south of these regions, and is common in India at that season. In summer it seeks the north, and has once been found in Spitzbergen. According to Dr. Tristram, the Arabs have a superstitious reverence for the bird, and call it the Doctor bird, as they believe it possesses marvellous medicinal powers. Its head is an indispensable ingredient in all their charms, and in the practice of witchcraft. The Hoopoe is the Lapwing of the Bible, and is the bird mentioned in the unclean list given in Leviticus xi. 19 and Deuteronomy xiv. 18.

Professor Young exhibited mounted specimens and enlarged drawings of the silicious spicules of a new Lithistid sponge from the Carboniferous limestone of Ayrshire, on which he made lengthened remarks.

PAPERS READ.

I.—*On Rhynchopora, a Genus of Brachiopod Shells, new to Carboniferous strata.* By Mr. JOHN YOUNG, F.G.S., Vice-President.

The writer stated that he had discovered in the upper limestone series at Bowertrapping, near Dalry, a species of *Rhynchopora* new to Carboniferous strata. The genus *Rhynchopora* was established by Professor W. King, of Queen's College, Galway, for a species of Rhynchonillid shell, showing a distinct perforated structure, found in one or two places, in the Permian formation, on the Continent. This, the only previously known species of the genus, is now named *Rhynchopora Geinitziana*. Before the discovery of a perforated structure in this species, it was stated by Dr. Carpenter that no Rhynchonillid shell was perforated, and consequently the finding of perforations in what was then known as *Rhynchonella Geinitziana*, led to a warm and rather interesting discussion between Dr. Carpenter and Professor King, the former stating that only the inner layers of the shell in this species were punctate; while the latter asserted that the shell was perforated throughout its entire thickness. Mr. Young, finding the Carboniferous species to be distinctly perforated, sent an example of the shell to Mr. Thomas Davidson, F.R.S., Brighton, author of the great work on

“British Fossil Brachiopoda,” for determination. He, being likewise satisfied as to its punctate structure, sent on the specimen to Professor King, who writes that it is undoubtedly a new and second species of his genus *Rhynchopora*, and that he considers the Carboniferous species as an interesting discovery, confirming all that he had already written as to the structure of the Permian shell. It is proposed by Mr. Davidson, who will figure and describe Mr. Young’s specimen, to name the species *Rhynchopora Youngii*, in honour of the discoverer.

II.—*On Apteryx owenii of New Zealand and its Eggs.* By Mr.

JOHN A. HARVIE-BROWN, F.Z.S., M.B.O.U., Vice-President.

Regarding these specimens of this rare species, my friend, Mr. A. J. Grant, writes under date 22nd June, 1878, from London:—
“I will now tell you of a pleasant surprise I have in store for you. I have succeeded in securing for you one of the rarest eggs in the world, through my brother-in-law, Rev. H. Rutherford. He has been living on the West Coast of New Zealand for some time, where his parish is, and he succeeded in obtaining through the diggers specimens of the bird and egg of the Small Apteryx of the South Island. The egg is one of the first found, there being not more than one, I think, in the various museums of New Zealand. At any rate, both bird and egg are very rare, and I am sure you will value them. There was another egg in the nest, but the dog which found it broke it to pieces.”

In reply to a letter asking for further particulars, Mr. Grant obtained from the Rev. H. Rutherford an account of how the egg was found, which I transcribe here:—

“Sept., 1877.—I got the Kiwi’s egg from Michael P. French. He told me that he had gone some distance up Soldiers’ Gully—which is situated close to Reefton, west coast of Nelson Province, N.Z., about a mile from that town. He was walking along the track early in last September, when he heard his dog barking a little way up on the side of the low range, which is densely covered with birch bush. Arriving, guided by the sound of the barking, he found the dog scratching at the root of a birch tree, the hole at which he was working being about the size of an ordinary rabbit’s burrow. He put his arm in and found that the bird was sitting upon two large eggs. He drew one forth, but as he was getting

out the other, the dog made a spring and broke it with his paw. He then caught the bird, which, if not the very bird that you have, was one exactly like it. The man had three of them skinned, and he did not know for certain which of the three it was that he got the egg from. So his mate, Robert Wolf, told me. The hole was 3 or 4 feet long, soft at the end, with a small quantity of leaves or fibres, or perhaps just the dry vegetable mould, which is very deep round these birch trees." So much for the Rev. Mr. Rutherford's letter.

I am not prepared at present to state how many specimens of the egg of *Apteryx owenii* exist in museums in this country or elsewhere, but possibly before long I may gain further information on this point. The specimen during transmission has suffered a slight fracture of the bill, but is otherwise perfect.

III.—*On the Birds of Iceland.* By MR. GEORGE A. BURNS.

During the past summer I formed one of a party which went on a yachting expedition to Iceland—a very novel and interesting cruise; but as we were only there a short time we had not the opportunity of doing much in the way of Natural History. Still we were able amongst us to make some observations upon the birds we met with; and from what we saw, and from what I have read, I am convinced that many birds which do not breed in this country, except in one or two islands of the Hebridean and Shetland groups, and others which are only rarely met with as occasional visitants, will be found breeding regularly, and perhaps numerous, in Iceland. In the list of birds noticed by us are several which are considered as prizes if met with in this country, and yet they all seemed common enough in Iceland. This list included the Wild Swan, the Arctic Skua, the Long-tailed Duck, the Pintail Duck, the Whimbrel, the Raven, the Redshank, the Snipe, the Golden Plover, the Meadow Pipit, the Red-necked Phalarope, the Snow Bunting, the White Wagtail, and the Stonechat. Of these the Whimbrel was one of the commonest—so much so that we were wearied by its constant cry from every cairn and heap of stones. The coasts (especially those in the north) swarm with sea-fowl of every description, and most of the islands seemed to be thronged with the Eider Duck, which is not allowed to be shot under penalty of a heavy fine. About the Lake of

Thingvalla the sportsman and naturalist would be sure to find almost every variety of duck, as well as all the birds I have mentioned. The Ptarmigan is almost the only game bird in Iceland, but is, I believe, nearly as common as grouse in Scotland. One cannot help being struck by the entire absence of blackbirds, thrushes, robins, and our other "feathered songsters." This, I think, may be partly accounted for by there being no trees in the island for them to nest in, and it will have been noticed that all the birds already mentioned are of species which lay their eggs on the ground or in rocky cliffs.

The birds which I exhibit to-night have all been met with more or less frequently in Scotland, though only one or two have been found breeding with us. The Greenland Falcon (*Falco groenlandicus*) is undoubtedly the finest of all the falcon tribe, and has always been in great request for the sport of hawking, £20 being the usual price for a young bird. They breed freely in the northern parts of Iceland, but their nests are very difficult to get at, owing to the precipitous and inaccessible nature of the rocks they select. It seems to be generally considered that the lighter the colour the older the bird, but possibly it may have something to do with the season at which they are taken. A skin brought home by another of our party was that of a smaller bird, considerably darker in colour. The food of the Falcon is said principally to consist of ptarmigan, curlews, hares, guillemots, puffins and other sea-fowl. My next two birds are common with us, but still more so with the Icelanders. The Goosander (*Mergus merganser*) is often found in our district, and may be seen almost every year on the Cart, near Glasgow. The Great Northern Diver (*Colymbus glacialis*) is also found in the West of Scotland, but is more common the farther north you proceed. My next curiously-marked specimen, the Harlequin Duck (*Anas histrionica*), is even a greater rarity than the Falcon, not above half a dozen specimens having occurred in Great Britain. They are said to be as common in Iceland as any other varieties of duck. Their nests are similar to those of the Eider Duck, being lined with their own down, although not of such a fine quality as that of the latter species, nor in sufficient quantities for exportation. My last bird is a specimen in mature plumage of Richardson's Skua (*Lestris richardsonii*), one of the well-known sea pirates, and the dread of the gulls. The only thing to notice about it is the dusky black of its feathers, there being

no trace of the white or yellow which is generally seen on the breast and neck of this species. The legs and feet are also all black, whereas, at an earlier period of the bird's existence, they are blotched with yellow.

JANUARY 7TH, 1879.

Mr. James Barclay Murdoch, Vice-President, in the Chair.

Messrs. John Guthrie Smith, John H. Fash, Alexander Smith, John Jex Long, and Archibald Drummond were elected Ordinary Members of the Society.

SPECIMENS EXHIBITED.

Mr. Jas. Lumsden, F.Z.S., exhibited a specimen of the Spotted Crake, *Porzana maruetta* (Leach), shot at Aberuthven by Mr. Graeme, of Inchbreakie, on 7th October last, and sent for exhibition by Mr. P. D. Malloch, of Perth. Mr. Lumsden read some notes from Mr. Harvie-Brown regarding this species, who also forwarded skins of the Water Rail and Little Grebe. Both of these species were said to be remarkably abundant this season, Mr. Malloch having got as many as seventeen of the former in one day, while the Grebe has been common on our streams during the frost so long as the least bit of open water remained.

Mr. D. M'Lellan exhibited specimens of the Hornet Clearwing, *Sesia apiformis*, with its larva and chrysalis, and a vertical section of the Willow, *Salix caprea*, from Kelvingrove Park, showing the injury which this insect inflicts on the tree. The larvae feed on the solid wood to such an extent as in many cases to cause the death of the tree. They form a tunnel of considerable length in the trunk or branches, living concealed for two years, eating upwards, and, when fully fed, spinning a tough cocoon and emerging as a perfect insect in midsummer. Unlike most others, the moths of this genus—of which there are a dozen species—are true lovers of the sunshine, and while sporting among the flowers are apt to be mistaken for bees, wasps, or other hymenopterous insects. Although not rare, they are local in their habits, and, when they get into a well-wooded locality, are very difficult to eradicate.

Mr. M'Lellan also showed a portion of the trunk of a beech tree which had been cut down in Glasgow Green. Upon splitting up

the lower portion of the stem there was exposed, about midway between the centre and outer bark of the tree, the initials of a name, with the date 1810, as distinct as if newly cut.

From the conversation which ensued it seemed to be the unanimous opinion of the members that the letters had been cut into the wood through the bark, which had afterwards closed, and allowed of a yearly addition to the trunk, the space between the letters and the exterior being about nine inches.

Mr. John Kirsop exhibited a specimen of *Claytonia alsinoides*, from Dumfriesshire, forwarded by Miss Johnstone, Solsgirth. This American plant is now getting very generally diffused over the country, examples of this species having been found at Gourrock and Rothesay. It has not been admitted into any British Flora until recently, when Dr. Joseph Hooker gave a place in the Student's Flora to *C. perfoliata*, which he says occurs too frequently to be omitted, and he includes it in the order Portulacaceae. Mr. Kirsop also showed a portion of the spike of *Xantheria kingiana* from New Zealand, a plant belonging to the Typhaceae, or some closely-allied order. The two species of *Typha* which occur in this country are small in comparison with the New Zealand specimen, the spikes of which, when entire, would probably measure about two feet in length. These plants are commonly misnamed bullrushes, the proper name being Reed Mace or Cat's-tail, the spikes closely resembling an angry cat's tail. The roots are farinaceous, and bread is made of the pollen by the natives of New Zealand.

Mr. John Young, F.G.S., exhibited some large and well-preserved specimens of fossil ferns, from the new pit at Bothwell Station, which is being put down by Messrs. Baird & Co. through part of the upper coal measures of the district, to the valuable seams of coal which lie about 200 fathoms below the present land surface. Mr. Young stated that the strata passed through in the upper portion of this pit consist of beds of reddish sandstone, reddish-gray shale, gray fire-clay, dark gray shale, grayish-white sandstone, and one or two irregular thin seams of coal. The plant-bearing beds in this pit lie 700 feet below the surface, but in a much higher geological horizon than those beds yielding plant remains in other districts of our coal-field, chiefly the roof shales that overlie some of the lower workable seams of coal. On a visit to the pit last autumn the secretary and himself had found the remains of the following plants in the fire-clay and gray sandy shales, viz.:—

Stigmaria ficoides with the rootlets attached, *Calamites arenosus* in an erect position in the shade, along with one or two crushed fragments of *Calamites nodosus*, and *Pinnularia capillacea*, the supposed roots of *Calamites*. The species of ferns noted were *Alethopteris heterophyllia*, *Neuropteris gigantea*, *Sphenopteris latifolia*, the latter found in large fronds, and seeming by its abundance to be the characteristic fern of the strata, and *Sphenopteris artemisiaefolia*. Of this very rare fern only one beautifully preserved frond was found in the sinking of the pit, and the sole other record of the species in our strata is from the roof shales of one of the coal seams at Airdrie, where it is rare. Mr. Young stated that he was indebted to Mr. Samuel Adair at the pit for kindly presenting a large series of specimens of the various species to the Hunterian Museum.

PAPER READ.

Observations on the Swollen Condition of Carboniferous Crinoid Stems. By Mr. R. ETHERIDGE, Jun., F.G.S., of the British Museum, Corresponding Member. With two Plates (I. and II.).

1. INTRODUCTION.

The enlargement visible in, and the injuries sustained by, the stems of Crinoids during Palaeozoic times, do not appear to have excited much curiosity amongst naturalists and palaeontologists. Indeed, the same remark applies to the Crinoidal remains of other geological periods, and, so far as I am aware, to those of the present day. I believe that this will prove a fruitful branch of study in the future. In the present communication I purpose placing on record a few personal observations made on the stems of Carboniferous Crinoids during the last few years, whilst engaged in palaeontological work on the Geological Survey of Scotland, and lately on specimens contained in the British Museum collection. The more apparent characters visible will only be touched on at present, as I wish to reserve the more purely microscopical details for a future communication.

2. HISTORY.

Before proceeding to describe the specimens, it is but right that attention should be drawn to the views held, and facts recorded by the comparatively small number of authors who have touched upon

this branch of study, whether having reference to Carboniferous species or those met with in younger rocks.

1793.—One, the first to notice these injured Crinoid stems, the Rev. David Ure, in speaking* of the Crinoidal remains collected by himself in the Rutherglen neighbourhood, says, “Some” (*i.e.*, the stems) “appear to have been wounded in a recent state. This is indicated by an unusual swelling, which in every case exhibits a large and deep puncture, probably the cause of the swelling.” This notice is accompanied by a figure representing† a portion of a column, irregularly swollen, and towards one side a laterally elongated puncture. Ure’s figure may be taken as a typical example of this condition of stem amongst Carboniferous Crinoids.

1820.—Baron Von Schlotheim gave a figure of a portion of the stem and calyx of the characteristic secondary *Encrinites mespiliiformis*,‡ the Bradford Encrinite of Parkinson. In this case the column is regularly and gradually swollen, but there is no evidence of any injury or puncture.

1821.—Mr. J. S. Miller, in his *Natural History of the Crinoidea*§ enters on the present subject somewhat fully. He gives a good figure|| of an enlargement of the stem of the common Carboniferous Crinoid, *Poteriocrinus crassus*, and ascribes it to a rapid secretion by the animal to repair an injury sustained through the loss of a side-arm. He says: “Its column has sometimes numerous joints swelling gradually out, and thus giving it a barrel-shaped appearance, generally pressed in on one of its sides, and becoming there concave, with a central perforation, evidently leading to the alimentary canal. This has all the appearance of a cicatrized wound, and as the alimentary canal in the column is not increased, the swelling can only arise from a more rapid secretion from these joints, probably to strengthen it, and to compensate thus for the injury probably sustained in one of its auxiliary side-arms. The cavity before mentioned was probably produced by the loss or separation of the injured auxiliary side-arm from the column, and the subsequent cicatrizing of the wound.¶ In addition to this illustration, Miller also gave figures of a peculiar condition in the stem of *Actinocrinus dactylus*.** “The column sometimes exhibits

* *The History of Rutherglen and East Kilbride*, 1793, p. 324.

† *T.* 18, f. 1.

‡ *Die Petrefactenkunde*, 1820, atlas, t. 29, f. 5.

§ Bristol, 4to, 1821.

|| Plate facing p. 68, p. 18.

¶ *Loc. cit.*, p. 69.

** *Actinocrinus*, t. 6, f. 17 and 18.

a swelling out of several joints, and a lateral concave depression with a centre perforation, as in *Poteriocrinites crassus*.”* One very strange figure of Miller’s may be referred to here—where a section of a portion of a column is shown with an exudation proceeding from the central canal and collecting on the exterior of the stem as a rounded encrusting mass.† Although not strictly analogous to the swellings at present under consideration, it is probable that it may bear some relation to them, and will be considered later on. Miller describes it in these words: “A calcareous secretion has sometimes exuded on this part, surrounded the column, and concealed its articulation, forming an inorganic investing mass, as appears on examining transverse fractures. This exudation sometimes swells out into large knobs.”‡

Finally, Miller reproduces Von Schlotheim’s figure of the swollen stem of *Encrinites mespiliformis*.§

1823.—Von Schlotheim’s addition to his previously quoted work contains another figure of a swollen stem of *Encrinites mespiliformis*,|| and he reproduces Miller’s figure of the perforated and enlarged stem of *Poteriocrinus crassus*.¶

1843.—The Messrs. Austin, in describing the stem of *Poteriocrinus crassus*,** made the following remarks on the subject:—“Miller was the first to observe the injuries which the columns of this species so frequently suffered. The effect of most of these mishaps, as presented to our notice, is a gradual swelling out into an unsightly protuberance of several consecutive joints, with a considerable concavity on one side. This concavity has evidently been produced by the violent extraction or severance of an auxiliary side-arm from the column, and the Crinoid, in its endeavours to repair the injury and strengthen the wounded part, has, by a rapid and more profuse secretion of calcareous matter, enlarged the joints above and below the severed member, and at the same time closed in the orifice which communicated with the columnar canal.” A similar figure†† to that of Miller is given by these authors, and also a smaller one‡‡ showing much the same effects. The statement that Miller was the first to observe such injuries requires modification, because it is probable that Ure’s figure represents a specimen of *Poteriocrinus*

* P. 96. † F. 26. ‡ p. 97. § Plate facing p. 114, f. 17.

|| *Nachträge zur Petrefactenkunde*, abth. 2, 1823, t. 23, f. 3d.

¶ *Ibid.*, t. 25, f. 2d.

** *Mon. Recent and Foss. Crinoidea*, 1843, p. 72.

†† T. 8. f. h.

‡‡ *Ibid.*, f. i.

crassus. Neither will the entire reference of the phenomena now under discussion to the severance of an auxiliary side-arm, and consequent repair, stand, for, allowing that it may and does result from this cause at times, I hope to show, later on, that the causes are of a very much more varied description.

1869.—An interesting and instructive paper by the late Mr. John Roſe, entitled “Note on the Cause and Nature of the Enlargement of some Crinoidal Columns,” appeared during this year.* In this paper Mr. Roſe conclusively showed that one amongst the many causes of enlargement of Crinoid columns arose from the attachment of a species of coral, *Cladochonus crassus*, (M'Coy) and the subsequent endeavours of the Crinoid to envelope its parasite (or epiphyte?) by the undue deposition of its substance. He further demonstrated that in this process of envelopment “the divisions of the ossicula of the column are carried round the intruder and show on the outside.” Very satisfactory figures accompany this paper—one,† a cross section, showing the coral and enclosing crinoidal matter, another,‡ a stem surrounded by a *Cladochonus*, in which the substance of the stem has not yet completely invested it. Mr. Roſe stated further, that a similar enlargement in a Bradford clay *Apiocrinites* was caused by the investment of a foreign substance.

1876.—We next come to a paper read before your Society—“Notes and Observations on Injured and Diseased Crinoids” (by a “Corresponding Member”)§—in which, as in the above paper, many interesting facts are recorded, but scarcely bear out, I think, the conclusions arrived at by the author, in their entirety. We are indebted to a “Corresponding Member” for the results of a study of numerous swollen stems from the Scotch Carboniferous rocks, from which it appears specimens in all stages of injury and repair were examined, from the much-mutilated condition of “two flattened sides, each perforated,” to one without “any evidence of disease except the swelling of the column.” The conclusions obtained from the above facts, as stated by a “Corresponding Member,” appear to be (1) That the joints or ossicles of the column are thickened, producing an elongation of the stem, and a modification of the surface ornamentation; (2) a straining of the parts

* *Geol. Mag.*, VI., 1869, p. 351.

† P. 352, f. 3.

‡ *Ibid.*, f. 2.

§ *Proc. Nat. Hist. Soc. Glasgow*, 1876, III., pt. 1, p. 91.

takes place around the perforation, and on the flattened side; (3) an irregular or contorted state of the restored portions is frequently to be observed. The deduction drawn by a "Corresponding Member" appears to be that, although admitting this appearance may be affected by the loss of a side-arm, and consequent repair of the injured parts, the chief reason is that of disease, arising "from an overstrain caused by forced flexion, or from idiopathic causes." He says: "Recalling to mind the phenomena attending necrosis, or caries, or even fracture, when defensive action is active, as well as the more rare instances of adventitious structure, formed to defend or support certain organs of animals against threatened destruction, and dismissing the idea of wound or puncture, how does the question rest?"

Freely admitting, as I do, that solitary instances of disease might be found and demonstrated amongst fossil Crinoidea, and again as freely admitting that the appearances under discussion are occasionally caused by the loss and repair of a side-arm, I cannot, at the same time, subscribe to the theory of disease so ably and in the sense advocated by a "Corresponding Member." The reasons for this difference of opinion will be found in the following descriptions of specimens—suffice it to say that I believe, with the exception of rare cases, the puncture and swellings visible on the majority of Crinoid stems are produced by a series of causes exterior to the will of the Crinoid, usually in the form of other organisms using the crinoid-structure as a means towards their own existence. Neither will strained flexure account for the phenomena, for it is now known that the stems of the Crinoidea will undergo this to an enormous extent without injury.

1878.—I am indebted to the kindness of my friend, Dr. J. R. S. Hunter, of Braidwood, for the loan of a second pamphlet by the same "Corresponding Member"—"Notes and Observations on Injured or Diseased Crinoids, &c."*—in which a still more elaborate and interesting array of facts are set forth. Several swollen examples of Crinoid stems are described, but do not now call for any special remark, except that the enlargement appears to be frequently accompanied by a straining of the stem. By far the most interesting portion of this communication is that on "Adventitious Structures on Crinoidal Fragments," in which is shown the

* *Proc. Nat. Hist. Soc. Glasgow*, 1878, III., pt. 3, p. 333.

method adopted by certain corals and polyzoa, of attaching themselves to living and dead Crinoid stems. In one case where a colony of *Chaetetes tumidus* had attached itself, the growth of the stem was apparently hindered and interrupted; for the stem beyond the edges of the cluster is enlarged, whereby the former is raised above the general level of the periphery, and enveloping, as it were, the coral. I give an exceedingly good figure of a similar occurrence (Pl. I. fig. 17, Pl. II. fig. 7), and shall return to the subject further on. A "Corresponding Member" also shows how the hole usually seen on these injured Crinoids is in one instance occupied by the root and part of the stem of a polyzoan.

3.—DESCRIPTION OF SPECIMENS.

As a rule we find the enlargement of Crinoidal columns, now under discussion, to consist of a gradual expansion of the stem at some definite point in its course. Generally the enlargement is gradual (Pl. I. figs. 1, 4, 6), the stem returning above the swelling to much the same diameter and shape as at the point below where the irregularity first manifested itself. Irregular and contorted enlargements are, however, met with (Pl. I. fig. 8); but cases of sudden expansion, so far as my own observation has gone, are rare. The chief modification appears to be, that one of the sides of the enlargement becomes flattened, and more or less concave (Pl. I. figs. 1 and 8), or, as pointed out by a "Corresponding Member," both may become so.* Of the former modification good examples are seen in the figures of Ure and Miller. Externally the separate segments or "ossicles" of the column undergo little or no change (except in one variety of swelling, to be more particularly referred to hereafter) beyond that necessary to assist in the general formation of the enlargement and some slight alteration in the surface ornamentation, as described by a "Corresponding Member." The same authority also noticed that a thickening of each ossicle took place, resulting in an elongation of the stem generally.

In very few cases which were not attributable to the loss of a side-arm have I met with a swelling or enlargement unaccompanied by an aperture or puncture, or the remains of one, at some point in the enlarged periphery. The best marked of these proved, on a section being made, to arise from such a course, but in the others

* *Proc. Nat. Hist. Soc. Glasgow*, 1876, III., pt. 1, p. 94.

no trace whatever of an opening could be detected. The specimens were small and could not be cut without destruction. Similar specimens are noticed by the before-mentioned authority.

The column at or about the aperture is usually flattened or impressed, or it may become quite concave. The opening is sometimes large and distinctly visible, at other times only represented by a mere dot (Pl. I. figs. 14 and 15); and again examples are before me in which its former existence is only indicated by a general depression of the surface. When well marked, the openings are either oval, oblong, round, irregular in form, or may possess a pinched appearance. The margins are usually rounded and directed inwards, but one case is described by a "Corresponding Member," where the hole had everted edges.* A good example of a small round, or circular, hole is shown in Pl. I. fig. 14, or fig. 15. The irregular form is seen in Pl. I. fig. 1, where the depression in which it occurs is much elongated vertically; or again in Pl. I. fig. 16, where the aperture is transversely elongated and much puckered at the corners, and with a gradual closing over of the substance of the stem. The holes arising from this irregular condition are also exhibited in a marked degree by those stems attacked by *Productus complectens* (mihi), Pl. II. figs. 2, 3, and 4.

As to the internal structure of these swollen stems, with the view of demonstrating this I have had prepared a number of cross sections of various stems, by means of which we shall be enabled to gain an insight, of a more or less complete nature, into the ultimate course and probable use of the apertures in question, and of the passages into which they lead.

It will be observed that in some sections (Pl. I. figs. 10—13) the holes lead into mere pockets, as it were, in the substance of the columns, and do not by any means reach the central canal. The pocket is itself frequently filled with a plug of calcareous matter (Pl. I. figs. 10, 11, and 12), but usually separated from the wall of the cavity by a thin, dark lining of matrix. This peculiar pocket-like opening has much the appearance of an inversion of the stem-wall, arising probably from its external rounded edges (Pl. I. fig. 13), which, in some instances at least, are produced by the subsequent growth of the stem to repair the injury done.

In other sections the apertures will be seen to lead directly into

* *Loc. cit.*, p. 94.

passages which communicate with the columnar canal (Pl. I. figs. 5, 7, and 9). The passages in question vary in length and form—they may be short, and without any form in particular (Pl. I. fig. 5), or they may be of some length, and distinctly funnel-shaped (Pl. I. fig. 7). An interesting and well-marked example lies before me, from Roscobie, contained in the collection of the Geological Survey of Scotland. The stem (Pl. I. figs. 1, 2, and 3) is a gradually enlarging one, and was cut at three different points, representing a space of $1\frac{1}{2}$ in. vertical. The middle section passed almost through the centre of the plug, and shows (Pl. I. fig. 3) the partially funnel-shaped passage leading to the columnar canal. The latter contains (Pl. I. figs. 2 and 3) a piece of black matrix (?) reposing against its further wall, and somewhat crescentiform in appearance. Both the upper (fig. 2) and lower section show the same black fragment extending upwards and downwards through the canal. It will be noticed that in this specimen the aperture is placed in a longitudinal depression, extending some distance up and down the stem. Pl. II. fig. 6 is a section of a small stem in the British Museum Collection from the English Carboniferous limestone series, and shows a remarkably straight and direct passage leading towards the central canal, but not reaching it. The passage dilates very slightly at its termination.

In the vertical section of another specimen in the British Museum Collection, an infilling of matrix marks the extent of the external opening leading by a more or less contracted passage to a small inner cavity filled with transparent calcite, and representing the object which had once dwelt within the Crinoid stem (Pl. II. fig. 8).

An attentive examination of any of the cross sections will show that, up to a certain point in the existence of the Crinoid, growth went on regularly and steadily; but if the outermost circular lines of accretion are followed round, it will be seen that, on arriving at the pocket, or passage, as the case may be, they curve inwards, following the latter, whereas those nearer the centre, on reaching the passage, simply abut against it. I believe the accretion lines with the inwardly curved termination to be simply those which were acquired by the column after the injury had been done, and the size of the aperture seen on the exterior of a column depends to a certain degree on the extent to which this process has gone. It is, of course, also dependent upon the original size of the aperture and passage.

With the view of comparing sections of stems possessing apertures and passages with those in which the branch canals leading to the auxiliary side-arms, and the mode of articulation of the arms themselves are exhibited, I have given two sections, one of them horizontal, and the other vertical (Pl. I. figs. 20—21). The marked difference between the articular sockets in these and the pocket-like apertures in Pl. I. figs. 10, 11, 12, and 13 is at once apparent. There is a nearer approach to them in the aperture and passage seen in Pl. I. figs. 5 and 7, but I do not think it is sufficiently strong to warrant us in concluding that these holes on the exterior of Crinoidal columns, and the passages leading from them, are merely the enlarged sockets of the auxiliary side-arms and the branch canals connecting them with the large columnar canal.

The examination of a large number of injured and enlarged Crinoid stems, and sections made from them, has led me to the conclusion that they may be provisionally placed under one of three heads, viz.:—

1. Those in which there is no trace of aperture or canal, but simply an enlargement of the column—the cause of the latter being sometimes present and apparent, at others not.

2. Those in which the aperture is usually round, or oval, leading into a short pocket-like cavity, and not communicating with the central canal.

3. Those in which the aperture is more or less irregular, leading into a similar passage placed in connection with the columnar canal.

4. AGENTS AND INFLUENCES WHICH PRODUCE THE ENLARGEMENT OF CRINOIDAL COLUMNS.

There can be no possible doubt that, in a large number of cases, enlargement is produced originally by the external attachment of bodies to the stems, foreign to the life and well-being of the particular individual attacked. Of this nature there may be enumerated—

1. *Cladochonus crassus* (M'Coy).—This coral has been satisfactorily shown by the late Mr. Rofe to attach itself to the stems of Crinoids, and to produce in them some very extraordinary examples of distortion. I have had an opportunity of examining Mr. Rofe's types, now in the British Museum, and can bear testimony to the accuracy of his descriptions in the *Geological*

Magazine. Mr. Rofe's specimens are supplemented in the National Collection by many others from the Derbyshire limestones, all pointing to one conclusion, that the coral in question was one of the most important agents in affecting distortion and enlargement in the Crinoid columns of the Derbyshire and Yorkshire Carboniferous area. Some idea of this may be formed when I say, that I have now before me more than fifty well-marked examples. In Pl. II. fig. 12^a may be seen the end of a stem with the petaloid canal, and the articular crenulations of the ossicle there exposed quite normally. Within the space of about eight or nine ossicles, or one inch vertical, the diameter has increased from seven lines, the measurement at the smaller end, to eleven lines, or nearly one inch, the actual breadth of the original stem at this point (Pl. II. fig. 12), exclusive of the coral and subsequently deposited matter, being as near as possible six lines. The individual had therefore increased in thickness on each side of the stem, through the action of the coral, between two and three lines. The action of the *Cladochonus* in attaching itself to the Crinoid stem is peculiar and characteristic. After the first attachment was made, it evidently grew laterally right and left, throwing off its bud-like calices, and ultimately surrounding the stem, as it were, with a band or belt (Pl. II. fig. 11). By this means a series of projecting corallites were left standing out from the stem like the spokes of a wheel from the axle, and in overcoming and surrounding which the Crinoid deposited sufficient substance to cause the swellings we are now investigating. The amount of the envelopment varied in different specimens. In some complete investment has taken place, in others partial enclosure only has gone on, whilst, in a third example, the apertures of the calices of the coral only are left. In this state the true nature of such openings is not easily decipherable, and it is only on making these microscopic sections that the cause becomes apparent. On examining such a section (Pl. II. figs. 13 and 14), it will be observed that complete encircling of the stem has taken place, the corallites all being connected by a common tube. From this it follows that the enclosing growth of the Crinoid took place from above or below, or both. The stems infested with *Cladochonus* appear to have experienced great inconvenience from its presence, if we may judge from the contorted, gnarled, and uncomfortable appearance most of the specimens

present. To give some idea of the work devolving on a Crinoid, consequent on the attachment of this coral, the following measurements of the two largest specimens which have come under my notice (in the British Museum) may be taken:—The original stem at the point measured was five lines in diameter: as now seen, with the additional secreted matter surrounding the *Cladochonus*, the diameter is one inch five lines, and the circumference four inches seven lines. Another almost equally large stem originally measured four lines—in its present state the diameter is one inch one line, and the circumference three inches eleven lines. There is in this specimen one of the ordinary circular apertures which lead directly into the calice of a *Cladochonus*.

It is a curious fact that most of the examples which have come under my observation from Derbyshire or Yorkshire are caused by *Cladochonus*, although there are a few good specimens of the passage leading direct to the columnar canal from these localities, in the British Museum (Pl. II. figs. 1 and 6). I have not succeeded in obtaining any clear evidence of enlarged Crinoid stems, arising from this cause, occurring in Scotch Carboniferous beds, although there is no reason why they should not, as *Cladochonus* occurs plentifully at certain localities.

Before closing this portion of our inquiry, it may perhaps be well to refer to some peculiar specimens also in the British Museum Collection (Pl. II. figs. 16 and 17), but which differ greatly in appearance from the true *Cladochonus*-infested stems. Those now under consideration have the whole surface riddled with circular holes, without showing any signs of enlargement. The apertures are arranged roughly in cycles, apparently following the line of demarcation between the ossicles composing the stem, and vary much in size. When very prevalent and close together they impart to the Crinoidal column a bitten and decayed appearance, changing its whole aspect. In some instances, where less weathered, one of the margins appears to project more than the others. So far, sections have not revealed any satisfactory solution of this peculiar appearance, for the apertures do not appear to lead any distance into the stem, but are merely superficial.

2. *Favosites parasitica* (Phillips)—The Rofe Collection (British Museum) contains a Crinoid stem, with a colony of this coral attached, occupying a central position on the stem, the latter having become swollen above and below it, thus leaving the

Favosites between two enlargements of Crinoidal matter—an upper and a lower (Pl. II. fig. 7). Round the edges of the coral can be seen a gradual closing-in of the substance of the stem, similar to that seen in Pl. I. figs. 16 and 17.

3. *The Stems of other Crinoids*.—The diligent collecting of Mr. James Bennie, of the Geological Survey of Scotland, has brought to light a number of intertwined and tangled stems from the Carboniferous limestone series of Dunbar. By means of these small specimens we are made acquainted with the fact that attachment of one Crinoid stem with the other took place in a most complete manner. By what means, and from what cause union first took place we are unable to say, but this having been effected, one, and sometimes both individuals, set to work to absorb or envelope one another, by the deposition of matter round about and over its offending neighbour, until the one had wholly enclosed that portion of the other lying across its stem, had only partially done so at the expense of considerably enlarging itself, or had finally formed, with the aid of others, an irregular and confused mass of Crinoid stems.

Polyzoa.—A “Corresponding Member” has already pointed out the manner in which Polyzoa and their roots become attached to Crinoid stems. By the aid of an exceedingly instructive specimen, from Roscobie, obtained by Mr. James Bennie, and now in the Collection of the Geological Survey of Scotland, I am in a position to show how even these delicate organisms can be the cause of enlargement in Crinoidal columns. In Pl. I. fig. 16 the usual polyzoal incrustation, which in this particular case appears to be a species of *Archaeopora*, has been gradually overlapped at its edges by the substances of the stem, and encroachment has taken place for some distance. The expanse occupied by the network must have been of some size, judging by the dimensions of the present depression in the stem. The manner in which the enclosure has taken place, with the obtusely rounded edges of the overlapping Crinoidal substance, is quite perceptible, together with the grooving or puckering left by its advance.

Productus complectens (mili). As one of the causes of enlargement of Crinoid stems, we must take into consideration the action of the peculiar little brachiopod I described some time ago under the above name.* A large number of small Crinoid stems were met

*“On an adherent *Productus*,” &c., *Quart. Jour. Geol. Soc.*, 1875.

with in the neighbourhood of Dunbar, by Mr. James Bennie, with small bodies attached to them in various stages of development, which proved on investigation to be a new form of *Productus*. In the younger conditions attachment took place by the spines of the ventral valve clasping the object to which the brachiopod adhered, but as development progressed the whole surface of the valve became united to the Crinoid stem. Had matters remained in this state, all well and good, we should merely have had a species of a genus not hitherto supposed to be adherent showing signs of it. "Attachment took place during the life of the Crinoid; for in nearly every case where the *Productus* remains adhering, we find that its rate of growth was less than that of the Crinoid, the result being that the substance of the latter surrounded or enclosed its parasite, first the encircling spines disappearing and gradually the shell. We have specimens showing this remarkably well in all stages of the process, from the mere absorption of the spines by the substance of the Crinoid, up to the total disappearance of the *Productus* itself, when the Crinoid stem assumes a swollen or distorted appearance."* In my paper on this subject, and from which the above extract is taken, I gave a figure† of a Crinoid stem completely surrounded by the grooves caused by the tightening spines, and which will afford some idea of the irritation which must have been set up in the Crinoid stem by their unwelcome presence. *P. compectens* is perhaps one of the best examples of the cause of enlargement in the columns of Crinoids, because, from the exceptional advantage of possessing many individuals, it has been possible to trace onwards and prove the process from the earliest stage to the point where we have presented to us only a swollen and distorted stem.

The foregoing examples may be taken as illustrating the manner in which the enlargement of Crinoid stems is produced by the external attachment of extraneous bodies, which afterwards become internal through the rapid and extra secretion of Crinoidal substance around them.

We have now to examine a different set of agents occupied in this process, those which, working from the exterior, penetrate the stem, and there, setting up local irritation, probably cause an unusual secretion of the substance of the stem, giving rise to the swollen or enlarged appearance.

* *Loc. cit.*, p. 460.

† T. 34, f. 12.

1. *Sponges*.—I have not as yet obtained any definite information of the ravages of this class, although I fully anticipate that indications of their presence will ultimately be met with. That burrowing sponges (? of the *Cliona* type) existed in the Carboniferous seas is, I think, abundantly proved by the condition of the shells of our common *Chonetes*, which at many localities—*e.g.*, East Barns, near Dunbar, and Roscobie quarry, are met with, riddled with passages and galleries of peculiar form, resembling those of sponges in shells of the present day. These I have briefly noticed elsewhere,* and I would recommend this branch of the enquiry to those possessed of material likely to yield good results.

2. *Annelida*.—An interesting specimen, found by Mr. James Bennie, leads me to think that in all probability Annelides took some part in these enlargements. Examine Pl. I. fig. 18 attentively: at the extreme edge of the large fractured surface will be seen two small holes in the Crinoid stem—the larger of which, when highly magnified, will be seen to be filled by a small black tube of shining material. On viewing the fractured surface this becomes much more apparent, pursuing its way towards the columnar canal, and near the centre becoming lost in an undistinguishable mass. To those accustomed to work amongst Carboniferous fossils, the aspect of the shining, horny-like tubes of *Serpulites* will be familiar, especially when possessing the delicate bloom which indicates conversion into Vivianite—a peculiar phosphate of iron. The little body penetrating this stem has such an appearance, and although, so far as I am aware, no evidence has yet been brought forward to show that the Carboniferous forms of *Serpulites* possessed burrowing powers, still, the resemblance is so strong that I cannot but refer the object in question to *Serpulites*, for want of a better resting-place. Unfortunately, this is the only specimen we possess, otherwise microscopic sections prepared from it would doubtless have thrown further light upon the matter.

V.—RECAPITULATION AND CONCLUSION.

The extent of our published knowledge on this subject appears to be this—

First.—Enlargement may be caused by the loss of a side-arm and subsequent repair of the parts. In the only well-defined

* *Geol. Mag.*, Dec. 2, 1847, IV., p. 319.

example of this which has come under my notice the enlargement of the stem was simply confined immediately to the part in question, and did not extend to a general swelling of the stem; neither was there any aperture. Miller was so far correct in his general description of this phenomenon of enlargement; only his remarks apply not to the loss of a side-arm, as he supposed, but to the causes which follow.

Second.—The combined researches of Mr. Rofo, a “Corresponding Member,” and myself, have proved that another cause is the external attachment of extraneous bodies, such as corals, stems of smaller Crinoids, certain Polyzoa, and a species of *Productus*. Future research will probably disclose other agents.

Third.—Enlargement is certainly caused by the attack of parasites, although the cause and effect under this heading are not so clear as they might be. There is some reason to believe, judging from Pl. I. figs. 18 and 19, that an Annelide was one of these.

In seeking a cause for this peculiar enlargement of Crinoidal stems, attention must be given to the theory of disease advanced by a “Corresponding Member;” but I think, after due consideration of the numerous facts I have now brought forward, the theory of disease, pure and simple, will have to be relegated to the position of one of the minor causes. After all, no doubt, any form of enlargement may be said to a certain extent to be disease, because it arises from an unnatural and undesirable state of the Crinoid, viz., the adherence of extraneous bodies during growth, or the attack of burrowing organisms within.

That these causes should give rise to serious disorganisation on the part of the Crinoid is not to be wondered at, when we take into consideration the important and delicate part played in its economy by the vascular axis contained in the columnar canal.* Any obstruction to the growth of the column and its axis would probably call forth all the resistance the Crinoid was capable of, and its chief endeavours would be to either get rid of the intruder, or, by the more vigorous deposition of matter round about the part attacked to render the life of its antagonist untenable.

* On this head, see P. H. Carpenter, on some points in the Anatomy of *Pentacrinus* and *Rhizocrinus* (*Jour. Anat. and Phys.*, 1877, XII., pt. 1, pp. 35-53.)

That such cause and effect are not without parallel in the invertebrate world we have not far to seek. For instance, look at the thickness attained by the shells of some oysters, arising from the rapid deposition of calcareous matter by the mantle of the mollusc to counteract the ravages of *Cliona*, and other similar parasites. Again, observe the commercial use of this peculiarity in some mollusca made by that ingenious and clever people, the Chinese, who introduce small images and reliefs below the mantle of a species of *Anodon*, and thus produce most peculiar structures quite foreign to the nature of the shell, simply by the irritation caused by their projection against the inner surface of the mantle.

Again, if any further example of the formation of additional matter consequent on the action of extraneous bodies is required, there may be mentioned that of certain Annelides on the corallum of the Stylasteridae. According to Mr. Moseley they "are liable to become much distorted in growth by the presence upon them of parasites of various kinds, each of which appears by the special kind of irritation which it offers to produce a particular form of abnormal growth in the part of the corallum it infests, producing thus, as it were, an animal gall. The commonest distortion is the reduction of the stem of a coral or branch, or of one side of these, into a hollow canal or deep furrow, more or less roofed over by a thin wall. This condition is produced by the adherence to the growing stem of an Aphroditacean Annelid. . . . On *Errina labiata* a parasitic filiform Nemertean also occurs, which twines itself round the tips of the branches in many coils. The branches thus irritated grow out into a burr-like mass of projecting points, which are evidently hypertrophied dactylopore prominences. . . ."

In conclusion, I have to express my thanks to Professor Geikie, F.R.S., for the loan of specimens in the Collection of the Geological Survey of Scotland, and to my colleague, Dr. H. Woodward, for pointing out to me many curious specimens in the British Museum. To Messrs. R. N. Peach and G. Sharman I am indebted for the accompanying drawings.

* The Croonian Lecture, "On the Structure of the Stylasteridae," 1878, p. 469.

DESCRIPTION OF PLATES I. AND II.

PLATE I.

Fig. 1. A swollen stem of *Poteriocrinus crassus?*, from Roscobie Quarry, Fife. Nat. size. The aperture is seen near the centre of the stem in an elongated depression, and filled with a plug of matrix.

Figs. 2 and 3. Sections of fig. 1, taken at various heights, to show the aperture and passage leading to the central canal and the mass of black matrix which extends throughout the canal for some distance. Nat. size.

Fig. 4. Another swollen stem from Bathgate, taken from the non-perforated side. Nat. size.

Fig. 5. The section of Fig. 4 cut directly across the passage. Nat. size.

Fig. 6. A stem—from the Edinburgh neighbourhood—in which there is a large oval depression resembling Miller's original figure in the *Natural History of the Crinoidea*. Nat. size.

Fig. 7. Section of the same stem, in which the passage leads direct to the central canal from the external depression. Nat. size.

Fig. 8. Vertical section, in which the connection between the external depression in the stem, the passage leading from it, and the canal is quite apparent. Nat. size.

Fig. 9. A horizontal section, showing a direct, somewhat triangular passage. The section has been cut a little above the communication between the latter and the canal. Nat. size.

Figs. 10 to 12. Horizontal sections of small stems, showing the shallow pocket-like passage not communicating with the canal. Fig. 10, Nat. size. Figs. 11 and 12. $\times 2$.

Fig. 13. Cross section of another small stem, in which the aperture shows a tendency to split into two passages. $\times 2$.

Fig. 14. A small stem, showing two small apertures, such as lead into pockets represented in Figs. 10-13. $\times 2$.

Fig. 15. A similar specimen, with one circular hole. Nat. size.

Fig. 16. A Crinoid stem, on which there has been an adherent Polyzoan now in course of enclosure. Nat. size.

Fig. 17. The Polyzoan, with enclosing Crinoidal matter enlarged. It appears to be a species of *Archaeopora*. $\times 2$.

Fig. 18. Swollen stem, with two apertures almost along the line of fracture. $\times 3$.

Fig. 19. The fractured surface of Fig. 18, showing the passage into which the two apertures led, and occupied by what appears to be an Annelide tube. $\times 3$.

Fig. 20. Vertical section of an uninjured stem, to show the mode of articulation of the auxiliary side-arms. Nat. size.

Fig. 21. Horizontal section of an uninjured stem, to show the same thing. Nat. size.

PLATE II.

Fig. 1. Vertical section of a stem, showing a deep concavity on one side filled with matrix, and a large space excavated in its substance. In the other half of the column this excavation communicates with the central canal. Nat. size.

Figs. 2-5. Four stems, to which specimens of *Productus complectens* are attached. They show the various degrees of envelopment by the substance of the Crinoid. Highly magnified. (Copied from the *Quart. Jour. Geol. Soc.*)

Fig. 6. Section of a small stem, from the Carboniferous limestone of Derbyshire, with a straight direct passage leading towards, but not reaching, the central canal. Nat. size.

Fig. 7. A stem which has become infested with a colony of *Favosites parasitica*, over which the Crinoid stem is gradually encroaching from above and below.

Fig. 8. Microscopic section of an enlarged stem, with some foreign body, probably the cause of the enlargement, lying against the columnar canal. Nat. size.

Figs. 9-11. Crinoid stems infested with colonies of *Cladochonus*. In fig. 9 are two enlargements of the stem caused by the different colonies, the terminations of the calices of which are seen protruding from it. Fig. 10 is a similar specimen, but with the calices in a better state of preservation, and more free of the Crinoid substance. Fig. 11. Another example, showing the gradual enlargement of the stem, and a single line of calice openings. Nat. size.

Fig. 12. A weathered section of a stem (*a*) which has been surrounded by a series of corallites of *Cladochonus*, (*b*) in their turn now enclosed within the more recently secreted Crinoidal matter. Nat. size. Fig. 12^a. The opposite extremity of the same stem to show the difference in size of the affected and normal condition of the stem. Nat. size.

Fig. 13. Section of a Crinoid stem, of which the original size is apparent, encircled by calices of *Cladochonus*, and the whole enveloped in secondary Crinoidal substance. Nat. size.

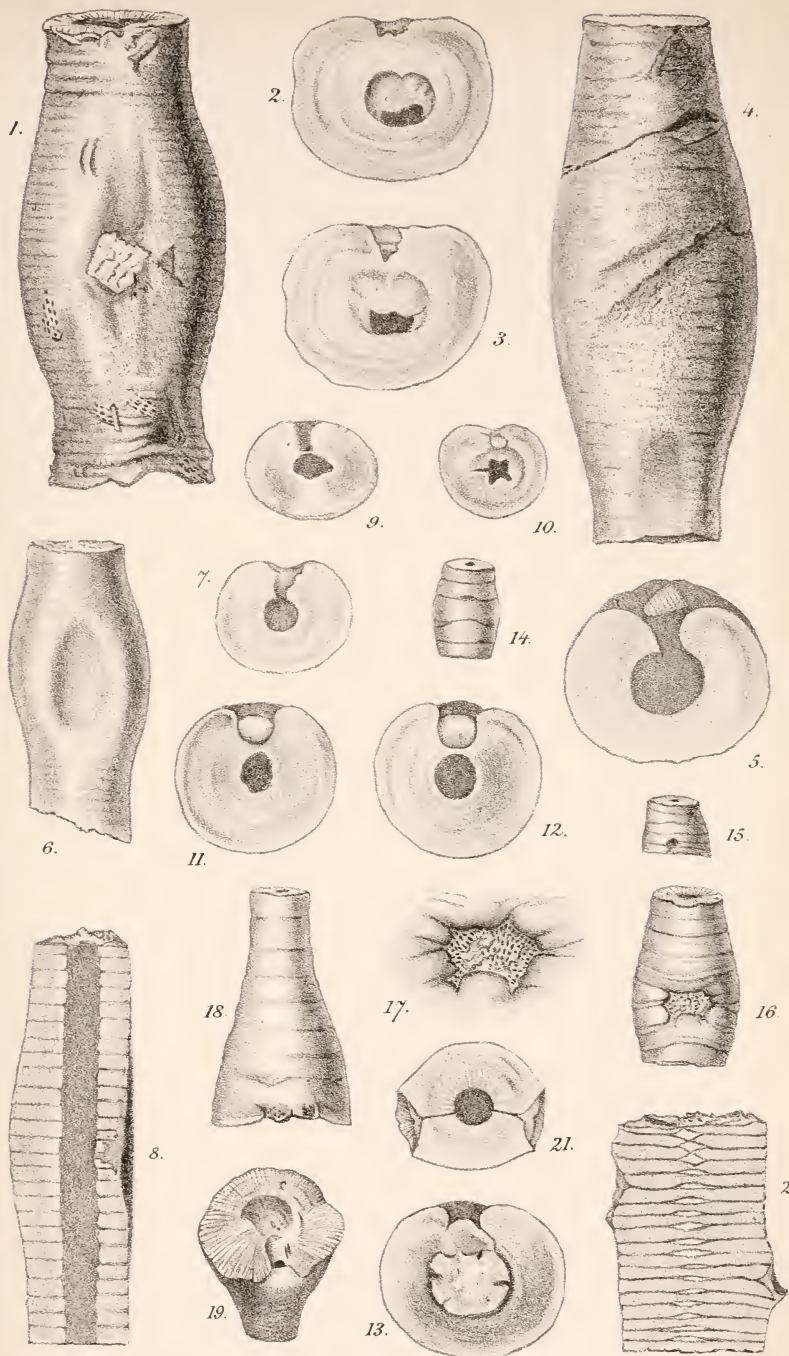
Fig. 14. Microscopic section of another stem, from which radiate four corallites of *Cladochonus*, surrounded by secondary Crinoid substance. Nat. size.

Fig. 15. A similar specimen, showing a very large calice of a *Cladochonus*. Nat. size.

Fig. 16. A fragment of a Crinoid stem, riddled with small circular holes, arranged in cycles. Nat. size.

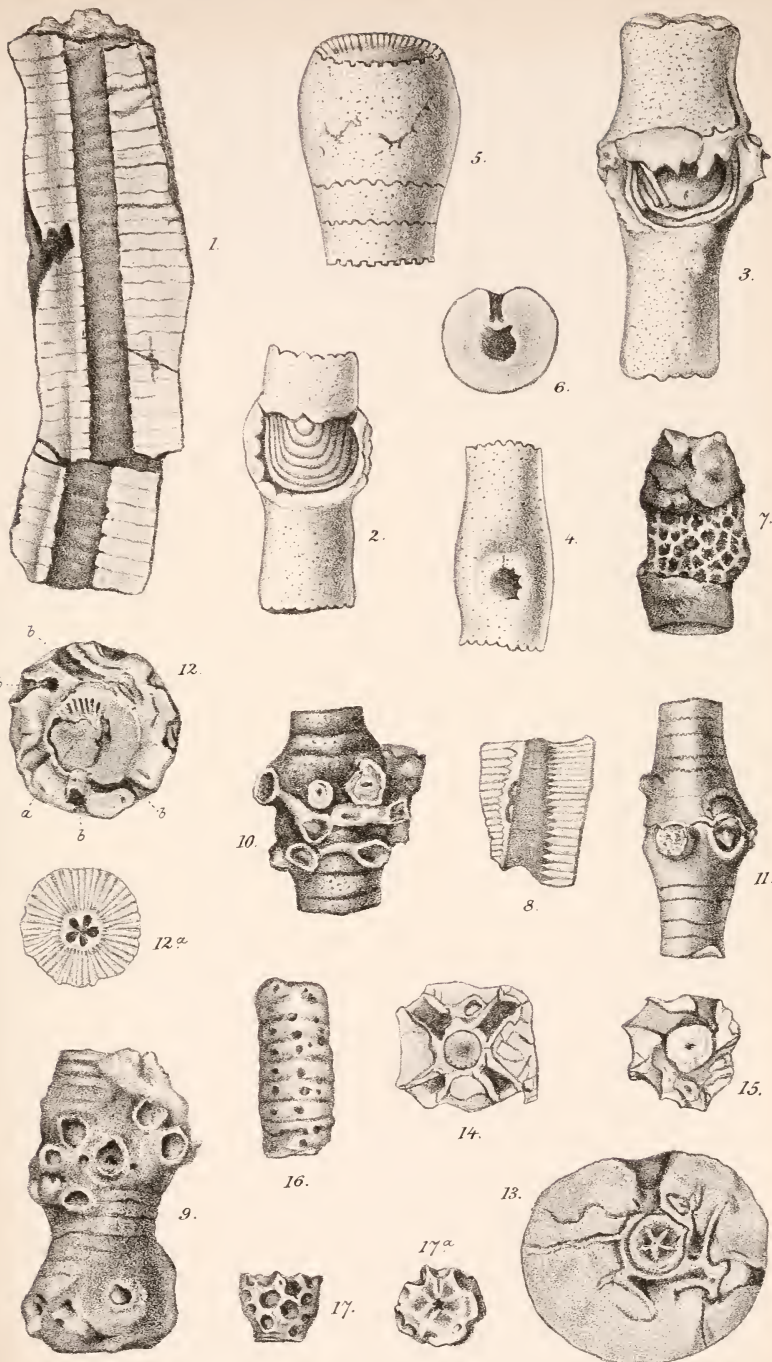
Fig. 17. Another, covered with similar holes, but without any definite arrangement. Fig. 17^a. Cross section of the same.

The subjects of Pl. I. figs. 1 to 21, and Pl. II. figs. 2 to 5, are from the Scotch Carboniferous limestone series, and are in the Collection of the Geological Survey of Scotland. Those of Pl. II. figs. 9 to 11 are in the "Gilbertson Collection;" whilst those of Pl. II. figs. 7, 8, 12 to 17, form part of the "Rofe Collection."



C. Berjeau, lith.

Waterston, Sons & Stewart, Lith^{rs} Edin^g



C. Berjeau, lith.

Waterston, Sons & Stewart Lith^{rs} Edin^r

JANUARY 28TH, 1879.

Mr. John Young, F.G.S., Vice-President, in the chair.

SPECIMENS EXHIBITED.

The Secretary showed a young Albino Hedgehog (*Erinaceus europaeus*), which had been forwarded by the Earl of Haddington, corresponding member, who wrote that some time after the capture of the mother (also an Albino) two young ones were discovered, but they had both died, and one of these having been preserved, had been sent for exhibition. Mr. James Lumsden, F.Z.S., read some notes on the history and habits of the species. Mr. Murdoch stated that several records of the occurrence of Albino Hedgehogs were to be found in the *Zoologist*, notably at Norwich in 1850, in Hants in 1858, and at Eton in 1867.

The Secretary also showed a fine and well-preserved skull of the Great Gray Seal (*Halichaerus gryphus*), sent for exhibition by Sir John W. P. Orde, F.Z.S. It was found on the shore of the Island of Uist, covered with wounds, supposed to have been got while fighting. It is one of the largest of the Seal family, an adult measuring from seven to ten feet, and is pretty common in our waters from Shetland to the Isle of Wight. It is said to have been found as far north as Disco, but is rather an inhabitant of temperate than of Arctic seas, and it is recorded to have been found breeding at the Fern Islands. It has a small amount of brain, and is of a very fierce disposition.

Mr. John M. Campbell, Kelvingrove Museum, showed a variety of objects which had been sent to that institution from Japan. Among these were specimens of the Japanese Pheasant, and a number of examples of the economic purposes to which the natives apply its feathers, in the formation of brushes, fans, and other articles of domestic use.

Mr. James D. Dougall exhibited a specimen of the Bittern, *Botaurus stellaris*, shot in the end of December last on the river Echaig, Argyllshire, by Mr. Duncan of Benmore's keeper. The stomach contained the remains of a small rock cod.

PAPERS READ.

I.—*Notes on the Common Opossum (Didelphis aurita), "Comadreja picaso," or Black and White Comadreja.* By Mr. ERNEST GIBSON, F.Z.S., M.B.O.U., Estancia "Los Ingleses," Partido de Ajo, near Cape San Antonio, Buenos Ayres. Corresponding Member.

This marsupial differs from the only other species our district possesses, not only in size and colour, but in habitat and habits. It is confined to the woods and higher—or at least dry—grounds, taking up its abode either in hollow trees or holes in the ground, but never found inhabiting "biscacheros" (burrows of the Biscacho, *Lagostomus trichodactylus*), though often frequenting them. From being the sworn foe of all hen-roosts, it also not only ventures about buildings by night, but will establish itself in the coolest manner possible in outhouses, garrets, roofs of houses, store-rooms—in short, anywhere it can gain admittance to. As the result of long experience, I go up to the loft in the cooper's "galpon" (barn), in fear and trembling, jumping back several feet at every box I turn over, in the momentary expectation of being glared, fuffed, and snapped at, by one of these vicious animals. The great look-out ladder is reared against the aforesaid barn, affording an easy means of access to the thatched roof, and thence to the loft; consequently one or more comadrejas may almost always be found there. One morning I found the cooper waiting at the foot of the ladder, armed with a cooper's "devil," and receiving three half-grown comadrejas as they came leisurely down it in succession. On another occasion one was found in the store-room, to which it must have gained access by a small window having been left open. The discoverer immediately hurled some missile and knocked it over, but came to the conclusion that he must have totally annihilated it, as not another trace of the intruder could he find. Two or three weeks after it was found in a box half-full of maccaroni, sleeping soundly, and looking very plump and comfortable. Another one kept us all frantic for several weeks, promenading about between the inner "cielo raso," or wooden ceiling, and the outer thatch roof. It was ultimately detected in the early morning returning to its abode from a nocturnal ramble, and was then dispatched. Examination proved it to be a female with seven young ones in the pouch—a promising colony, doubtless! A.

similar case showed that, in order to gain the thatched roof, another comadreja ascended and descended regularly by one of the outside corners of the house, built of brick faced with mortar, which covered both bricks and interstices smoothly over, and at least twelve feet high. The tail could have been of no assistance in this case, but the mortar bore the traces of the claws.

In the woods surrounding our head station were certain hollow trees where I could always depend upon finding one or more comadreas. I should here note that, except when the female has young, this species is generally found in pairs, or occasionally three are met with together. Once I found five full-grown ones in a nest, but notwithstanding that they all appeared to be adults, I am inclined to believe they were simply a female and young ones. As a rule they make a nest in their abode, of dry grass, wool, feathers, and pieces of paper and rags. Even in woods, though, if the soil is sufficiently sandy and dry, they will take possession of some burrow, enlarging it if necessary. The fact of their never occupying any burrow but those in very dry soil, and their avoidance of water, constitute one of the greatest differences between this and the next species. The one is entirely arboreal and terrestrial in its habits, the other terrestrial and aquatic—the former I never saw swim, the latter never climb a tree.

Lastly, the “comadreja picaso” is very frequently to be found in the nests of our common green parroquet (*Bolborhynchus monachus*), occupying one of the chambers thereof. I formerly used to thrust my hand into these nests after eggs or birds, but now take care to ascertain that they contain none but their legitimate occupants. The result of one investigation was a comadreja in one of the upper chambers, parroquets occupying the intermediate ones, and a teal duck sitting on five eggs in the lowest. Unless the extremely thorny nature of the building material had kept the comadreja from extending its explorations, I fail to see how these neighbours should have escaped; it says much for their courage that they should have continued to remain in immediate proximity to such an inveterate enemy. At night one frequently hears the parroquets leaving their nests with a terrific uproar, and it is then generally attributed to a comadreja, as tiger-cats could only rarely gain admittance.

Eggs and birds of all kinds, but particularly poultry, constitute the chief food of the comadreja. To these may probably be added

various small quadrupeds, frogs, and insects, though the two latter are only a supposition on my part.

I have very frequently taken both this species and the next in traps at "biscacheros," but never yet drowned out the former, as I have often done the latter; showing that it is only the pursuit of food that takes the "comadreja picaso" there, and that whether that prey is young biscachos, birds (prairie owl and burrowing ground woodpecker), rats and mice, or frogs, it never takes up its abode with the biscachos.

It is to be regretted that I can only give an approximate date for its breeding-time. The two or three instances I have recorded are about the end of October and beginning of November, but doubtless the season varies more. The usual number of young is about seven or eight, but in one instance I found no less than thirteen. These were smaller than shrew mice, quite bare, the eyes unopened, and they were still attached to the mother—inside the pouch, of course. About the end of November I found another female, with nine young ones, in a hollow tree; these were the size of large rats, and in appearance, ferocity, &c., just miniature editions of their mother. The nestful could not be resolved into head or tail, and when I poked the female up into wakefulness and defence, all the young ones clung on to her fur with claws and tails, presenting such an aggregate collection of vicious black eyes, sharp teeth, and twining caudal appendages, and fuffing and swearing in proportion to their looks, that I felt I had got into rather bad society.

The movements of the "comadreja picaso" are very sluggish; on the ground it moves but slowly, with a long loping run, and can almost be overtaken by a quick walker. Even in trees it does not move fast.

It sleeps all through the day, and is not easily roused. When discovered in a nest, it will not voluntarily leave it, preferring to remain on the defensive, and fuffing and snapping at the intruder. The way it bites and worries at a stick is a caution. I saw one absolutely break several of its sharp teeth on the blade of a bowie-knife, and yet continue trying to make an impression on it.

The odour peculiar to the species is hardly perceptible till the animal is irritated, when it becomes very strong indeed. Though bad enough in all conscience, it is not to be compared to that of the polecat.

The last noteworthy point connected with the "comadreja picaso" is its tenacity of life. Dogs may worry at it as long as they like—it hardly offers any resistance; half-a-dozen times will it be left for dead, and as often does it revive and begin to move off. The first and biggest one I came across was in a parroquet's nest. I put three revolver bullets into its body, and gave it a knife thrust as it came towards me, which precipitated it to the ground, over twenty feet. By the time I descended, it was trotting leisurely away, and after various assaults on it with a stick, I was ultimately compelled to fire other two shots into the head, after which it did not come to life any more. Hanging I found to be the best and speediest way of securing a specimen, without mortally injuring both the cranium and fur. The latter is very handsome, but the skin is impregnated with grease to such an extent as to be a great deterrent to its use. All specimens I ever killed, whatever the season, were extremely fat.

There has been no perceptible change or variation in the numbers of the "comadreja picaso" in our district, during the last six years. Unlike the next species, wet or dry seasons cannot much affect the abundance of its food, as it does not frequent the swamps; while, from its habits, man, its only enemy, does not often come across it. Accordingly, I long expect to be able, as I am at present, to lay my hands on specimens whenever I want them.

II.—*The Flora of Chile.* By Mr. THOMAS KING.

As the character of vegetation depends on the nature of its surroundings, I will first say a few words regarding the physical geography of Chile. This country lies between the Andes and the Pacific, and stretches from the southern borders of the tropics to Cape Horn—a distance of 2000 miles. Its average breadth is from 70 or 80 miles, and its area 150,000 square miles, or about a fourth larger than Great Britain and Ireland. In a country so situated there is necessarily great diversity of climate, and consequently conditions favourable to the growth of many different kinds of plants. But the climate is even more varied than we might expect from the geographical position of the country, owing to the great differences of elevation and the unequal distribution of moisture. The surface rises from the sea level to heights far above the snow line, and while in Valdivia, in the

south, the annual rainfall is over 100 inches, in the north it is reduced to a shower or two in the year.

As might be anticipated, the vegetation is very varied. In Britain we have of flowering plants and ferns about 1600 species, but the Flora of Chile, as represented by the collection in the Santiago Museum, contains 4013 species, belonging to 747 genera, and 140 natural orders. Feuille, Molina, and Miers have each described a number of species, but we are indebted to Claude Gay, a Frenchman, for the first Chilian Flora. In 1834, when Mr. Darwin visited Chile in the *Beagle*, Gay was collecting specimens in all branches of Natural History. He spent twelve years in the country and then took his collections to Paris, where, with the help of other scientific men, he brought out in 1845 his "Historia de Chile," in 27 volumes, 8 of which are devoted to Botany. Though almost necessarily incomplete and inaccurate, it is a very valuable work, and will serve as a basis for all future Chilian Floras. Dr. R. A. Philippe, the able and zealous Professor of Natural History in the University of Chile, Santiago, has done more than any other man, except Gay, to extend our knowledge of Chilian vegetation. Not only has he made large collections himself, but for many years he has named and described all the new plants found by his friends, so that the number of known species is constantly increasing, and in 1872 I saw a manuscript catalogue, drawn up by Dr. Philippe and his sons, of all the native species known up to that date.

I will now mention what seem to me the most remarkable features of the Chilian Flora. In October, 1864, after a voyage of 100 days, during which time we had seen no plants but floating seaweed, we neared the shores of Chile, a few miles to the south of Valparaiso. Taking a glass and looking at the hill-sides, I saw they were covered with vegetation, but of a kind new to me. It was neither forest nor pasture, but short bushy vegetation. I found afterwards that there were trees also, but the abundance of bushes is a remarkable feature in the landscape. After living in the country for some time, I saw that these bushes were evergreen, but at a later date I found, in the vicinity of Valparaiso, two deciduous woody plants, one an acacia, the other a fuchsia.

Another feature, much more marked, is the want of grass. As there is no rain in Central Chile—in which Santiago and Valparaiso

are situated—from the spring to the autumnal equinox, the ground during that time is dry and bare. On first entering the Bay of Valparaiso, and looking at the treeless, rounded, earth-coloured hills, I wondered that people ever built a city there. It did not seem at all, as its name implies, a Valley of Paradise. When at length I again returned to this country, nothing surprised and pleased me so much as the universal covering of green, and I felt that grass would never again be to me a common thing. A curious fact connected with the reappearance of herbaceous vegetation at the beginning of the rainy season, is that the green haze which overspreads the ground after the first shower is caused by the germination of countless numbers of the seeds of Stork's Bill—*Erodium cicutarium* and *E. moschatum*—plants believed, with good reason, to have been accidentally introduced from Europe.

Again, the Chilian Flora includes certain tropical or sub-tropical plants, such as canes, palms, and the cacti, which arrest the attention of people from colder countries. I was much pleased when I first saw seed on a cane plant—*Chusquea*: it was just like ryegrass seed. There is only one species of palm on the mainland, *Jubaea spectabilis*, or *Micrococos chilensis*, which attains a great height, and has a bulging trunk three feet in diameter. It is not so graceful as many of its kind, but to one who has never seen a palm, except in a conservatory, it is a beautiful, and even a wonderful tree. The southern limit of palms in Chile is 34° S., and it is worthy of remark that Valparaiso is situated very nearly in the same latitude— $33^{\circ} 1' 56''$.

But it must not be supposed, from what I have just now said, that the vegetation of Chile is of a tropical character. To support a rank vegetation, both heat and moisture are necessary. In the north, where the temperature is high, moisture is wanting; and in the south, where moisture is abundant, the temperature is comparatively low. The central parts of the country have a climate resembling that of Southern Europe. The mean winter temperature of Valparaiso is 51° Fah., that of summer 61° , and the mean annual temperature 57° . The thermometer seldom rises above 80° in the shade, and though the roofs on winter mornings are covered with hoar-frost, I never saw ice. Of course, inland the variations are greater.

I will mention only one other feature, but perhaps the most remarkable of all. Nearly all the Chilian species are different from

the British. This is an interesting fact in connection with the distribution of plants. I understand that the flora of the continent of Europe has much in common with that of our own country—in fact, that all our British species are also continental, and that there is a strong family likeness between our flora and that of North America. But the case is quite different with respect to Chile; there, the vegetation has an unfamiliar appearance. Of course, many of the natural orders and genera are the same as here, but the species are different. And this difference is not owing to any peculiarity in the soil or the climate, as is shown by the rapidity with which European plants spread themselves, when once introduced. Of these I may mention a few. Our common bindweed (*Convolvulus arvensis*), is now one of the worst Chilian weeds. *Mentha piperita* and *M. citrata*, the *Yerba-buena* of the Chilenos, were introduced by the Spaniards to season their dishes, and are now found in every damp place in the country. Hemlock (*Conium maculatum*), now so common that it is used to thatch booths, comes from a few seeds which an apothecary had sent to him from Spain, fifty or sixty years ago. *Trifolium repens* (white clover), is now common on the hills behind Valparaiso; *Viola odorata* (the scented violet), grows by the sides of streams, and little boys sell bunches of them in the streets. I saw the dandelion for the first time in June, 1872. Dr. Philippe had seen it six months earlier, but by December I saw it growing in the streets of Santiago. I tried to introduce the field Daisy (*Bellis perennis*), and got some seed sent to me from the West End Park. It grew well enough and flowered, but did not spread. I suppose it is extinct by this time. But the most remarkable introduction of all is perhaps the Cardon—that is the Great Thistle (*Cynara cardunculus*), a plant from the south of Europe. It now covers large tracts in Chile, and is, I believe, the same thistle that has overrun the plains of the Argentine Republic.

In addition to the introduced species, there are a number of cosmopolites, such as *Lemna minor* and *L. gibba*, *Typha latifolia*, *Arundo phragmites*, *Hymenophyllum tunbridgense*, *Cystopteris fragilis*, *Funaria hygrometrica*.

Having now mentioned some of the more noticeable features of the Chilian Flora, namely—1st, the abundance of bushes; 2nd, the fact that nearly all the woody plants in the central provinces are evergreen; 3rd, the absence of a carpet of grass; 4th, the

presence of certain tropical forms, such as palms; 5th, the difference between the Chilian and the British species, I will now show some dried specimens, noting their peculiarities, and will take first a few which have become familiar to us from cultivation in this country:—

Calceolaria.—Several species grow luxuriantly in the neighbourhood of Valparaiso. I think our gardeners waste their time and skill in trying to grow calceolarias out of doors. To any one who has seen them growing wild, our garden plants seem dwarfed, pinched and insignificant.

Fuchsia.—This is, I believe, the wild form of the fuchsias now growing so freely in the open air at all the Clyde watering-places. I gathered this specimen near Valparaiso.

Potato (Solanum tuberosum).—I believe the potato is found wild on the Andes from Chile to Mexico. I gathered the specimens behind Valparaiso, but I am not sure that they are truly wild—the tubers are suspiciously like those sold in the shops. The Chilenos eat potatoes twice a day,—to breakfast and dinner, so that they form a very well-known article of food. If they were to become diseased and scarce, everybody would soon know of it; but, though making inquiries, I never heard of the potato disease all the eight years I was in the country, till at last, in 1872, just a few months before I came away, a Scotchman told me that he had seen, near Santiago, a field of potatoes with blackened shaws. In what state the tubers were I don't know. If the disease first appeared in Chile about 1870, that was a quarter of a century after its first appearance in Britain. The potato is a native of dry places, and produces tubers, perhaps from the uncertainty of being able to produce seeds. Those behind Valparaiso, though they flower freely, do not ripen seeds, as the shaws are burnt up by the sunshine before there is time.

In cultivating the potato we wrong it in several ways: we divide the tuber—the store of food nature had intended for one, amongst several plants—or as the farmers say, we cut the potato into sets; and in doing this we necessarily destroy nature's protection—the skin—and leave the raw flesh exposed to water, worms, and all the hurtful influences it may meet with underground. The plant bears this treatment for several generations, but by and by all its reserve energy is exhausted, and when a trying time comes, such as a wet season, it succumbs. Immediately thereupon

it is attacked by fungi and parasitical insects, their presence not being the cause of the disease, but a consequence.

This, I believe, is the generally-received theory regarding the potato disease, and it seems a very reasonable one. But I am not aware that what I am about to say has yet been received as reasonable. I hold that we cannot cure the potato disease, but that we may prevent it; and, in order to do so, I would import annually wild tubers from the Andes. These I would go on improving until I had produced varieties fit for profitable cultivation. The farmer should then take them, and use them in the way that would pay him best. They would keep sound for many years; but whenever he saw signs of failure, let him cease to propagate the enfeebled plants and fall back on a later importation. As the Andes are far away, perhaps it would be advisable to acclimatise the wild plant on the hills of Italy and Spain, where they could be got at more easily. I know that potatoes imported from South America to this country have failed, but what I do not know is the history of those potatoes before they were imported. I should mention, in conclusion, that the Chilenos always plant their potatoes whole.

Lapageria rosea (R. and P.)—This beautiful climber, which is now exhibited at almost every flower-show, grows wild amongst “Boldo” bushes in the neighbourhood of Concepcion, lat. 36° S. It is named in honour of Josephine Lapagerie, wife of Napoleon I., but I much prefer its euphonious Indian name “Copigue.”

Oxalis.—Of this genus we have in Scotland only one species—the wood sorrel; but in Chile there are 57 species, some of which are now cultivated in this country; but I do not think that the “Churco” (*O. gigantea*), the largest *Oxalis* in the world, has yet been introduced. It grows in great patches in the desert of Atacama, and attains a height of from three to five feet. The flowers are yellow, and about the size of a buttercup; the leaves are trifoliate, and have the ordinary acid taste. It flowers with one shower a year, but if there happens to be no rain it does not blossom. The inhabitants of the district in which it grows make use of it in housebuilding. First they put up a frame-work of wood, next fill all the open spaces with “Churco,” and then plaster all over with clay. It is said that rats will not eat through this wall, doubtless because they dislike the taste of “Churco.”

I must mention one other species of this genus—*O. lobata*, “Flor

de la perdiz, or Partridge flower" of the natives. It is the earliest flower of the rainy season. When the Stork's Bill and young grass are making the hill-sides green, this little bulbous-rooted sorrel springs up as plentiful as our field daisy, and by the month of May, which corresponds to our November, the surface is, as it were, gilded with its delicate yellow blossoms.

Tropaeolum tricolor, *T. brachyceras*, and *T. azureum*.—These are exquisitely beautiful climbers, covering the bushes in September and October. They are all now cultivated in our conservatories. I was surprised to see another Chilean species, *T. speciosum*, growing freely on the front of a cottage near Selkirk in the autumn of 1877. *T. tricolor* is described by Darwin in his work on Climbing Plants.

Aristotelia, "Maqui."—This is an arborescent bush about the size of our hazel. I mention it to show how easily Chilean shrubs might be acclimatised here. I raised a plant of it from seed at Innellan in 1873, and it has grown there in the open air ever since. "Maqui" berries are reckoned a powerful remedy in dysentery.

Lardizabala bitemata, "Coguille."—This is an evergreen climber, as beautiful as ivy, and bears graceful racemes of dusky purple-chocolate flowers. It comes nearer my idea of tropical woody climbers than anything I have seen. A young plant of it is now growing in the Glasgow Botanic Gardens.

Drymis chilensis, or *D. winteri* (Winter's Bark), tree "Canelo."—This handsome evergreen tree extends from the Straits of Magellan to lat. 31° S. It is the sacred tree of the Araucanian Indians, and its bark was long a well-known medicine in our own country. It was introduced by Dr. Winter, a physician in Drake's expedition in 1577—hence its name, Winter's Bark. It is well worth the attention of shrub fanciers, and would grow easily in mild situations. The general aspect is that of the rhododendron, but looser. The flowers are, however, quite different.

Ledocarpum pedunculare, "Amancay."—This handsome yellow-flowered woody plant grows in the northern desert. It is easily raised from seed. I had a plant of it eight inches high, but it died in the air of Glasgow.

Cruickshanksia (natural order, Rubiaceae).—This genus is peculiar to Chile, and, so far as I know, none of the species are yet cultivated in Britain. They grow in the north, and form beautiful patches on the sand.

Myrtus ugni, "Mol."—A fine plant of this is in the Glasgow

Botanic Gardens. The berries are very good, and are made into jam. There are 44 species of Myrtaceae in Chile, some of them very beautiful shrubs, especially when in flower.

Loranthus.—Four species. These are all parasitical, and, like the mistletoe, have exceedingly sticky berries.

Litrea venonosa.—This was one of the first plants I heard of in Valparaiso. "Have you seen 'Litre'?" Then I was told of its wonderful properties. If you touch it, or sit under its shade, your face swells and turns red, as if you had erysipelas. I have heard of school children being kept at home for weeks because they had been smitten by "Litre." The cure for the eruption is a poultice of the leaves of "Mayten." However, I treated the "Litre" like any other bush—forced my way through thickets of it, broke off branches, collected its seeds, and rubbed my hands with its leaves, but all without result. The explanation given was that it did not affect every one alike. Still, I believe there must be some truth in what everybody says, as in the natural order to which it belongs—the Anacardiaceae—there are plants possessing very hurtful properties. It forms a dusky, handsome shrub, and in favourable situations becomes a timber tree.

Maytenus chilensis.—This is a more graceful tree than our birch. If you imagine a cross between the boxwood and the weeping willow, you will have some notion of its general appearance. It was introduced into Britain in 1829, and Loudon remarks that it would probably become a hardy shrub, but I have never seen it at home.

Quillaja saponaria, "Quillai."—This is another fine evergreen tree, with clear shining leaves, common in the central provinces. Its bark is now largely exported to France for scouring wool. The Chilenos use it instead of soap for washing the head, and some say that to it they are indebted for their luxuriant hair.

Of the Leguminosae there are 269 Chilean species, and many are of forms altogether wanting in Britain. All our native species have the papilionaceous corolla, like the pea or the broom, with the stamens united, but in the Chilean Flora there is not only this form but three others.—1st, the genus *Adesmia* has the papilionaceous corolla with the stamens free; 2nd, *Caesalpinia*, *Cassia*, &c., have the flowers regular, or nearly so; and 3rd, the *Acacias* have quite regular flowers, with an indefinite number of stamens.

I will now name a few of the Leguminosae:—

Balsamocarpon brevifolium, “Algarrobillo.”—This plant grows in the northern desert, and attains the size of a gooseberry bush. The pods, which consist mostly of gum or resin, are used in tanning leather, and the peas are eaten by the Chinchilla.

Acacia cavenia, “Espino.”—This is the deciduous tree already mentioned as growing in Central Chile. At one time a great part of the country was covered with impenetrable thickets of it, which have been recklessly cut down to make wood-charcoal, fences, &c. It would make excellent growing hedges, but at present the branches are cut off and set up close to each other on end, and form a good temporary fence. The wood is ornamental, but unfortunately of small size, and so fragrant are the flowers that the tree is called “Aromo” as well as “Espino” (thorn).

Errazurizia glandulifera (Philippe, new genus).—This is a pretty and peculiar-looking plant, with an incense-like fragrance. It has a trailing habit, and would be suitable for a rockery. I discovered it in the neighbourhood of Carrizal-Bajo, and Dr. Philippe named it in honour of the President of Chile, just then elected, Senor Errazuriz.

Adesmia balsamica.—The twigs and leaves of this plant are completely covered by a sticky, fragrant gum, from which I used to think the perfumers might get a new scent. I removed it easily by alcohol, but then I could not remove the smell of the alcohol from the gum.

Solanum elaeagnoides, “Tomatillo.”—The fruit is celebrated for removing greasy stains from cloth.

Cuscuta chilensis, Dodder, “Pelo de anjeles,” that is, angel’s hair.—Parasitical on lucerne, &c.

Eccecmocarpus scaber.—A handsome climber, now common in England. It is described by Darwin in his “Climbing Plants.”

Argyllia geranoides, and other species.—These plants grow in the north, and are yet unknown in Britain; at least the genus is not in Loudon’s “Cyclopaedia of Plants cultivated in Britain.”

Schizanthus candidus.—Many fine species of this genus are now common in this country; one of the best known is *S. pinnatus*.

The Verbena is common in the vicinity of Valparaiso. The Mimulus is also a native of Chile. The Heliotrope forms large bushes in some of the northern valleys.

Cordia decandra, “Carbon.”—Grows in the north now only as bushes, but formerly as trees. I have been told that far inland in

the Andean valleys there are still great trees of it. The timber is very ornamental, and would be valuable to the cabinetmaker if it could be had in quantity. It flowers profusely, having beautiful white bells; but the foliage is dingy and sticky.

Of the Compositae there are 736 Chilean species, many of them woody, such as *Baccharis rosmarinifolius*, *B. concava*, *Proustia pyrifolia*, *P. pungens*, *Senecio denticulatus*, *Flourensia thurifer*.

Mutisia.—Of this genus Loudon says, "*Mutisia* is an exceedingly interesting genus of shrubby climbers, with leaves terminating in tendrils, by the prehension of which the stems are supported. *M. latifolia* represents a family of climbers so very different from every other hitherto propagated in British gardens, that we cannot but strongly recommend it for trial against every conservatory wall." Darwin says that this is the only genus in the Compositae which has tendrils.

M. latifolia is given in Loudon, but it is very inferior in beauty to *M. subulata*, whose flowers show like stars above the bushes. Also in this species the leaves are reduced to a line, as the name indicates, so that each seems a tendril.

Cryptocaria peumus, "Peumo."—A very fine shrub, or tree, in favourable situations. The fruit is eaten, but smells like castor-oil.

Guivena avellana, "Avellano."—This is, I think, the finest Chilean shrub. It has clear, shining, compound leaves, resembling those of *Mahonia quercifolia*, and has fruits about the size of a marble, which in ripening change from green to yellow, and from yellow to red. It grows in the south, and might be easily reared in Britain. I was much pleased to see a young plant of it in the Botanic Gardens last summer.

Leontochir ovallei, "Mano de leon," (that is "lion's fore-paw," and the lion being the puma).—This is a rare plant, and, so far as I know, confined to a small district in the north. The roots, which resemble those of the dahlia, are about two feet below the surface. The head of flowers is like a peony, but unfortunately the colour is not pure.

Timber Trees.—*Fitzroya*, "Alerce" or "Larch"—so named from some resemblance to the European larch, and perhaps the most useful wood in Chile. It attains a great size and age. As many as 2000 rings of annual growth have been counted in a trunk. The wood is red, and is said neither to rot, warp, nor crack.

"Roble," meaning oak, but in reality a beech, *Fagus*.—The wood

is very durable and strong, and is used where these properties are required.

Laurel.—This is an inferior wood, and is used for the commonest purposes.

Myrtus luma, “Luma.”—So hard that it is used for cart-axles.

Persea lingue, “Lingue.”—A valuable timber tree. The wood resembles cheap mahogany, and is used to make office furniture, etc.

“Belloto.”—That is acorn, and so called because the fruit resembles an acorn.

Fruits.—The fruits cultivated in Chile are nearly all introduced from the Old World:—Vine, Fig, Orange, Olive, Peach, Almond, Plum, Apricot, Cherry, Mulberry, Walnut, Pomegranate, Pear, Quince, Apple, Melon, and Cucumber. The only valuable native fruit is a variety of strawberry; the others—“Boldo,” “Maqui,” “Quilo,” “Peumo,” “Avellano,” etc.—rank no higher than our hips, haws, sloes, and brambles.

Grains.—The chief grains are wheat and maize.

FEBRUARY 25TH, 1879.

Professor John Young, M.D., F.G.S., President, in the chair.

Messrs. John C. Dougall, James Neilson, jun., and David Macbrayne, were elected Ordinary Members.

It was agreed to place on the record a notice of the death of Mr. George Thomson, a corresponding member of the Society, and that an extract from the minutes should be sent to the surviving relatives of the deceased, accompanied by an expression of the sincere sympathy of the members with them in the loss they have sustained.

Mr. Thomson was originally connected with the Naturalists' Society, which became incorporated with the Natural History Society in 1866, and for some years after the union he took an interest in the business, and a share in the management of the Society. He was unanimously elected a corresponding member before he left this country for Western Africa for the purpose of establishing a sanatorium for the benefit of missionaries labouring in that field. For the accomplishment of this object he worked with untiring zeal, and had the satisfaction before his death of

seeing the scheme successfully carried out. Amidst the labours thus entailed upon him, as well as the fulfilment of other duties, he still found leisure for indulging in his favourite pursuits, and by his diligence as a collector he has done much to illustrate the Fauna and Flora of that portion of Africa where he was located. His contributions to this Society were frequent and varied, and many of his friends have had their collections enriched by his donations.

Though Mr. Thomson, when in this country, took an interest in all departments of Natural History, he was chiefly attached to the study of plants, and in his botanical excursions was successful in finding new stations for many of our rare and interesting species, and these have been recorded on his authority in the latest edition of Henney's "Clydesdale Flora," 1877.

Mr. Thomson was endowed with a cheerful and amiable disposition, which made him a favourite with all who had the pleasure of his acquaintance, while to those who enjoyed a closer friendship he was endeared by his warm and generous affections, as well as by his upright bearing and many sterling qualities.

The members, though deeply regretting his loss, have the satisfaction of knowing that Mr. Thomson did good work, and was useful in the sphere in which he was placed, and feel that the remembrance of his many good characteristics will prolong his memory amongst them.

Mr. Thomson died at Victoria, Western Africa, on 14th December last, after a week's illness.

SPECIMENS EXHIBITED.

Mr. James Coutts exhibited several objects of interest from Victoria, Western Africa, forwarded by the late Mr. George Thomson, corresponding member, to whose memory he paid a warm and deserved tribute. Among the objects shown were two feet of a large Lizard, or Iguana, with a few of its eggs, and which reaches, when full grown, a length of seven or eight feet; a species of *Lemur*—a genus of quadrumanous animals nearly allied to the monkeys, but with a form approaching that of quadrupeds, which live chiefly on fruits and insects, and mostly inhabit Madagascar and the East Indian Islands; as also a species of Chiroptera or Bat, a family of mammals widely distributed over the globe, and found both in the old

and new worlds and in Australia. The President at some length gave a description of the various specimens.

PAPERS READ.

I.—*Notes on the occurrence of the Tufted Duck (Fuligula cristata) as a breeding species in Scotland.* By Mr. ROWLEY JEX LONG.

In looking over the *Proceedings* of this Society I do not find any mention made of this bird as a nesting species in Scotland. In Vol. I., part i., page 312, Messrs. Robert Gray and Thos. Anderson, in a paper read on 30th March, 1869, on the birds of Ayrshire and Wigtownshire, say, regarding *Fuligula cristata*, "Strictly a winter visitant." In Vol. II., part i., page 163, Mr. James S. Dickson, in his paper of 30th May, 1871, on the birds of Possil Marsh, says, "Mr. Gray informs me that a Tufted Duck was obtained at Possil within a few years." Whether this specimen was obtained in winter or summer Mr. Dickson does not say. In Vol. III., part i., pages 52, 53, 54, Mr. Harvie-Brown, on 25th January, 1876, in his paper On the Birds of the North-east of Russia, mentions this bird as rare. In page 72 of the same part of the *Proceedings*, Mr. James Lumsden, in his paper on the birds of Loch Lomond and district, 29th February, 1876, says, with regard to *Fuligula cristata*, "a few pairs on the loch every winter."

Within the last few days Mr. Small, of Edinburgh, writes to me that two years ago a Mr. Herbert took a nest in Fifeshire and placed the eggs under a hen, which brought them out; also that a brother of Sir Victor Brooke took two nests last year, but he does not say where.

Mr. Small does not recollect ever having had a specimen sent to him for preservation during the breeding season, nor to have heard of the nest being taken in Scotland, with the exception of the above two instances.

The specimens which I have brought here to-night, and which were obtained from Perthshire, were sent to me in the latter part of last year, my friend having had them in his possession since last summer. He writes: "The Tufted Duck's nest I found under a swan's nest, on a small island, about 18 inches down among the straw, and there were 9 eggs in it. I shot the drake, which you have, but the duck got away after being wounded. I took two of

the eggs, and went back again a week after, but she never returned, so I took the whole of them."

I have brought for your inspection the bird which was sent and some of the eggs. It is very likely that there may be other instances on record of this bird breeding in Scotland, but, if so, I am not aware of them. At any rate it is as yet a comparatively rare breeding species, and therefore may be a subject of some interest to the Society.

Mr. Harvie-Brown and other members made some remarks on the importance of the information communicated by Mr. Long.

II.—*Notes on the Birds of the North-west of Perthshire.*

By Mr. WILLIAM HORN.

Under the above heading I mean to include all that part of Perthshire which is watered by the Tay and its tributaries above Dunkeld, a district full of interest to the ornithologist on account of its varied character. It includes the valleys of the Garry, Tummel, Lyon, Dochart, and Bran; Lochs Tay, Tummel, Rannoch, and Ericht; as well as some of the highest mountains in Scotland. The character of the country, though for the most part rugged and mountainous, is toned down by the numerous woods of pine and birch which fringe most of the rivers and lochs, while in the larger valleys there is a considerable extent of arable ground. This is especially the case in Strath Tay, where there is a considerable breadth of cultivated ground between the hills and the river. The mountains of Ben Lawers and Schiehallion, between Lochs Tay and Rannoch; Ben More, in Glen Dochart; Ben-y-Gloe, above the Pass of Glen Tilt; and Ben Brackie, overhanging the Pass of Killiecrankie, offer an occasional resting-place to the Golden and White-tailed Eagles, while the Ptarmigan and Snow Bunting breed on their highest tops. Game birds of all kinds abound on the lower hills, especially the Red Grouse, the pursuit of which annually attracts numbers of sportsmen from all parts of the kingdom. Nowhere, perhaps, in Scotland is this bird to be found in greater abundance.

The well-wooded glens with which the country abounds, among which may be mentioned Glen Lyon, Glen Bruar, the Pass of Killiecrankie, and the woods at the Falls of Moness, near Aberfeldy, are favourite resorts of the warblers and small birds of all

kinds, while the marshy ground along the banks of the Dochart and the moor of Rannoch are much frequented by many of the waders. The Kingfisher, Bald Coot, and Water Hen inhabit the banks of the rivers, while the Oyster Catcher breeds in considerable numbers on many of the channel banks and islands on the Tay and Tummel. The Common and Black-headed Gulls breed on an island in Loch Tay.

For an inland county the lochs are peculiarly rich in sea birds, Ducks, Geese, &c. On Loch Tay have been killed the Osprey, Wild Swan, Pochard, Widgeon, Tufted Duck, Golden-eye, Scaup Duck, Goosander, Little Grebe, Great Northern Diver, Cormorant, Razor-bill, Puffin, Leach's Petrel, and many other commoner species; and in the immediate neighbourhood of the loch, the Snowy Owl, Woodpecker, Bohemian Waxwing, Snow Bunting, Brambling, Crossbill, Quail, Pigmy Curlew, &c.

Many species are slowly but surely gaining ground annually, and amongst them I would note specially the Missel Thrush, Rook, Jackdaw, Jay, Starling, Chaffinch, Bullfinch, Crossbill, and some of the warblers; and no doubt this is owing to the increased acreage under wood. Other species, on the other hand, are getting gradually more scarce, and some of them, I have no doubt, will soon be extinct in the district. All the rarer species of raptorial birds, the Landrail, the Common Swallow, and House Martin, are less common than they used to be, even within the last six years. Hawks of all kinds are shot down indiscriminately by gamekeepers, and consequently are but seldom seen. For several years I have not heard a Landrail in Strath Tay, and for two years past there has been a marked falling off in the numbers of Swallows and House Martins.

The following list I have endeavoured to make as complete as possible. The names, however, of some birds which have occurred may be omitted, for there are only included in my list such species as I have either met with myself or heard of from undoubted sources.

I feel that I ought not to conclude these remarks without acknowledging the valuable assistance I have received from Colonel H. M. Drummond Hay of Seggieden, Mr. J. A. Harvie-Brown of Dunipace, Larbert, and Mr. Duncan Dewar, gamekeeper, Remony, Kenmore.

The nomenclature is according to Sundevall's method, revised by H. Thornton Wharton.

OSCINES.

Redstart.—*Ruticilla phoenicurus* (Linnaeus). Common in summer.* Frequents old walls at the sides of plantations.

Redbreast.—*Erithacus rubecula* (Linnaeus). Very common.

Stonechat.—*Pratincola rubicola* (Linnaeus). Pretty common.

Whinchat.—*Pratincola rubetra* (Linnaeus). Rare.

Wheatear.—*Saxicola oenanthe* (Linnaeus). Commoner than either of the two last mentioned species, and to be found in the same localities year after year.

Missel Thrush.—*Turdus viscivorus*, Linnaeus. Very abundant, and increasing every year.

Song Thrush.—*Turdus musicus*, Linnaeus. Very common.

Redwing.—*Turdus iliacus*, Linnaeus. A common winter visitant.

Fieldfare.—*Turdus pilaris*, Linnaeus. Also a common winter visitant. Col. Drummond Hay mentions that he has seen this bird in the Faskally woods, near Pitlochry, in June, and asks whether it could have been bred there. I think it is quite possible, as I believe I have seen Fieldfares in the Aberfeldy district at a later date than June.

Blackbird.—*Turdus merula*, Linnaeus. Very numerous in all the wooded valleys in this district.

Ring Ouzel.—*Turdus torquatus*, Linnaeus. Breeds on most of the hills in Perthshire in considerable numbers.

Dipper.—*Cinclus aquaticus*, Bechstein. Common on the Tay and all its tributary streams. There is hardly a burn, however small, where one or two of this species may not be seen.

Wren.—*Troglodytes parvulus*, Koch. Very abundant.

Gold-crest.—*Regulus cristatus*, Koch. Not often seen. In the Old Statistical Account of Scotland this species is mentioned as being rare in the parish of Dunkeld (1798).

Fire-crest.—*Regulus ignicapillus* (Brehm). Observed by myself in October, 1879, at Edradynate, in Strath Tay.

Chiffchaff.—*Phylloscopus collybita* (Vieillot). This species occurs in the Rannoch district, on the authority of Mr. Thomas Eadle.†

Willow Wren.—*Phylloscopus trochilus* (Linnaeus). To be found in all the large birch woods of the Breadalbane country.

Wood Wren.—*Phylloscopus sibilatrix* (Bechstein). Not uncommon in the woods of Faskally and near Pitlochry, according to

* Booth's Cat. Birds in Dyke Road Museum, p. 14. † *Zoologist*, 1871, p. 2656.

Col. Drummond Hay, who knows that neighbourhood thoroughly. Has also been seen in Glen Lyon.*

Lesser Whitethroat.—*Sylvia curruca* (Linnaeus). Rare.

Garden Warbler.—*Sylvia salicaria* (Linnaeus). Not uncommon about Dunkeld, and one has been seen by Col. Drummond Hay at Pitlochry.

Sedge Warbler.—*Calamodius schoenobaenus* (Linnaeus). Occurs on several places on the banks of the Tay.

Great Titmouse.—*Parus major*, Linnaeus. Common.

Blue Titmouse.—*Parus caeruleus*, Linnaeus. Very common.

Coal Titmouse.—*Parus ater*, Linnaeus. Very abundant. A very large flock of this species was seen by me lately in a wood on the opposite side of the Tay from Aberfeldy, and they seemed to be holding a discussion upon some knotty point in connection with their winter place of residence, for every now and then one or two would start off from the main body and try to induce the others to follow. Their twittering was most delightful to listen to.

Marsh Titmouse.—*Parus palustris*, Linnaeus. Rare.

Crested Titmouse.—*Parus cristatus*, Linnaeus. With reference to this species Col. Drummond Hay says:† “The Pass of Killiecrankie has been given as a habitat for this bird. I have never seen it there, nor is it a likely place for it, as the Scotch fir on which it subsists is not found there, the pass being exclusively clothed with natural birch. A much more likely habitat would be the old pine forest in Rannoch; but I have never met it, or ever heard of its being found there, or in any part of Perthshire. The nearest locality to the pass where I have seen it is on the remnants of the old forest of Rothiemurchus, where it is still a constant resident. The Killiecrankie bird must have been, I suspect, confounded with the *Parus ater*. The call notes of the two birds are very distinct.”

Yarrell states that Mr. F. W. Bigge of Hampton Court, in the summer of 1837, observed several examples of this species in the pass of Killiecrankie.

Long-tailed Titmouse.—*Acredula caudata* (Linnaeus). Common.

Great Gray Shrike.—*Lanius excubitor*, Linnaeus. Several have been killed in different parts of Perthshire, but I have only heard of one in this particular district.

* Booth's Cat. British Birds in Dyke Road Museum, p. 107.

† Yarrell's British Birds, 3rd Edition, 1856, Vol. I., p. 392.

Waxwing.—*Ampelis garrulus*, Linnaeus. One of this species has been killed near Loch Tay, by Mr. D. Dewar, gamekeeper at Remony, near Kenmore, who has the specimen in his possession.

Spotted Flycatcher.—*Muscicapa grisola*, Linnaeus. Not common, but a few may be seen every season in the wooded parts of the country.

Pied Wagtail.—*Motacilla lugubris*, Temminck. Common.

Gray Wagtail.—*Motacilla sulphurea*, Bechstein. A few seen by me every season. Col. Drummond Hay says that the Yellow Wagtail has never been observed by him in Perthshire or any of the adjoining counties, and where it has been recorded he believes it to have been confounded with the Gray Wagtail in its winter dress.

Tree Pipit.—*Anthus trivialis* (Linnaeus). Rare. Seen in Faskally woods, near Pitlochry, by Col. Drummond Hay.

Meadow Pipit.—*Anthus pratensis* (Linnaeus). Very common in all this district.

Rock Pipit.—*Anthus obscurus* (Latham). In a list of "birds observed at Rannoch in 1879,"* by Thomas Eadle, the Rock Pipit is included, but I agree with Mr. J. A. Harvie-Brown in thinking this must be an error.

Hedge Sparrow.—*Accentor modularis* (Linnaeus). Not very abundant but increasing yearly.

Pine Grosbeak.—*Pinicola enucleator* (Linnaeus). One seen at Dunkeld by Col. Drummond Hay, hitherto unrecorded.†

Bullfinch.—*Pyrrhula europaea*, Vieillot. Common in all the wooded glens, especially in the woods behind Aberfeldy and in the Pass of Killiecrankie. As this bird is frequently accused of damaging fruit trees, I give the following notes by Col. Drummond Hay in its defence:—

"This bird has a bad name, on account of the supposed mischief he does in destroying the fruit buds during the spring months, and is consequently shot down indiscriminately. In its defence, however, I may say that I have known an apple-tree in the neighbourhood of Pitlochry, under which the whole ground was positively strewn with buds, and yet, when the autumn came round, this very tree, which in spring had all the appearance of having been destroyed by Bullfinches, bore a heavier and a finer crop than any other

* *Zoologist*, 1871, p. 2656.

† Harting's "Handbook of Brit. Birds," p. 114.

tree in the garden. This may have been from the fact of being partially disbudded, or the buds that were destroyed having been affected with caterpillars, and so prevented the spreading—leaving the buds that remained to perfect their fruit in security.”

Greenfinch.—*Ligurinus chloris* (Linnaeus). Plentifully distributed throughout the valley of the Tay.

Goldfinch.—*Carduelis elegans*, Stephens. Tolerably numerous in summer. I have seen several come close to the verandah at Killiechassie, near Aberfeldy, where I had put a cage with a canary, and imitate it to perfection.

Siskin.—*Carduelis spinus* (Linnaeus). Rare, but I have seen a nest on an island in the Tay, opposite Dalguise. It also breeds at Rannoch,* and at Killin,† as well as near Pitlochry, where Col. Drummond Hay says that it is abundant in winter.

Obs. *Mealy Redpoll*.—*Linota linaria* (Linnaeus). Mentioned in the New Statistical Account of Scotland, 1845, as a rare bird in Killin parish, but I have never observed it myself.

Lesser Redpoll.—*Linota rufescens* (Vieillot). Rare, but occurs near Pitlochry and Killin.

Linnet.—*Linota cannabina* (Linnaeus). Common.

Chaffinch.—*Fringilla coelebs*, Linnaeus. One of the commonest birds in the district.

Brambling.—*Fringilla montifringilla*, Linnaeus. Rare. Mr. E. T. Booth has taken a nest of the Brambling in Glenlyon, Perthshire,‡ and Mr. Dewar has shot one near Loch Tay.

House Sparrow.—*Passer domesticus* (Linnaeus). Very common. This species, Col. Drummond Hay says, is much more abundant than formerly in the Upper Athole district. About twenty or thirty years ago he can hardly recollect having seen one.

Crossbill.—*Loxia curvirostra*, Linnaeus. This bird is very abundant in the neighbourhood of Dunkeld during the winter months,§ and is mentioned in the Old Statistical Account of Scotland as having first appeared in Dunkeld when the larch was planted there. Col. Drummond Hay has frequently noticed these birds in the woods near Pitlochry, especially among Scotch firs, and so late in the season as to lead him to suppose that, being early

* See *Zoologist*, 1871, p. 2656. † Jardine, *Nat. Lib.*, p. 278.

‡ *Zoologist*, 1877, p. 60.

§ See New Statistical Account of Scotland, Dunkeld Parish.

breeders, they were nesting. Mr. Dewar has got them occasionally on Loch Tay side.

Bunting.—*Emberiza miliaria*, Linnaeus. Not common.

Yellowhammer.—*Emberiza citrinella*, Linnaeus. Very common.

Snow Bunting.—*Plectrophanes nivalis* (Linnaeus). Breeds on most of the high mountains in this district, especially Ben Lawers and Schiehallion.

Rose-coloured Pastor.—*Pastor roseus* (Linnaeus). A specimen of this rare species was obtained at Dunkeld on 29th September, 1831.

Starling.—*Sturnus vulgaris*, Linnaeus. Very abundant, and increasing in numbers every year.

Chough.—*Fregilus graculus* (Linnaeus). Pennant states that he found this bird "in the farthest parts of Glenlyon and Achmore," but I have never heard of any being seen of late years.

Magpie.—*Pica rustica* (Scopoli). This bird used to be common in Strath Tay and in the neighbourhood of Pitlochry, but is now seldom seen. Almost the only district where it is still seen regularly is Glenqueich, near Amulree.

Jay.—*Garrulus glandarius* (Linnaeus). In Strath Tay, the Jay is increasing rapidly in numbers, but Col. Drummond Hay says that in the Athole district it is far from being so abundant as formerly.

Jackdaw.—*Corvus monedula*, Linnaeus. Swarms in the numerous high rocks overhanging the valley of the Tay.

Rook.—*Corvus frugilegus*, Linnaeus. Very common. There are several large rookeries in the valley of the Tay, notably those at Castle Menzies, Ballechin, and Pitnacree.

Raven.—*Corvus corax*, Linnaeus. A good many always to be seen on the high grounds.

Carrion Crow.—*Corvus corone*, Linnaeus. Common.

Hooded Crow.—*Corvus cornix*, Linnaeus. Not common. Kept down by the gamekeepers, who wage continual war against them.

Tree Creeper.—*Certhia familiaris*, Linnaeus. Common in the wooded glens. I have seen a great many in the wood at the Falls of Moness, at Aberfeldy. Mr. E. T. Booth found a nest there.* It is also found in the woods near Pitlochry.

Obs. *Nuthatch*.—*Sitta caesia*, Wolf. The New Statistical Account of Scotland, 1845, mentions this bird as a rarity in the

* Cat. Birds in Dyke Road Museum, p. 155.

parish of Killin, along with the Greater Spotted Woodpecker, Greater and Lesser Redpolls, Kites, and Hen Harrier, Water Rail, &c. It is also mentioned as frequenting Drummond Hill, near Taymouth, by Alexander Campbell.* It is very doubtful whether this species should be included on the authority of the above-mentioned works.

Swallow.—*Hirundo rustica*, Linnaeus. Common, but decreasing in number. They arrive in Strath Tay about 13th April.

Martin.—*Chelidon urbica* (Linnaeus). Very common, and breeds in large companies under the cliffs about Ben-y-Gloe in Glen Tilt, according to Col. Drummond Hay.

Sand Martin.—*Cotyle riparia* (Linnaeus). Common along the banks of the Tay, where they breed in large numbers.

Skylark.—*Alauda arvensis*, Linnaeus. Not very common.

VOLUCRES.

Greater Spotted Woodpecker.—*Picus major*, Linnaeus. In the New Statistical Account of Scotland this species is mentioned as occurring in the parishes of Blair and Killin. One has been obtained within the last few years by Mr Dewar, while keeper at Finlarig, on the north side of Loch Tay.

Wryneck.—*Jynx torquilla*, Linnaeus. Col. Drummond Hay, in a letter to the *Scottish Naturalist*, says that, for several seasons in succession, he heard the note of the Wryneck while fishing in the Tay about Ballathy, not far from Stanley, and also in the Faskally woods, near Pitlochry. On the 6th September, this year, there was a specimen caught on the banks of the Caledonian Railway, near Stanley, which is now in the collection of Mr. T. Marshall.

Cuckoo.—*Cuculus canorus*, Linnaeus. Very abundant all through the summer. On 12th August, 1877, I saw no fewer than three young birds on a moor, near Aberfeldy, and while beating a wood at the same place on 7th or 8th October, 1873, Mr. J. A. Harvie-Brown saw an adult bird. This year, 1878, it was heard for the first time on 5th May.

Roller.—*Coracias garrula*, Linnaeus. One specimen obtained at Dunkeld is mentioned by Mr. Gray.†

* Journey through Scotland, by A. Campbell, 1802. Vol. I., p. 231.

† "Birds of West of Scotland, p. 202."

Nightjar.—*Caprimulgus europaeus*, Linnaeus. Seen occasionally on the moors in autumn.

Swift.—*Cypselus apus* (Linnaeus). Common.

Kingfisher.—*Alcedo ispida*, Linnaeus. According to the New Statistical Account of Scotland, a few Kingfishers are found near Dunkeld on the banks of the Tay. One was shot in 1877 by the keeper at Bolfracks, between Aberfeldy and Kenmore, and the keeper who shot it says that, though they used to be pretty common on the banks of the Tay, he had not seen any but this one for many years back.

Ring Dove.—*Columba palumbus*, Linnaeus. Common.

Stock Dove.—*Columba oenas*, Linnaeus. A pair of this species bred at Dunkeld in June, 1878.*

ACCIPITRES.

Barn Owl.—*Aluco flammeus* (Linnaeus). Not nearly so common as it used to be in this district. I have heard of nests being taken at Castle Menzies and in the ruins of the Cathedral at Dunkeld.

Long-eared Owl.—*Asio otus* (Linnaeus). Not uncommon in the autumn months.

Short-eared Owl.—*Asio accipitrinus* (Pallas). Very common in neighbourhood of Dunkeld, and has been killed by Mr. Dewar on the north side of Loch Tay.

Tawny Owl.—*Strix stridula*, Linnaeus. Perhaps the commonest variety of all. I have frequently seen three or four in an afternoon's walk through the woods at Killiechassie, near Aberfeldy.

Snowy Owl.—*Nyctea scandiaca* (Linnaeus). One has been killed on Morinish Hill, near Loch Tay, by Mr. Dewar.

Obs. *Eagle Owl*.—*Bubo ignavus* (Forster). One was shot on the banks of the Tummel, near Pitlochry, but there is no doubt that it must have been an escaped bird. Mr. J. A. Harvie-Brown tells me that one escaped from Fountain's Abbey shortly before this one was shot.

Sparrow Hawk.—*Accipiter nisus* (Linnaeus). Common.

American Gos-Hawk.—*Astur atricapillus* (Linnaeus). Mr. R. Gray mentions that a specimen of this bird was obtained by a

* *Scot. Nat.*, Vol. V., p. 36.

keeper on the flanks of Schiehallion along with a number of Snow Buntings.*

Hen-Harrier.—*Circus cyaneus* (Linnaeus). Mentioned in the New Statistical Account of Scotland, 1845, as one of the rare birds in Killin parish. Colonel Drummond Hay says that, though not uncommon in former years, it is now all but extinct through the incessant persecution of keepers.

Buzzard.—*Buteo vulgaris* (Leach). Not so common as in former years. Colonel Drummond Hay says that even in 1832 they were to be seen in considerable numbers about the Dunkeld grounds. In the Old Statistical Account of Scotland the name "buzzard" is applied indiscriminately to Buzzards and Glead.

Rough-legged Buzzard.—*Buteo lagopus* (Gmelin.) The New Statistical Account, 1845, says that this species is only an occasional visitant in the neighbourhood of Dunkeld, but that in 1840 a great many were seen. Colonel Drummond Hay mentions the fact that as late as the year 1856 he remembers this bird being constantly trapped by the gamekeeper on the Ballyouchan shootings, near Pitlochry, and that then it was far more numerous than the last-named species. Now they are both nearly extinct.

Greenland Falcon.—*Falco candicans*, Gmelin. Harting mentions that a specimen of this bird was obtained at Foss, on Loch Tummel side, in the spring of 1862.

Peregrine Falcon.—*Falco peregrinus*, Tunstall. Much rarer than they used to be. In the New Statistical Account, 1845, the Peregrine is said to be by no means rare in the parish of Dunkeld, while Colonel Drummond Hay tells me that some years ago it used to nest regularly on the rocks about Craig-y-barns. One was killed at Grandtully not long ago.

Merlin.—*Falco aesalon*, Tunstall. As common as the Sparrowhawk. Two years ago three or four Merlins were caught on a pole-trap on Killiechassie Moor, near Aberfeldy, in a very short time.

Hobby.—*Falco subbuteo*, Linnaeus. The Hobby is mentioned in a list of "Birds observed at Rannoch" by Thomas Eadle,† and my friend Mr. J. A. Harvie-Brown tells me that he saw it there in 1874 on two occasions.

Kestrel.—*Falco tinnunculus*, Linnaeus. Tolerably abundant.

* "Birds of West of Scotland," p. 39. † *Zoologist*, 1871, p. 2656.

Golden Eagle.—*Aquila chrysaëtus* (Linnaeus). Towards the middle of last century, according to Pennant,* eagles were so common in Rannoch, that the commissioners of the forfeited estates offered a reward of five shillings for every one that was destroyed; in a little time such numbers were brought in that the Honourable Board reduced the premium to three shillings and sixpence. This and the endless war waged against them by gamekeepers, sufficiently explains the comparative rarity of their appearance in this part of Perthshire at the present time. They are still occasionally to be seen, however, frequenting the high tops of Ferragon, Ben Lawers, Schiehallion, &c. The keeper at Killiechassie told me that he came upon one suddenly on a misty day near the top of Ferragon in 1873.

White-tailed Eagle.—*Haliaëtus albicilla* (Linnaeus). An Eagle of this species was seen on Loch Tummel by Henry Hussey's son, and a few days afterwards at Loch Erricht.† I have heard of two others being seen and killed, one in Glen Lyon, and the other on Ben Lawers.

Kite.—*Milvus ictinus* (Savigny). Though much rarer than formerly, this species still exists in considerable numbers in the wilder parts of Perthshire.

Honey Buzzard.—*Pernis apivorus* (Linnaeus). Macgillivray ‡ mentions the occurrence of a nest in the woods of Aberfeldy on the authority of Mr. J. M. Brown. Dr. Robertson of Dunkeld also got one at Dalguise in the autumn of 1836. The New Statistical Account says one was shot at Dunkeld some years before 1845, and is in the possession of the Honourable Fox Maule, Birnam Lodge.

Osprey.—*Pandion haliaëtus* (Linnaeus). Has been shot by Mr. Dewar on Loch Tay, and though not common, is not a very rare bird. It is to be seen on the Tay sometimes in the neighbourhood of Dunkeld.

GALLINAE.

Obs. *Pallas' Sand-Grouse*.—*Syrnhaptes paradoxus* (Pallas). One of this species was sent in a hamper of game from Perth to Mr. A. Ruthven, gamedealer, Liverpool, and is now in Derby Museum. It is not known from what district of Perthshire it came.

* Pennant's "Tour," Vol. iii., p. 24. † *Zoologist*, 1864, p. 9206.

‡ Macgillivray's "British Birds," Vol. III., p. 738.

§ *Zoologist*, 1863, p. 8689.

Ptarmigan.—*Lagopus mutus*, Leach. A few are to be found on some of the highest mountains, such as Ben Lawers, Ben More, Schiehallion, &c.

Red Grouse.—*Lagopus scoticus* (Latham). The commonest bird in the district.

Capercaillie.—*Tetrao urogallus*, Linnaeus. More numerous here, perhaps, than in any other part of Scotland. Since their reintroduction into this country by the late Marquis of Breadalbane, they have increased rapidly, and are now spreading all over Scotland. They do a good deal of damage to the trees, and are said to drive out blackgame and pheasants.

Black Grouse.—*Tetrao tetrix*, Linnaeus. Common, especially on the birch-clad hills above Taymouth, in Strath Tay.

Pheasant.—*Phasianus colchicus*, Linnaeus. In 1793* the Pheasant was a common bird at Dunkeld, having been introduced by the Athole family, but in 1798† they were dying out again after repeated attempts to rear them had been made. Now, however, they seem to do well at all the large places, such as Castle Menzies, Taymouth, Murthly, &c.

Partridge.—*Perdix cinerea* (Charleton). Very common on the low grounds.

Quail.—*Coturnix communis* (Bonnaterre). One has been shot by Mr. Dewar on Loch Tay side.

GRALLATORES.

Heron.—*Ardea cinerea*, Linnaeus. Common. Breeds at Blair Athole, where there is a heronry. Yarrell‡ mentions, on the authority of Sir David Lindsay, that Cranes formed part of the bill of fare at a grand hunting entertainment given by the Earl of Athole to James V. of Scotland and the Queen mother, on the banks of the Loghaine, in Glen Tilt. There is little doubt that Herons are meant here.

Curlew.—*Numenius arquata* (Linnaeus). Very abundant everywhere.

Greenshank.—*Totanus glottis* (Pallas). Rare. Col. Drummond Hay says: "Mr. Carrington showed me an unblown egg of this species which he had recently found on one of the moors in the north-west of Perthshire, where he saw the old birds breeding."

* Old Stat. Acct. Scot., Vol. IX. † Old Stat. Acct. Scot., Vol. XX., p. 439.

‡ Yarrell, Vol. II., p. 531.

Wood Sandpiper.—*Totanus glareola* (Linnaeus). In some "Ornithological notes from Perthshire," in the *Zoologist*,* mention is made of this species being found on the moor of Rannoch.

Redshank.—*Totanus calidris* (Linnaeus). Common on the Tay.

Common Sandpiper.—*Actitis hypoleucos* (Linnaeus). Very common.

Curlew Sandpiper.—*Tringa subarquata* (Güldenstädt). One shot by Mr. Dewar near Loch Tay.

Woodcock.—*Scolopax rusticola*, Linnaeus. Remains all the year round, and breeds in most of the woods. It is perhaps worthy of remark that since they began to breed here in any numbers, there has been a marked falling off in the number of birds to be found when beating the woods at the end of the season.

Common Snipe.—*Gallinago gallinaria* (O. F. Müller). Not very numerous.

Jack Snipe.—*Limnocryptes gallinula* (Linnaeus). Nearly as common as the last-mentioned species, and I have shot them on the 12th of August.

Red-necked Phalarope.—*Phalaropus hyperboreus* (Linnaeus). Col. Drummond Hay tells me that a rather numerous colony of this bird was known to him to breed annually in a small isolated loch in the Athole district, but, as he has not visited it for some years, he cannot say whether they still frequent the same spot.

Grey Phalarope.—*Phalaropus fulicarius* (Linnaeus). Mr. E. T. Booth obtained a single specimen of this species in Glen Lyon, at a distance of forty miles from the sea.†

Black-winged Stilt.—*Himantopus candidus* (Bonnaterre). Mr. Don, in his account of the native plants and animals of Forfarshire, mentions two specimens of this species of Plover which were obtained, one on the mountain of Clova, in Forfarshire, and the other on Ben Lawers, at the north side of Loch Tay.

Lapwing.—*Vanellus cristatus*, Meyer. Breeds in large numbers all through the district.

Golden Plover.—*Charadrius pluvialis*, Linnaeus. A few to be seen on the moors throughout the summer.

Dotterel.—*Eudromias morinellus* (Linnaeus). Rapidly decreasing in numbers. It is still to be found during the breeding season, however, on some of the higher mountains to the north of Loch

* *Zoologist*, 1876, p. 5101. † Cat. Birds in Dyke Road Museum, p. 98.

Tay. Mr. Booth obtained some specimens on the north side of Glen Lyon.*

Ringed Plover.—*Aegialitis hiaticula* (Linnaeus). Rare. Has been seen by Col. Drummond Hay in the Athole district.

Oyster Catcher.—*Haematopus ostralegus*, Linnaeus. On every channel island on the Tay and its tributaries several pairs of this bird are to be seen during the breeding season. In one or two places they breed in large numbers, as at Dalguise, between Dunkeld and Balinluig. Their eggs are greedily gathered for sale as Plover's eggs.

Water Rail.—*Rallus aquaticus*, Linnaeus. Rare. Has been shot near Aberfeldy, at Killiechassie, and on Loch Tay, at Finlarig.

Corn Crake.—*Crex pratensis*, Bechstein. In the neighbourhood of Aberfeldy I have not heard or seen a Corn Crake for two years, whereas, in the Athole district, Col. Drummond Hay says it is much more abundant than it used to be.

Moor-hen.—*Gallinula chloropus* (Linnaeus). Very common.

Coot.—*Fulica atra*, Linnaeus. Not so common as the last-mentioned species.

NATATOIRES.

Arctic Tern.—*Sterna macrura*, Naumann. Rare.

Kittiwake.—*Rissa tridactyla* (Linnaeus). Has been shot on Loch Tay by Mr. Dewar.

Black-headed Gull.—*Chroicocephalus ridibundus* (Linnaeus). Common.

Great Black-backed Gull.—*Larus marinus*, Linnaeus. Rare. Has been obtained by Mr. Dewar on Loch Tay.

Lesser Black-backed Gull.—*Larus fuscus*, Linnaeus. Tolerably common, and generally seen in company with the Black-headed Gull.

Common Gull.—*Larus canus*, Linnaeus. Not so common as either the Black-headed or Lesser Black-backed Gulls. Breeds on an island in Loch Tay.

Razor-bill.—*Alca torda*, Linnaeus. Shot by Mr. Dewar on Loch Tay, who tells me that he sees several every year.

Common Guillemot.—*Alca troile* (Linnaeus). Has been obtained on Loch Tay by Mr. John Tarret, who has the skin in his possession.

* Cat. Birds in Dyke Road Museum, p. 146.

Puffin.—*Fratercula arctica* (Linnaeus). One found dead on the shore of Loch Tay in July, 1878, by Mr. Dewar.

Great Northern Diver.—*Colymbus glacialis*, Linnaeus. Frequents Loch Tay. Col. Drummond Hay has known instances of these birds being taken in the nets set for pike on Loch Ordie.

Black-throated Diver.—*Colymbus arcticus*, Linnaeus. Mr. J. A. Harvie-Brown states that at least one pair breeds near Pitlochry, while Col. Drummond Hay has seen one specimen in splendid plumage which was killed there.

Little Grebe.—*Podiceps minor* (Gmelin). Often seen on the lochs.

Great Cormorant.—*Phalacrocorax carbo* (Linnaeus). Killed by Mr. Dewar on Loch Tay, and now in his collection.

Shag.—*Phalacrocorax cristatus* (Faber). Not a rare bird on Loch Tay, and I have seen two or three at different times on Loch Glassie, near Aberfeldy.

Leach's Petrel.—*Procellaria leucorrhoea* (Vieillot). One shot by Mr. Dewar on Loch Tay, in July, 1875.

Stormy Petrel.—*Procellaria pelagica*, Linnaeus. One found dead in Glen Tilt on November 1st, 1868.

Obs. *Wild Geese* are frequently seen passing and repassing during their autumnal and vernal migrations, but it is impossible to say to what species they belong.

Whooper.—*Cygnus musicus*, Bechstein. In severe winters to be seen on many of the lochs.

Obs. *Black Swan*.—Seen on Loch Tay by Mr. Dewar. No doubt an escaped bird.

Widgeon.—*Mareca penelope* (Linnaeus). Common in winter.

Teal.—*Nettion crecca* (Linnaeus). Plentifully distributed all over the district. Breeds in considerable numbers by the numerous burn sides, and in the peat-hags.

Wild Duck.—*Anas boschas*, Linnaeus. Common.

Shoveller.—*Spatula clypeata* (Linnaeus). A pair of these birds was seen at the mouth of the river Dochart by Mr. Homes, when fishing at Killin.

Pochard.—*Fuligula ferina* (Linnaeus). Not uncommon on Loch Tay. A nest of this species was found on a small loch at Kilbryde, near Dunblane, this season, 1879.

Tufted Duck.—*Fuligula cristata* (Leach). Pretty common on Loch Tay. Mr. Dewar has frequently shot them.

Scaup.—*Fuligula marila* (Linnaeus). Occasionally to be seen on Loch Tay.

Golden-eye.—*Clangula glaucion* (Linnaeus). Rare.

Eider Duck.—*Somateria mollissima* (Linnaeus). Several shot by Mr. Dewar on Loch Tay.

Goosander.—*Mergus merganser*, Linnaeus. Breeds on an island on the Tay, between Dunkeld and Ballinluig. Is often seen on Loch Tay.

Red-breasted Merganser.—*Mergus serrator*, Linnaeus. Col. D. Hay has seen this species in the Athole district.

III.—On the species of *Dentalium* found in the Carboniferous Strata of the West of Scotland. By Mr. JOHN YOUNG, F.G.S.

Mr. Young stated that in Woodward's classification of the Molluscs, *Dentalium* is placed next to the Clitonidæ in their organization, and form a family by themselves named Dentalidæ. According to this authority, these tooth shells are animal feeders, devouring Foraminifera and minute bivalves. They are found in most seas, in sand or mud, in which they bury themselves—the British species ranging over the sea bottom at a depth of from 10 to 100 fathoms. The shells of *Dentalium* are tubular, symmetrical, curved, open at both ends, attenuated posteriorly, the aperture circular and not constricted, and the surface of the shell smooth, annulated or longitudinally striated. They have been found ranging from the Devonian formation to the present seas, and seventy fossil and thirty living species have been recorded. The species found in our Scottish beds are *Dentalium ingens*, De Koninck; *D. priscum*, Goldfuss; *D. inornatum*, M'Coy, and two other smaller forms, apparently undescribed, to which the author had provisionally given the specific names of *D. Scoticum* and *D. Dalryense*. After giving in detail a description of the first three species, and noticing the localities where they have been found, the author stated that the little species to which he had provisionally given the name of *D. Scoticum*, is abundant in the shale of one or two localities, where it is always associated with *D. priscum*. In our lists it is generally confounded with *D. inornatum*, but may be easily distinguished from that species by its small size and the much greater curve of its shell, which is smooth, the greater curvature being at the posterior end. It rarely exceeds $\frac{2}{8}$ inch in length, and at the anterior end $\frac{1}{16}$ inch in diameter, and now that well-preserved examples of *D. inornatum* have been

found, the distinguishing characters of it and of *D. Scoticum* can be better compared.

During the course of an excursion last summer, and while proceeding from Cunningham Baidland to Dalry, attention was directed by Mr. John Smith, of the Eglinton Ironworks, to a bed of shale lying exposed alongside one of the pit railways, and which he stated contained some rather rare Entomostraca. Among other organisms obtained from this shale it was interesting to find a species of *Dentalium* which Mr. Young considered new, and which he had pleasure in naming after a district which has of recent years yielded many interesting groups of fossils. *D. Dalryense* is a little curved tapering form, and may be described as having its surface ornamented by fine, sharp, regular lines of growth, which have an oblique curve around the shell. It seems to have seldom exceeded $\frac{1}{4}$ inch in length by $\frac{1}{12}$ inch in diameter at its anterior end. It has the same curvature as *D. Scoticum*, but is easily distinguished from that species by its fine sharp annular lines of growth and by a rather more rapid tapering of its shell. This species is only known to occur in the bed of shale at Dalry which lies in the upper limestone series of that district, but it will probably be discovered in other localities. Mr. Young concluded by stating that while the Scottish species of *Dentalium* range from the lower to the upper marine beds, yet they do not occur, so far as he was aware, in any of the purer beds of limestone. All the species of the genus which he had found were obtained from the shales, which indicated that they lived in seas of lesser depth than those in which the purer limestones were deposited. This conclusion therefore agrees with what Mr. Young has already recorded regarding many other Carboniferous gasteropod shells which are likewise chiefly obtained from the shale beds.

IV.—*Notes on the state of Vegetation in the Public Parks, and Observations regarding the Weather during 1878.* By Mr. DUNCAN M'LELLAN, Superintendent of Parks.

Last season will long be remembered as one of the most genial and fruitful of the present century. The spring months were all that could be desired for starting anew the vegetable world. The soil was in perfect condition during the month of March for receiving the precious seed, and April with its sunshine and showers brought out a flush of vegetation which has rarely been

equalled; consequently, trees and shrubs were very luxuriant in all the Parks during the summer and autumn. The only exception proved to be the horse chestnuts and limes in Kelvingrove Park, which received a blight in May during a few days of east wind. This, combined with the sulphurous smoke from St. Rollox, rendered them unsightly for the remainder of the season.

The flowers in all the Parks bloomed very profusely, more especially geraniums and calceolarias. The planting-out season in May being very favourable, the plants were enabled to get a good start, and with the high temperature and brilliant sunshine which prevailed during June, July, and August, the blooms and foliage were brought to remarkable perfection. The flowers continued in good form until late in the autumn, indeed geraniums, antirrhinums, stocks, and pentstemons remained in bloom until the end of October, when frost and snow killed them. A further proof of the very mild weather in autumn was afforded by the bursting into leaf and flower of the Scarlet-fruited Elder.

As a result of the fine weather during last summer and autumn, all flowering trees and shrubs promise an abundant bloom for this year, especially the rhododendrons. Although the frost was very severe during December, the wood and buds were well matured, and do not appear to have suffered.

It may be interesting to note that the display of flowers in George Square, although in the centre of the city, was not far behind that of the Parks—annuals, stocks, geraniums, calceolarias, and other bedded-out plants were very effective. Experiments were made by planting a number of foliage plants and shrubs, to test their endurance of smoke. The following appeared to good advantage all the season:—*Eucalyptus globulus*, or gum-tree of Australia, *Arabia sieboldii*, various species of *Dracaena*, *Yucca*, *Agave americana*, *Echeveria metallica*, *Acacia lophantha*, *Grevillea robusta*. These were planted out about the beginning of June, and remained in the ground until the first week of October.

At the close of my remarks on the weather of 1877, which was an extremely wet season, I expressed a wish that the old Scotch proverb, "Lang foul, lang fair," might prove true in 1878, and I think you will agree with me that it has been verified by the following record kept at Queen's Park:—

During 1878 there were 225 dry days, with a total rainfall of 26·18 inches, as against 195 dry days, with a total rainfall of

COPY OF METEOROLOGICAL RECORD KEPT AT QUEEN'S PARK, GLASGOW,
FOR THE LAST THREE YEARS.

MONTH.	1878.				1877.				1876.			
	Rainfall.	THERMOMETER.		Dry Days.	Rainfall.	THERMOMETER.		Dry Days.	Rainfall.	THERMOMETER.		Dry Days.
		Average.				Average.				Average.		
		Max.	Min.			Max.	Min.			Max.	Min.	
JANUARY,	4·65	41	31	14	9·39	41	31	4	3·35	42	31	15
FEBRUARY,	1·41	44	35	17	4·45	48	33	5	3·11	32	29	10
MARCH, ..	1·85	49	32	21	2·33	45	30	12	5·00	35	29	13
APRIL, ...	2·25	53	38	19	2·26	47	34	18	1·66	52	36	17
MAY, ...	2·73	60	42	14	1·57	54	37	22	·44	61	38	27
JUNE, ...	2·30	68	45	18	2·86	68	47	14	2·35	66	45	17
JULY, ...	·39	71	48	27	3·07	64	49	4	2·58	75	49	17
AUGUST,...	2·53	67	50	13	6·20	63	48	9	2·68	69	48	21
SEPTEMBER,	4·61	63	47	10	1·50	60	41	22	2·97	61	43	14
OCTOBER,	1·26	55	43	20	4·71	54	39	11	5·52	55	44	16
NOVEMBER,	1·30	41	30	23	5·22	52	40	2	2·84	43	33	22
DECEMBER,	·90	33	28	29	4·47	44	33	8	4·81	42	34	6
	26·18	53	39	225	48·03	53	38	131	37·31	52	38	195

48·03 inches, in 1877. The lowest point to which the thermometer fell was 10° on the 24th December last, and the highest in the shade 89° on the 28th June, as against 13° on the 27th February, and 79° on the 16th June, of 1877, the average temperature being about equal for each year.

It may be interesting to notice a prediction made to me by an old gentleman in Kilmarnock when I was there at the end of February last year. On the previous week a peculiar fog or mist had settled down over the town, which my friend assured me was a sign that we would have a very dry summer, as he recollected the same phenomenon occurring before the dry year of 1826.

The above record proves this weather prophet to be a keen observer of nature, and teaches us that we may derive benefit from everyday signs if we can read them aright.

MARCH 25TH, 1879.

Mr. John A. Harvie-Brown, F.Z.S., Vice-President, in the chair.

Messrs. R. Wilson Thom and St. John Vincent Day were elected ordinary members.

SPECIMENS EXHIBITED.

Mr. James Coutts exhibited specimens of sponges from the Greensand, and various fossils from the Carboniferous and Liassic formations in the South of England, on which Mr. John Young, F.G.S., made some descriptive remarks.

PAPERS READ.

I.—*Notes and Observations of Adventitious Structures on Crinoid Stems.* By a Corresponding Member. Communicated by MR. JOHN YOUNG, F.G.S.

[Third Paper.]

A long engagement, often renewed, renders the remarks which follow in some degree hallowed; and it would be a relief, while the pen can still be wielded, to advance or complete the old self-imposed compact, in continuation of previous observations in these pages—for nature presents nothing in itself frivolous.

In a short paper read at a meeting of the Natural History Society, about a year ago (see Vol. III., 1878, p. 333), it was demonstrated that the Polyzoa and Crinoidea attached themselves, not strictly parasitically, but adequately, by a basal structure, as independent organisms, to fragments of old ocean debris, particularly in the latter, to those belonging to its own genus. Other organisms likewise attach themselves less markedly, and a few as if so attached are found which do not need or seek such support, except as a temporary resting-place, and there apparently perish. But to begin:

I. ?*Michelinia*, De Kon. An irregular mass of irregular calcareous structure, attached to a much worn fragment of Crinoid, found at Gare, has somewhat of the character of the coral *Michelinia*. The cups or cells are heaped up and ill defined in variously shaped squares, divided by slender partitions, with no notable surface markings. Some specimens of what is evidently the basement portion are found, but do not aid much in defining or determining this organism, being seemingly the side of a cell, with the slender partitions, and in one instance showing lines or bracings of attachment or of extension. The structure is by no means attractive, and from this cause, or its rarity, few specimens have been collected or preserved.

II. *Palaeacis cyclostoma*, Phill. Numerous specimens of this Actinozoon, on worn stems of Crinoids, at Gare, and in the beds connected with the first calmy limestone, are found.

A species also named *Palaeacis cyclostoma*, is found in the shales above the Hosie limestone. These are so dissimilar in aspect and character, as to admit of a doubt whether they are of the same species. The specimens from Gare, and from the first calmy limestone, are all badly-formed single cells of the same size (about one line diameter), high and comparatively strong on one side. The whole consists apparently of three or four distinctly dotted rows of a coarse character, rather than of fine reticulation; the lowest row only forming a complete circle, while the others form portions, more or less, of circles. The high side derives its strength from the angle of its external wall alone, as it is straight or perpendicular on the inner side, and from the highest point the lips of the cup gradually slope to the opposite side, which is low. The bottom of the cup is thin and flat. At a glance they all appear imperfectly-formed cups, yet, as every specimen is alike, there is reason to believe that the organism is of adult proportions, never

assuming any other form, size, or ornamentation. But the specimens found in the shales above the Hosie limestone are elegant and complete structures, twice the diameter of the former, the cells being formed in a mass of some thickness, with well-defined elevated cups, and depressions in the mass separating the cups from each other. The cups are symmetrically formed, strong, with rounded bottoms. The whole structure is finely reticulated.

III. *Spirorbis caperatus*, M'Coy. This little Annelid often selected Crinoids on which to attach and construct its abiding place, and does not seem to have chosen any but those which were much worn. Although numerous, the specimens are by no means conspicuous, and a small bit of Crinoid may have from one to four specimens on its surface; but comparatively few bear the characteristic markings, and the size is not uniform. Professor M'Coy's description does not seem to be perfectly correct, although not likely to be misleading; but at the time of passing the "Synopsis" through his hands, he had seen only one example of the species. "Strongly wrinkled concentrically," as described by him, applies to distinct and regular, round, concentric, fine lines, crossing the shell from one point of attachment to the other, a shell marking which belongs to the outer coat exclusively, not as wrinkles or wrinkle-like, as illustrated by the specimens exhibited.

- A. A characteristic specimen.
- B. Partially abraded.
- C. Showing cavity and thickness of shell.
- D. Three specimens on a bit of worn Crinoid, along with *Palaeacis*, *Stenopora*, basal attachment of Polyzoon, &c.
- E. A specimen entangled with web of *Stenopora* not during life.

IV. *Ortonia carbonaria*, J. Young. To have found that good specimens of *Ortonia carbonaria* had been laid aside for enquiry, upwards of 50 years ago, is something very like a new observation. Often in comparatively recent times, in agglomerated masses of fossils, this organism has been found at Gare, and in the first calmy limestone bed; but the specimens—about a dozen in number—under notice, which had so long ago excited attention, are attached to the surface of a clean well-preserved Crinoid. A question naturally

arises—Did these slender and minute structures build the fabric they present, and live on stems of Crinoids; or is their condition an accidental phenomenon by mere temporary adhesion or contact?

V. *Vermilia minuta*, Brown. These fabricless inhabitants of ancient oceans, in their shadowy shrouds might excite the imagination and please the visionary in his dreams. Did they perform any significant or important office?

To smooth, unworn Crinoids—not to the tattered and torn, like faint images in a mirror, scarcely more substantial—they seem to have clung, and, martyr-like, performed their last wriggle, not after any pattern, but variously; and like man, have fulfilled their allotted span in the same space in history—they lived—they died.

VI. *Crania quadrata*, M'Coy. In the sediments of the old seas the broken and dismembered stems of a Crinoid were the special throne of the *Crania*, although other debris was not rejected. The attached valve is generally almost exclusively found on these stems. If it were important, the proportion might be vaguely ascertained. In 30 instances, for example, attached to well-preserved fragmentary Crinoids—not to worn or abraded fragments—28 present the attached valve, and only 2 specimens of both valves. In the majority of examples little is left of the shelly matter, and one is left involved in a web of *Stenopora tumida*. Of the free valve, on a small stem, two examples occur; one evidently bearing the free valve compressed; another specimen, deemed very rare, has during life been encroached on by an enlarging basal portion of Crinoid, or the union of several, and would have been covered had not the vital energy of the first occupant apparently necessitated a deviation from the common plan by continued and forcible resistance, causing the Crinoid to disperse its required structure on either side, free of the living *Crania*—which nevertheless perished, as it would seem, through its confined and restricted action and growth. The phenomenon is unique as far as known.

VII. *Discina nitida*, Lamarck. On a fragment of stem of a Crinoid only one *Discina* (with both valves), indifferently preserved, has been seen, and, consequently, in this connection, it must be found rarely. It is, however, by no means rare, and is often found in small ironstone nodules beautifully preserved. It is found, also, on shells, sometimes in groups.

As light dawned the original stock of organic substances, long

laid aside, as found on Crinoids, decreased—the basal portions of the Crinoid, when recognized in its hydra aspects, having alone obscured several genera of imagined structures.

II.—*On Fresh and Brackish-water Ostracoda, chiefly from the West of Scotland.* By Mr. DAVID ROBERTSON, F.L.S., F.G.S.

This paper, being a contribution to the “Fauna of Scotland,” published by the Society, is printed separately.

III.—*Notes on the Occurrence of a species of Boring Marine Alga penetrating the Shell Structure of a species of Productus.* By Mr. JOHN YOUNG, F.G.S.

Mr. Young stated that, while preparing specimens of a *Productus* for microscopic examination of the shell structure, he had occasion to remove the outer surface of the shell with weak acid. After this was done, he found that the inner layer, in many of the specimens, had been burrowed by a minute parasitic organism of a tubular character. These borings on the surface are scarcely visible to the naked eye, but when examined under a low power of the microscope, are seen to branch in certain directions by bifurcation of the tubes as they pass through the inner layers of the shell. In some of the specimens the dark matter filling the tubes is seen to terminate in rounded points: some of the branches also present a moniliform structure of tube; while others, viewed in cross sections on the etched surfaces of the shell, appear as a series of black round dots. Mr. Young stated that at first he was inclined to regard these perforations as the work of a minute burrowing sponge, but he had found that a similar organism which had been found perforating the structure of Silurian and Devonian corals and brachiopods, as well as corals from some of the more recent formations, had been described by Professor P. M. Duncan, F.G.S., in the *Quarterly Journal of the Geological Society of London*, for May, 1876. Professor Duncan, in his paper, regards these perforations as the work of a unicellular alga, parasitic within the structure of the organisms, and clearly related to *Achlya*; and he distinguishes the form found in the palaeozoic rocks as *Palaeachlya perforans*. After a close comparison of the Carboniferous organism with that figured by Professor Duncan, Mr. Young was inclined to

regard it as the same, as it agreed in all essential particulars, except those which would naturally arise out of differences in the form and structure of the kind of organism penetrated. To distinguish the Carboniferous form from that already described, he proposed to call it *Palaeachlya perforans*, var. *carbonaria*, as it appears to have been a little more robust than the older form.

Mr. James Neilson, jun., also showed an interesting series of *Chonetes Laguessiana* from Roscobie, Fifeshire, which, under the partly eroded surface of the outer shell, showed numerous perforations of, apparently, the same boring alga. Mr. Young had also found it in the shell structure of *Productus costatus*, a Carboniferous limestone fossil, as well as the last named.

APRIL 29TH, 1879.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr. John Smith, Stobbs, Kilwinning, was elected a corresponding member, and Mr. Christopher Sherry an ordinary member.

SPECIMENS EXHIBITED.

Mr. John Young, F.G.S., exhibited a series of Conodont remains and Sponge Spicules from the Silurian and Devonian limestone strata of England, forwarded by Mr. John Smith, Kilwinning, corresponding member, who had sent for exhibition, at a former meeting of the Society, an interesting series of conodonts and various forms of sponge spicules, which he had found in the limestone strata around Dalry, Ayrshire. Since that time Mr. Smith had visited several districts in England, and had been successful in discovering the remains of conodonts in some of the weathered shales and limestones of the localities he had visited, and which curious remains had not, so far as he knew, been formerly noted as occurring either in the Silurian or Devonian formations of England. Very little is yet known of the nature of the organisms that have yielded these conodont remains, which consist of small teeth, jaws, &c., of many different forms, one authority referring them to the jaws of annelides, another to those of myxinoid fishes, or to the lingual armature of certain forms of mollusca or the

maxillipeds of crustacea. As new localities for these interesting though obscure forms are being found, it is to be hoped that more light will soon be thrown upon the true nature of their origin.

Mr. Young also exhibited a series of beautiful plates he had received from Mr. Thomas Davidson, F.R.S., Brighton, illustrating a number of new and rare forms of Carboniferous brachiopoda from the West of Scotland, which he is preparing for the supplement to his great work on the Fossil Brachiopoda of Great Britain, upon which he has been busily engaged for the last 30 years. Among the specimens figured in these plates, Mr. Young called the attention of the members to a small species of *Productus* which he had found at Brockley, near Lesmahagow, and to a small species of *Chonetes* from Corrieburn, Campsie. The former had been identified by Prof. de Koninck, of Liège, as his *Productus Griffithianus*, found first at Vise, in Belgium, but which has not previously been recorded for Britain. The second had been identified by Mr. Davidson as *Chonetes gibberula* (McCoy), and also new to the Scottish list.

Mr. Henry C. Young exhibited the following spiders new to Scottish lists:—

Steatoda bipunctata, Linn. One specimen, a male, taken in the window of a cellar at Port-Dundas on 14th June, 1878.

Agroëca proxima, Cambr. One male, taken on a hedge bank at Kilmalcolm on 4th September, 1878.

Neriene rufipes, Sund. Two females, taken in the neighbourhood of Glasgow in June, 1878.

Linyphia zebrina, Menge. This spider was exceedingly common among herbage in every locality visited during last summer and autumn.

Linyphia pallida, Cambr. One specimen found at roots of grass near Hamilton on 22nd August, 1878.

Epëira agalena, Walck. A male and female of this species were taken at Aviemore, Perthshire, in July, 1878, by Mr. J. J. King.

Xysticus ulmi, Hahn. A male of this species taken among grass on the cliffs, Arbroath, in September, 1878.

Tarentula miniata, C. L. Koch. One specimen, a female, taken at Prestwick, by Mr. F. Alexander, in July, 1878.

Heliophanus flavipes, C. L. Koch. Two specimens, females, taken in the neighbourhood of Glasgow in June, 1878.

PAPERS READ.

- I.—*On the Mammalia of Scotland.* By Mr. EDWARD R. ALSTON, F.Z.S., F.L.S., F.G.S., Corresponding Member.

This paper, which forms a portion of the “Fauna of Scotland,” published by the Society, is printed separately.

- II.—*On the Archaeology and Natural History of Tory Island.* By Mr. J. A. MAHONY, Corresponding Member. With two Plates [III. and IV.].

What Iona is to Scotland, Tory is to Ireland. The archaeological remains of the Irish island are not in so good a state of preservation as those of Iona, but do not yield to them in interest. It is therefore of importance to chronicle them, as well as to have a full record of the Natural History of so remote an island; but this has not hitherto been done. The readiest way to get to the island is from Ballinass, near Falcarragh. This place is 42 miles from Londonderry by road. Arrived at Ballinass you make arrangements for a small boat to take you to the island, the “regulation” cost of which is 20s. From Ballinass to Tory the distance is 10 Irish miles, and the journey is, of course, not unattended by danger; but, with a breeze from the S.W. or S.E., is pleasantly performed in two or three hours. The writer has visited the island six times, and on two occasions only experienced any trouble in returning. Southerly gales kept him a prisoner for a week at one time, and for five days at another.

Tory is two and a-half miles long, and about a-quarter of a mile broad at its western extremity. There it is level, but on the east it rises into towering headlands 200 feet high—these cliffs (or “tors,” as they are called by the natives, and which may account for the name of the island) being of the boldest and most fantastic shapes.

The usual place of landing is at the Camus, where the first thing to attract notice is the Round Tower. Nothing has been done to preserve this interesting ruin from the ravages of time, and its original height cannot now be accurately ascertained. It was examined, however, by Mr. Edwin Getty, in 1845, and at that time the pileus or cap was partly standing. He gives the height at 51 feet, the outer circumference at 51 feet 6 inches, and the diameter 17 feet 2 inches.* Every winter now brings down some of the

* Ulster Journal of Archaeology, Vol. I., p. 146.

upper structure, and I estimated that its present height is 45 feet. It is built of undressed boulders of red granite, and where white lime, made of burnt shells, has been used, it is only sparingly so, and wherever even a very small stone could be employed, it has been fitted in. The doorway is at a height of 8 feet from the ground, and the writer was enabled to climb up to it by the help of the interstices between the stones. Here it was found that the wall was 4 feet 3 inches in thickness, the doorway itself being $5\frac{1}{2}$ feet high.

Looking upwards through the interior, projecting stones at regular distances seemed to indicate the existence of stone floors when the tower was in use, and these floors were five in number, so far as the present state of the tower enabled one to judge, the communication between them being probably by means of ladders. That Round Towers were, to some extent at least, intended for places of refuge, is shown by their mode of building, as well as by the fact of the door being placed in so comparatively inaccessible a position.

The next most important ruin in the island is the Abbey of St. Finian. Its extent was easily ascertainable in 1870, and a few years previous to that an arch, probably the east door, was intact; but now the whole is an indistinguishable heap of stones. This abbey is believed to have been founded by St. Columba in the sixth century, before he commenced his missionary work in Iona.

The remains of another church are met with outside the "town" as you travel westwards. This is "The Church of the Seven"—or Mor Sheishear—a very small place of worship, as it does not seem from the examination made by the writer to have been more than 12 feet long. From a hole in the wall earth is sometimes taken, which is guaranteed to banish rats from any house in which it is placed. The natives are jealous of any stranger helping himself to this sacred deposit, so the services of the man who has the assumed privilege had to be secured; but the result of its use when transported to the mainland was not successful in causing the rats to depart.

Near the Tower is a rude collection of stones, mostly chiselled, which gets the name of "The Altar of St. John the Baptist." A trough-shaped mass of sandstone, 4 feet 10 inches long and 5 inches deep, with a cup-shaped vessel, rudely fashioned of the same material, is placed in the centre. The uses of these remains are

not known, but at this "altar" the priest was in the habit of officiating before the present chapel was built.

There are three Crosses on the island, although one of them could not now be recognized as such. The least imperfect is placed on a pedestal, built in 1877, by the Rev. James M'Fadden, for its preservation. It is of mica slate, and is 6 feet in height, ending, as it does, at the arms. No markings are now visible.

The second cross is called St. Columba's Cross, from the idea that the figure of a man indicated on it represents that saint. The third is known as St. John's Cross. It has lost its arms, which, however, are carefully laid at the side of the monolithical pedestal on which it stands.

Another, and more perfect Cross, was taken, a long time ago, from Tory, and now lies in the graveyard of Ray Church, near Falcarragh.

So much for the ecclesiastical remains. They point to a very remote time, and are, I think, full of interest, especially when looked at in the picturesque light which the legends of the islanders have associated with them, but which it would not be suitable to reproduce here. It seems to be determined with tolerable accuracy, however, that Columba left his native place, Gartan (about 11 miles from Ramelton), and established a religious fraternity in Tory Island, before he went to Derry, or thence to Iona. Some of the remains are certainly coeval with his residence there, and others later, but all old—probably from the sixth to the tenth century.

Botany.—With a granitic soil, the island is anything but fertile. The people don't attempt to grow oats; barley and potatoes are the principal crops. From the west town to the east town—a distance of a mile—the rocky substratum is covered by a thin coating of peaty soil, except where it has been removed for fuel. It is generally only nine inches to a foot in depth, and ultimately the people will be compelled to leave the island for want of fuel, for they are, as a rule, too poor to buy coal. This peaty surface soil is covered by a stunted growth of heather (*Calluna vulgaris*), associated with *Nardus stricta* and *Carex panicea*, along with some grasses, which solely seem to justify the presence of a few sheep and two or three very lean cattle. The sward on the summit of the eastern cliffs is composed, to a large extent, of a dwarf variety of sea thrift (*Armeria maritima*). On the shore, above high-water mark, the common scurvy grass (*Cochlearia officinalis*) is every-



J. A. Mahony. direxit

TORY ISLAND.

G. C. Smith, delin.



A. Mahony, delin.

J. J. Smith, delin.

TORY ISLAND.

1. The Red Port. 2 The West Town

where to be seen, while, in shady nooks on the cliffs, *Asplenium marinum* is noticed, though it is not abundant. The flora of Tory would be very poor in variety but for the superior conditions for existence afforded to plants by a great hollow about the centre of the island, on the north side, called the Ram's Hollow, or in Irish, *Lagareithe*. This is like a steep amphitheatre in form, and was likely at one time a large cave, the roof of which has collapsed. There is still an arched opening to the sea. On the sides and in the bottom of this hollow may be found:—

Solidago virgaurea.

Rumex acetosella.

Angelica sylvestris.

Thymus serpyllum.

Lonicera periclymenum.

*Bellis perennis.**

Sedum anglicum.

Athyrium filix-foemina.

Hedera helix.

Polygala vulgaris.

Tormentilla officinalis.

As might be inferred from its position, the larger *Laminariae* and *Fuci* are abundant, and of robust growth. The specific gravity of the sea water at Tory is greater than near the mainland, or than the water at any part of the Derry or Antrim coast. This may be, and likely is, the cause of the fronds of *Laminaria digitata* being thick and “leathery” here as compared with those of other places, and of the extraordinary development of *Laminaria bulbosa*. In the sheltered bays the *Himanthalia lorea* grows to a length of 20 feet, and forms, at low-water, a barrier almost impassable by boats.

Thus it is that the burning of these seaweeds into kelp is carried on vigorously in the months of June, July, and August, and used to be the source on which the people depended for paying their rents. Now, however, they appropriate the money to their own uses, most of them having determined to resist such payments as a relic of the dark ages.

During the remainder of the year, when not employed at kelp making, the inhabitants of Tory reap the harvest of the sea by

* Also all over the island.

fishing. Every season brings its appropriate kind of fish. In July and August "Braziers," as the Tory folk call them, but known elsewhere as "Barwin" and "Gunner" (*Pagellus centrodontus*), are caught from the curraghs, or canvas boats, with long lines, in great numbers. The bait used is the common limpet. This fish is split open, salted, and dried in the sun, and forms an important article of export. At other times the Cod (*Gadus morrhua*), the Haddock (*G. aeglefinus*), the Ling (*Lota molva*), the Mackerel (*Scomber scomber*), are captured and taken in open boats to Ballinass, Dunfanaghy, Ramelton, and Letterkenney.

The Dogfish (*Scyllium catulus*) is very common on the coasts, and a deadly war is waged against it by the islanders. Among the smaller fishes to be met with, often under stones on the shore or in rock pools, are—

The Cornish Sucker (*Lepidogaster cornubiensis*), the Worm Pipefish (*Syngnathus lumbriciformis*), the Smooth Blenny (*Blennius pholis*), the Spotted Gunnell (*Blennius gunnellus*), the Black Goby (*Gobius niger*).

I will conclude these notes by saying that I have not looked into the Mammalia of the island beyond ascertaining that there are no rats on the island, but abundance of rabbits and mice, and that there are no snakes, toads, or frogs.

III.—On the Yellow Opossum (*Didelphis crassicaudata*), from Cape San Antonio, Province of Buenos Ayres. By Mr. ERNEST GIBSON, Corresponding Member.

In my last paper* I treated of the companion species, the Black and White variety (*Didelphis aurita*), and I now put together these notes on the Yellow Opossum, the "*Camadreja colorado*" (Red or Yellow Opossum), as it is called in our district, and exhibit two or three skins. The usual measurement of adult specimens may be seen in the following table:—

	Male.	Female.
Total length, nose to end of tail, .	29 inches.	26 inches.
Length of tail,	12½ "	12 "
Nose to shoulder,	7½ "	5 "
Girth of chest,	9½ "	8 "
Girth anterior to hind leg, . .	9½ "	7 "
Height at shoulder,	5 "	4½ "
Height at hind leg,	5½ "	4½ "

* See *Proceedings*, Vol. iv., Part I., page 38.

Eyes black, small, and very sinister—the latter because they are set obliquely in the head. Bare portions—such as nose, ears, soles of feet, and tip of tail—pale flesh-colour. Fur, yellow or yellowish-brown, deeper in colour on the abdomen, but varying there to an orange or reddish tinge. Frequently very beautiful varieties are found, either bright orange, or orange with a coppery tinge of red, both metallically bright; but after two or three weeks I have always been disappointed by finding the skins change to a dull, dead colour, completely losing the pretty gloss they have in life. The fur is short, but very close and fine. Occasionally one sees a tobacco pouch of yellow 'possum skin, which is the only use it is ever put to.

Though of late the species has been very abundant in this district, three years had passed here before I met with it for the first time, which is rather surprising, considering that I was then regularly egg-hunting in its favourite haunts—the swamps and fens. Since then the swamps have been unusually full of water, remaining so even during each summer's drought, and consequently affording both security and abundance of food for the animal in the shape of young birds and eggs.

The aforesaid first-met-with specimen I found in a "Biscachero," a colony of *Lagostomus trichodactylus*, while drowning out Biscachos one day. Desirous of securing it alive if possible, I took off my coat and endeavoured to entangle it in that—no easy matter, for it would turn on me now and then, and spring at my knee above the riding boot. Even when I did manage to throw my coat over it, its head would suddenly appear in the most unexpected proximity to my hands and cause me to let go. Successful at last, I drove my bowie-knife into the ground, and, clasping one end of a long silver watch-chain to the Opossum's hind leg, attached it by that. At sundown I returned for my captive, but was rather puzzled as to how I should get on to my horse with it, as I was riding bare-backed, and the said horse was young and anything but quiet. So I elected to reach for the knife without dismounting, and after a short struggle managed to do so; but at the critical moment my horse shied, his 'possumship swung up against the off fore-shoulder and incontinently put in his teeth, upon which I experienced the well-known sensation of being astride a young earthquake, followed by the pampas rising up and striking me heavily over the head and shoulders. Then I "went for that

heathen" Opossum and smote it violently, professing a momentary and most thoroughly unzoological contempt for the value of this particular cranium. But I met with my punishment, while at the same time adding to my knowledge of the family, for on going to pick up the now apparently dead Opossum, I had my thumb instantly bitten to the bone.

This was the only case I ever knew of the Yellow Opossum using its tail to aid it in springing at an enemy. In doing so, the tail was curved round into an arch, so that about a third of its length rested on the ground, and on the animal springing up—nearly perpendicularly—the muscles evidently acted as a propelling power, enabling it to jump nearly two feet in height. As the action was repeated several times, I retain no doubt on the matter, though surprised that it should never have occurred again in any other instance.

When on land "Biscacheros" (inhabited ones) and vacant armadillo burrows generally afford this species a home. How it agrees with the inmates of the former I never ascertained, but confess to having my doubts. On this subject, as on having a skunk as occasional hall-porter, I should like to have the frank opinion of some communicative "member for the burrows" of *L. trichodactylus*!

Though as much at home in the water as an Otter, the Opossums I surprised sleeping on any little islands during the flood of 1877 would not leave the land, and if driven to the edge of the water, stood at bay there rather than take to it.

As I described the black and white species as being entirely terrestrial and arboreal in its habits, so may the present one be distinguished as being as entirely terrestrial and aquatic. The nature of its food may be imagined, when I cite one instance of finding a specimen in a duck's nest, in the middle of a swamp. It was rolled up among the eggs and sound asleep, actually letting me touch it with my riding whip before it awoke, when it took to the water, and escaped. As birds, and even eggs, are to be found all the year round, the only hard times for the Yellow Opossum is during a drought, when the swamps dry up and deprive it of both shelter and food.

One spring, about the end of September, I rode over to the Cañada de Cisñeros (Swamp of the Swanneries), in search of eggs of *Cygnus nigricollis*. Three or four nests gave me as much to

carry as I could wish for, and left me free to look out for other game. The water was deep, sometimes over my horse's withers, but the bottom being comparatively free from mud, we moved about quite easily. Presently a nest attached to some reeds caught my eye, and at once announced itself as a novelty. It was spherical in shape, six or seven inches in diameter, constructed of dry rushes and water grasses, and suspended about a foot above the water. No aperture being visible, I began to remove the upper part of the nest, and was considerably surprised on finding its occupant to be a Yellow Opossum. It immediately sprung from the nest, and seemed to run along the surface of the water for several yards before plunging in. This, however, it effected by grasping the rushes just at the surface of the water, though they grew two or three inches apart, and using both fore and hind feet with such marvellous celerity as to give the above-mentioned appearance. On being pursued till it came to a channel of open water, it took to swimming—not so fast but what I managed to overtake it, when fuffing angrily at me once or twice, it dived like an Otter and disappeared. On the same occasion I found a good many similar nests, and have since continued to do so. All present the same characteristics—varying in size according to that of the occupant, from a few inches to over a foot in diameter; built loosely, but sufficiently strong and thick to sustain and hide the inmate. Where the opening is I never could ascertain, and am inclined to think that the Opossum simply pushes its way in somewhere in the side, curling itself into a ball as it does so, and drawing the aperture roughly together again. The trick of running among the rushes I have often seen repeated, and its swimming and diving powers almost equal those of the Otter.

On the ground the Yellow Opossum progresses more rapidly than its black and white relative, though easily run down on foot, and at bay is rather more disposed to be aggressive. That feigning of death (which some naturalists now believe to be a temporary and involuntary paralyzation of all the faculties through fear), characteristic of all the family, and so strongly shown in the other species, is by no means so fully developed in this one. Neither is it quite so tenacious of life as the others.

The Yellow Opossum is, I am glad to say, not so highly odorous as its darker relative, but has the same style of voice—a

hissing or fuffing sound—only used when attacked, and uttered evidently from the throat, as the mouth remains open.

During the flood of 1877 one came on board the raft on which we were floating bales to a small port in our neighbourhood, and was not discovered till we arrived at our destination on the following day. But, as a rule, the Yellow Opossum does not show such cool assurance in its dealings with man as the allied species.

I have never yet been so fortunate as to find a nest of young ones, and can only state, in regard to its breeding habits, that the young are independent of the mother at a very early stage, some I have taken being only the size of a small rat. This, then, must remain a point for future notice.

IV.—*On the Mammalia of the Outer Hebrides.* By Mr. JOHN A. HARVIE-BROWN, F.Z.S., M.B.O.U., Vice-President.

INTRODUCTION.

It is unnecessary for me to describe at any length the physical geography of the Long Island, as that has frequently been done before by authors, down from the date of Martin and the other historians whose names and works I shall mention further on, and to most of which latter I have referred during the preparation of this paper.

A short description, however, may not be considered out of place.

The total length of the Outer Hebrides, from the Butt of Lewis to Barra Head, is about 130 miles. The greater part of Lewis is comparatively flat, and covered with lochs,* or rough, uneven ground of no great altitude.

Harris, on the other hand, is rugged and grand, especially the northern half, where some of the mountains reach to altitudes of over 2,500 feet. On the west coast of South Harris commences the level, sandy-margined, pastoral country, which, with scarcely any intermission, stretches southward to the south end of the Long Island, interrupted only by the sounds, and the shallow fords, which separate the various islands.

North Uist presents to the eye the most curious division of land and water, being exactly the counterpart of Harris. Looking

* Martin tells us that from this fact the island receives its Gaelic name, viz., *Leog*, meaning “*water lying on the surface of the land.*”—“Description of the Western Isles,” 2nd edition, 1716, p. 1.

down upon it from the sides of its higher hills on the east side, it appears a perfect network of lochs, islands, and arms of the sea, and it is difficult at all points to say where land ends and water begins. Arms of the sea, such as Loch Maddy, stretch away inland from the east coast, until only separated from the Atlantic on the west by an isthmus of a few yards in width,* while the land on either side is studded with innumerable fresh-water lochs, and cut up in every direction by the ramifications of the offshoots from the sea. Ben Eabhal and Ben Lee are the only hills of any altitude, and the lower range of the Grogary hills bounds the flat land in the west. Beyond these stretches the pastoral country before referred to.

Benbecula is very similar, being mossy land studded with lochs, with a pastoral seaboard on the west side.

In the scenery of South Uist the same rugged grandeur which we meet with in Harris is combined with the flatter, water-intersected, and pastoral descriptions of country. The high hills of Hecla and Ben More, and their connecting range, form the iron-bound east coast. The central portions are mossy moorland, and the west side pastoral, fringed with sand-hills—an admirable barrier to the encroachment of the Atlantic waves.

Much the same scenery is found in Barra, but there are no high hills; but when we come to the lesser islands of Mingalay and Bernera, or Barra Head, a magnificent precipitous coast frowns over the Atlantic. The cliffs of Mingalay rival in sheer precipitous front the famed cliffs of St. Kilda, and at no locality in Scotland of the same size, I believe, will be seen a more wonderful colony of rock-birds than on the Stack of Lianamull, behind the cliffs of Mingalay.

The geological formation of the Outer Hebrides consists exclusively of gneiss rocks, with a poor surface soil and a large proportion of moss and moor. In the west the land is richer. The sandy pastures go by the name of “machars.”

An examination of Mr. E. R. Alston's exhaustive paper on the Mammalia of Scotland, prepared at the request of the Council of this Society (*vide* “Fauna of Scotland”), and of the table at page 4 of the same, will show, that of twenty-four terrestrial Mammals

* The neck of land separating Loch Maddy from the Sound of Harris is only from 15 to 20 yards in width.

which occur in Scotland, seven occur in the Inner Hebrides, and only six in the Outer Hebrides, while Ireland contains no less than twelve.

Of the twelve in Ireland, one I consider doubtful as an indigenous species, viz., the Squirrel—*Sciurus vulgaris*. My reasons for doing so cannot be given in this place, as they involve too long a discussion for this paper.

To five previously recorded in the Outer Hebrides I am now able to add the sixth—*Sorex minutus*.

We gather the general information from these comparative lists that the semi-aquatic Otter, and the wide-ranging, swift Deer were those animals—not purely oceanic—which had the earliest and widest distribution in the Long Island amongst now-existing species. Next in order probably come some of the smaller rodents, and then the Marten. The Rabbit cannot be taken into this consideration, as it was an introduced species.

The following is a list of the various works treating of the Outer Hebrides which have been found more or less useful in this connection, as well as of others which I have not had an opportunity of examining:—

1703. M. Martin—"A Description of the Western Islands of Scotland."

1716. A second edition—the one I have consulted.

1764. Rev. Kenneth Macaulay—"A Voyage to, and History of, St. Kilda."

1769-1774. T. Pennant—"A Tour in Scotland, and Voyage to the Hebrides."

1777. Lightfoot—Pennant—"Flora Scotica." Contains a Sketch of Caledonian Zoology, by Pennant.

1793. Rev. J. L. Buchanan—"Travels in the Western Hebrides."

1787. John Knox—"Tour through the Highlands of Scotland and the Hebride Isles in 1786."

1807. Rev. J. Hall's "Travels in Scotland, with a Trip to the Orkneys and Hebrides." 2 vols.

1808. Dr. Walker—"Economic History of the Hebrides." Contains Botany, but little Zoology.

1819. Dr. MacCulloch—"Description of the Western Islands of Scotland." 2 vols. text, 8vo, and 1 vol. plates, 4to.

1829-30. John Macgillivray—"Account of the Series of Islands denominated the Outer Hebrides." (*Edin. Journ. Nat.*

Hist. and Geog. Science, Vols. I. and II. Quadrupeds, pp. 161-5, Birds, pp. 321-34.)

Donald Maclean—"Account of one of the Hebrides."

1838. L. MacLean—"Sketches of the Island of St. Kilda."

1842. James Wilson, F.R.S.E.—"Voyage round the Coasts of Scotland and the Isles." 2 vols.

1865-66. Prof. Duns, D.D., F.R.S.E.—"On the Natural History of Lewis." *Proc. Royal Soc. Edin.*, Vol. v., pp. 615-625.

1868. Henry D. Graham—"On the occurrence of the Harp Seal (*Phoca groenlandica*) in Loch Tarbert, Jura, with Remarks on the Habits of some other Species frequenting the Western Islands." (*Proc. Nat. Hist. Soc. of Glasgow*, Vol. I., p. 53.)

1870. J. A. Harvie-Brown—"Journal of a Trip to the Outer Hebrides in 1870" (April 13th to June 1st), including portions written by Captain H. W. Feilden. MS.

1875. "Sixty-One" (Rev. Mr. Hutchinson)—"Reminiscences of the Lews."

1875. Captain H. W. Feilden—"Journal of a Tour through the Outer Hebrides in 1870." (*Proc. Nat. Hist. Soc., Glas.*, Vol. II., p. 58.)

Annals and Magazine of Nat. Hist., Vol. VIII., pp. 7, 96, 230.

1879. E. R. Alston, F.Z.S., F.L.S., &c.—"Fauna of Scotland"—Mammalia. Published by the Natural History Society of Glasgow.

1879. J. A. Harvie-Brown—"Journal of a trip to the Outer Hebrides in 1879." May 28th to June 21st, 1879. MS.

In preparing the following Catalogue and Notes, I have been materially assisted by my friend Mr. E. R. Alston, who revised the synonymy, and added several notes and suggestions, besides what I have gathered from a perusal of the MS. of his paper on the "Mammalia of Scotland," before mentioned. To Professor Duns' courtesy I am also indebted for a copy of his paper "On the Natural History of the Lews." Mr. A. Williamson has added some interesting results of his experience of the Deer of Lewis, as well as other matter.

CHEIROPTERA.

Vespertilionidae.

1. COMMON BAT.

VESPERUGO PIPISTRELLUS (*Schreber*).

Does not appear to be plentiful in the Long Island. Captain Macdonald of Rodil told me, in 1870, he had only once seen a Bat at Rodil, which is a well-sheltered spot, with a few trees around it

and a considerable plantation near it. Professor Duns includes "Bats" in his paper (*loc. cit.*), but without notes. Previous writers are unanimous in excluding them, but we may with safety include them under this species, as it is the only one likely to occur. Since the above was written, and while staying at Rodil in June, 1879, I was repeatedly assured that Bats had become much commoner there of late years, and are now far from rare. I failed, however, to observe any myself.

INSECTIVORA.

Soricidae.

LESSER SHREW.

SOREX MINUTUS, *Linn.**

This is the species probably meant by Macgillivray as being "found in the Outer Hebrides on sandy pastures, where it is termed *Luch-fheoir*" (*Edin. Jour. Nat. and Geog. Sc.*, Vol. II.)—a name, however, properly belonging to the Field Vole (*vide* Alston, "Fauna of Scotland," *Mammalia*, p. 28). I was fortunate in obtaining a single specimen of this species in North Uist, in June, 1879, which I preserved in spirits for identification. They are very rarely seen here except in harvest-time, so that my getting one in summer was considered very lucky indeed. It was the only one I saw.

CARNIVORA.

Mustelidae.

COMMON OTTER.

LUTRA VULGARIS, *Erxleben*. Gaelic—*Balgar*.†

The Otter is plentiful in some localities, frequenting the sea-shore for the most part, until the Salmon and Sea-trout begin to "run" in July, when it follows them up the streams, and frequents the fresh-water lochs. Exciting sport may sometimes be had when men and dogs succeed in hemming one in upon any restricted area, or upon one of the smaller sheets of water. "Sixty-One" gives an interesting account of such a hunt in his "Reminiscences" (p. 129). A forester in Harris showed me a small rock in Loch Resort, where he once killed two at one shot. The recently-frequented resting-place of an Otter is readily recognizable by the freshness of the grass, but the droppings themselves, which cause the greenness, rapidly dry up.

* *Sorex pygmaeus*, Pall. of the 2nd ed. of Bell's "Brit. Quadrupeds."

† The name *Balgar*, applied to this animal in the Hebrides, properly belongs to the Fox.

Otters are found more or less plentifully all along the coast line, through South Uist to Barra Head.

John Macgillivray mentions the fact of the Otters in the Hebrides being of the darker coloured type.* I have not had an opportunity of comparing them with those obtained on the mainland.

A shepherd in North Uist, on his own beat alone, had shot over 70 Otters during a residence of 25 years.

3. MARTEN.

MARTES SYLVESTRIS, *Nilsson*. Gaelic—*Taghan*.

In 1870 this species was reported as present in Harris, but not abundant. There are no trees in Harris—or at least only a very few at scattered localities—and the Martens which are procured are found amongst cairns and long heather on the hillsides. It occurs in the Mhorsgail deer-forest in Lewis (Prof. Duns, *op. cit*). It was recorded so long ago as 1777, by Pennant, as occurring in Harris (Lightfoot's "Flora Scotica," &c.). The "Polecats" of the "Old Stat. Account" of Lewis were undoubtedly Martens. At the present time (1879) the Marten is very rare in Harris.

Mr. H. Greenwood tells me—"There seem to be no Martens left in the Lews. Certainly they were here at one time, but have been destroyed." *In lit.*, 27th December, 1879.

CARNIVORA.

Phocidae.

Pinnipedia.

4. COMMON SEAL.

PHOCA VITULINA, *Linn*.

The Common Seal is very abundant on these coasts—perhaps nowhere more so than in the Sound of Harris. I have seen twelve upon a small sloping rock in Loch Maddy, which was just sufficiently large to afford them resting room.

Their habit of springing out of water like salmon has been noticed by several observers under somewhat different circumstances. Mr. Macdonald, of Newton, told me that he once saw a number of Seals rushing against a strong tide-stream between two rocks in the Sound of Harris. They followed one another in single file, "springing right out of the water like salmon breasting a fall." The place, which he pointed out to me afterwards, is not more than forty yards in width, and the ebbing tide, when I saw

* *Op. cit*.

it, escaping from a land-locked strait, rushed through this narrow gorge with such tremendous impetus that I felt sure at the time no vessel could have stemmed its flow. John Macgillivray also noticed the habit. He says: "During a storm, I have seen them throwing themselves forward half out of the water several times in succession;" and my friend, Mr. J. Henderson, of Mull, has seen them doing so in calm weather before a storm. Mr. Henderson has had much experience in the haunts and habits of Seals upon the West Coast.

I saw them on various occasions plunging and springing out of the water. They looked like salmon *bent* in their spring, and coming down head first. This appears to be quite a common practice, and must not be confounded with the more direct and forward movement witnessed when they are stemming a rapid.

After accomplishing the ascent of an unusually strong and rapid tide-way, they have been seen by Mr. Macdonald to pant for breath, showing that this movement has been called forth by unusual exertion.

Other authors record this habit in the breeding season, and assign it to the males chasing one another, but it appears evident that it is practised at various times and seasons, and is not necessarily connected with the combats of the males.

Martin records that the inhabitants of the Long Island use the flesh of the Seal for food, "and find it as nourishing as beef and mutton" (*op., cit.*, 2nd ed., p. 11).*

It is perhaps worthy of record here that Seals are hardly ever known to frequent sand-banks in the Sound of Harris. Mr. Macdonald had never seen one upon a sand-bank; rocks are invariably preferred.

Captain Macdonald, of Stein, in Skye, who has had much experience of Seal-shooting on the west coast of that Island, finds that the Seals there are generally fat, and that they float oftener and longer when shot than they do in other localities known to him. In the Sound of Harris it was quite provoking the number that were lost after being shot in the water, when I was there this year.

5. RINGED SEAL.

PHOCA HISPIDA, Schreber. Gaelic—*Bodach*?

Evidence of the occurrence of this species in the Hebrides on the

* *Vide* Lawrence Edmonstone's "Seals of the Shetland Islands," 1837, p. 4.

authority of Mr. M'Neil, of Colonsay, is given,* but we have no positive records of its occurrence beyond the accounts quoted of Bell's "British Quadrupeds," 2nd ed., pp. 248-9.

6. GREENLAND SEAL.

PHOCA GROENLANDICA, *Fabricius*.

On the 2nd of May I saw four of this species upon a rock in the Sound of Harris. Mr. Macdonald, of Newton, and I started down the Sound in one of his boats, in quest of Seals. After firing two ineffectual shots at Seals in the water, we spied several lying on a rock, a good way out in the Sound. Getting well to leeward, we dropped gently down behind the rock, and landed, but a slight scrape upon the rough projections of the surface startled them, and before we got over the top they had slid into the deep water. Running forward we had a good view of them, as they kept close in and often rushed past within a few feet of where we were standing, and "the large splashy-looking, dark marks on either side of the back" were distinctly visible (I quote almost exactly from my Journal). I fired into one near the rock, but before the boat could be brought round he sank. The strong tide running made it vain to search for him.

As regards the evidence of this species occurring in the British seas, I think that given by Mr. Henry D. Graham is well worthy of credence. Mr. Graham, well known as a careful observer and a naturalist of ability, saw "three of these rare visitors to British waters" in Loch Tarbert, Jura, and, with the aid of a powerful telescope, "both he and his friends could distinctly make out the markings which characterize the Harp Seal," and "the animals remained in full view for three hours, constantly watched." Mr. Graham appears to have been quite aware of the name *Tapvaist* being indiscriminately applied to several species of large Seal. (*Vide Proc. Nat. Hist. Soc. of Glasgow*, Vol. I., p. 53, 1868.)

GREAT GREY SEAL.

HALICHOERUS GRYPHUS, *Fabricius*.

Haskier Island has long been known as a resort of this species. Pennant mentions Seals in "*Hiskyr*" in 1777. Captain Macdonald, R.N., showed me a very fine skin of one he had shot in the Sound

* Bell's "British Quadrupeds," 2nd ed., p. 249.

of Harris, and Mr. Macdonald, of Newton, pointed out to me various favourite rocks in the Sound which the Great Seal frequents in small numbers. Some confusion amongst natives exists as to the difference between the Great Grey and the Greenland Seals, all apparently going under the name of "Grey" or "Haskeir" Seals. The dark markings on the side of the back, on either side of the spine, are very prominent in the Greenland Seal, however, and can hardly fail to arrest the attention.*

Captain H. J. Elwes visited Haskeir Island on 30th June, 1868, and saw a few of the large seals in the water.

"Up to the year 1858," as Captain Elwes informs me, "it was the custom annually to have a battue there in November, when the Seals resort to the rocks with their young ones. The boats arrived usually about daybreak, and the men cut off the retreat of the Seals lying on the rocks, and killed from 40 to 100 young and old. They used to be divided amongst the men, but the farms of Vallay, Scolpig, and Balitone, were each entitled to a larger share. This battue was stopped by the late proprietor, Sir J. Orde, Bart."

John Macgillivray also observed this species on a rock off the west coast of South Uist.

Mr. Macdonald, of Newton, has been present at the killing of 53 in one day at Haskeir, where they breed.†

In the Sound of Harris is a rock called to this day Skeir na Taibheist, which is still frequented by a pair of the large Grey Seal, and in June, 1879, I saw a pair of very large specimens upon it. This rock has borne the name for many years, and the fact of their breeding in the Sound of Harris cannot be doubted, as the young have been found upon the rocks even of late years.

* Macgillivray also takes notice of the fact that the Great Seals seldom enter the shallow sounds, but Mr. J. Henderson has given me evidence of their occurrence within the range of the Outer Hebrides, upon a certain isolated rock (*en ore*).

† For some account of the catching of these seals and apportioning of them afterwards, see Martin, *op. cit.* p. 60, *et seq.* Donald Maclean, in his "Account of one of the Hebrides," made mention of the practice of hunting seals with dogs: the services of which, however, could amount only to irritating them to resistance, and thus by detaining them, gain time to the hunter to attack them with a club (*vide* Edmonstone's "Seals of the Shetland Isles," p. 37). A hundred years previous to the date of Martin's work, however, six times this number have been killed during one battue. On the rock of Easmuil 320 have been killed in one day (Martin, *Western Islands*, p. 62).

This Skeir na Taibheist is out of gunshot of any of the other rocks in the Sound, bearing witness to the superior sagacity and wariness of this species, as observed by the natives and those who have been in the custom of hunting them constantly in the Sound of Harris. In the Sound the Haskeir seals go very much more in pairs than the common species, but at Haskeir this cannot be said to be the case.

Apart from his superior size, the Great Grey Seal can be readily distinguished by his greater length of nose and his hoary grey appearance. When in the water, and looking towards one, the head looks very grey, and appears to me to have a striking resemblance to that of a sleuth-hound, wanting only the long pendant ears of the latter to make the likeness perfect. The eyes appear deeply sunken in the sockets, this appearance being imparted by the grey colour of the rest of the face.

8. WALRUS.

TRICHECUS ROSMARS (Linn.)

Instances of the occurrence of the Walrus in Scotland are given in "Bell's British Quadrupeds," by which records it will be seen that "one was killed in December, 1817, at Caolas Stocnis,* on the east coast of Harris, and was examined by the late Mr. Macgillivray, who gave an account of it in Vol. xvii. of the 'Naturalists' Library;'" and "another was killed in April, 1841, on the East Heiskar, near Harris, by Captain Macdonald, R.N., as mentioned by Dr. R. Brown in the 'Annals and Magazine of Natural History, 1871.'"

Captain Macdonald, of Stein, Skye, told me that a Walrus was distinctly seen two years ago, close to the point of rock near Stein. It lifted its head quite out of water, and the tusks were distinctly seen. It was afterwards fired at, and correctly described by a keeper, off the coast of Sleat in Skye.

Professor Heddle, with whom I was travelling in June, 1879, stated also that he saw one adult, and a young one, in 1849 or 1850, off the coast of the parish of Walls in Orkney.

* At present (1879) a herring-curing establishment.

CETACEA.
(*Odontoceti*).

Delphinidae.

17. PILOT WHALE.

GLOBICEPHALUS MELAS (*Trail*). Gaelic:—*Muc-mhara*,* *Liomadairan*.

Mr. E. R. Alston writes to me:—"Their occurrence among the Hebrides is rarer than at Shetland. More than 300 were taken in 1805, and 92 in 1832, at Stornoway. (*Naturalists' Library*, xxvi., pp. 214-215.) Nearly 200 were taken there in 1869."

Mr. Macdonald was at the killing of 100 of these animals, some years previous to 1870. They were, as usual, pressed in confusion on to the shore of a small semicircular sandy bay, not far from his house—Newton—on the Sound of Harris.

Prof. Duns informs me also that he was present at the death of a large herd of Caaing Whales, numbering in all 90, old and young, and he had an opportunity of "cutting into" and examining them.

Even as early as the days of Martin this species is mentioned, the 50 "young whales" spoken of so quaintly belonging no doubt to it.†

18. PORPOISE.

PHOCAENA COMMUNIS (*F. Cuv.*) Gaelic:—*Muc-mhara*. *Canna*.

Common in the seas surrounding the Long Island, but does not so often approach close to land, nor is it induced to enter the sea lochs so easily as the last species.

Obs. Mr. James Wilson, during his "Voyage round Scotland," saw whales "of the largest class" off the entrance of East Loch Tarbet. Mr. Alston informs me that "these were probably either *Balaenoptera musculus* (Linn.), the Common Rorqual, or *B. sibbaldi* (Gray), *cf.* Bell, 2nd ed. A specimen of the former, I am informed by Prof. Turner, was brought into Stornoway in 1871. *B. rostrata* (Fabr.)—Rudolph's Rorqual—has occurred off Islay. Other species of Cetaceans doubtless occur, but I know of no records." Large whales are often seen in the herring season off the Sutherland coast, opposite Stornoway.

* All whales in the Hebrides are called "Muc-mhara," but at the same time several species are separately distinguished, thus:—*Mucan biorach* (sharp-pointed), for Bottle-nosed Dolphin; *Liomadairan* (the Jumping or Leaping Whale), for the present species, or Herring Whale.

† Martin, *op. cit.*, pp. 5, 6.

RUMINANTIA.

Cervidae.

16. RED DEER.

Cervus elephas (Linn.)

Martin in his time computed the number of deer in Harris to be "at least 2000."

John Macgillivray tells us that deer "were so plentiful in Harris and Lewis 30 years ago," (*i.e.*, about 1800) that the poor had an abundant supply of food. A peasant is said to have killed five at one shot, and another to have killed 18 in a season. They rapidly decreased, however, when the local Militia became instituted, and after Lord Seaforth's time, who had protected them. He (Macgillivray) seems to have been under the impression that the species had become extinct in all the Long Island except Lewis and Harris; but Captain Feilden and I were told nothing in 1870 which would lead us to suppose that it had ever become actually extinct in North Uist, although it was generally considered that it was rapidly approaching extinction. In 1879 it was reported to me that there was no increase in their numbers in North Uist, but at the same time no perceptible decrease since 1870.

Perhaps the finest collection of stags' heads and horns—of animals killed in Lewis—is that of Mr. A. Williamson, of Edinburgh, who rented the Aline and Soval shootings for several years. I had the pleasure of seeing these lately. The small but beautifully symmetrical horns are indeed a contrast to his marvellous collection of Wapiti and other trophies from Colorado, but they are none the less interesting and valuable. I am also indebted to Mr. Williamson's courtesy for the following account of the Deer of the Lews, and as these experiences cannot fail to prove valuable additions to our knowledge of the history of the Red Deer in Great Britain, I transcribe those parts of his letter in full, which relate to this species :—

"26th March, 1879.—Stags in the Long Island I found rapidly deteriorating as they are doing elsewhere. From a table I kept very carefully during the first three years I was at Aline, I find the average weights were as follows :—

1872.—16	stags averaged	11½ stones (clean).
1873.—18	„ „	11 stones 3 lbs.
1874.—22	„ „	10¾ stones.

"As I shot nothing under four years old, or any wretched old brute, of which we had but too many, these averages give a correct idea of the size of Lewis stags. I noticed one very striking peculiarity, their immense craving for bones and old deers-horns. My predecessor shot an old horse a few days before he left in May, about two miles from the lodge. When I arrived in August, the Deer were coming nightly to chew the bones, and all the latter had disappeared before I left in November of the same year.

"I have often, when lying watching a herd, seen the hinds chewing the horns of a stag lying on the ground, and that this was a common practice was shown by the marks of their teeth on almost every stag I killed late in the season. I never saw signs of anything of the kind on the 50 stags I have since shot on the mainland.

"The heads of the Lewis Deer are very pretty, though small, having generally more points than mainland Deer. I generally killed two, sometimes three Royals in a year, and "11-pointers" were very common.

"The cause of the deterioration in the Lewis and Harris Deer I attribute to overstocking, not to their being overshot so much. Doubtless, there, as elsewhere, though nothing like to the same extent, the killing-off of the finest stags and hinds is telling; but I believe it is mainly owing to the poor feeding on ground unable to carry the vast numbers of Deer in the Harris and Lewis forests. The number of the hinds was far too great, as Sir James Matheson was opposed to their being shot down. If the severe winter has killed off the half of them, it will have done great good." So much for Mr Williamson's interesting observations and conclusions, with which, I am sure, all who have studied the subject as thoroughly as he has done must agree.

In Harris, in 1870, I saw plenty of Deer. As already shown by Mr. Williamson, the stags are not usually large, nor approaching in size those of certain forests on the mainland. In one lot, however, there was one immense brute, as compared with the others. With a powerful glass—"Lord Bury Telescope"—I could make out one Royal head in the same lot, and another with 8 points. The horns, though usually small, are seldom distorted. This I learned from an inspection of many heads at Fin-castle, and the shooting lodges, and from the information of the foresters, in whose company I passed several days during my search for Eagles' eyries.

At this season the hinds keep, as a rule, lower down the hill-sides, and seldom associate with the stags. Only on one occasion did I see stags and hinds in company. Several times I started a solitary hind from her lair low down amongst the old rank heather, and on all such occasions she seemed to be an aged beast, greyer and more rugged-looking than those which were going in herds. Probably these were the old barren hinds. About 70 or 80 stags are killed in a season on the wester half of the Harris Forest, and about 60 on the easter half—at that time leased by the Messrs. Milbank—"all by stalking, driving never being resorted to," as I was informed by the head forester. In 1869, 75 were killed on the former, and 50 on the latter beat.

Captain Macdonald, of Rodil, informed me that when fresh blood was introduced from Athole Forest, one fine large stag of the Athole lot would not take up with the degenerate stock at all. This splendid animal wandered southward to Rodil, thence crossed the Sound of Harris—8 miles—going from island to island, to North Uist. Here the hinds did not please him, and he travelled on until he reached Barra Head. There, as Captain Macdonald told me further, he "smelt no longer the scent of land," and turning, retraced his steps, and attempted to land again in Harris. Alas! two Cockney sportsmen, who had taken the Borge shootings, massacred the noble animal in the water, before he even put foot on land, when Captain Macdonald happened to be away from home.

In North Uist Deer are not now so numerous as formerly, and appeared in 1870 to be gradually dying out. They have bad heads, *much deformed*. The only fresh blood ever introduced was a single stag, I understand, about 3 or 4 years previous to 1870. There is no suitable forest ground in North Uist, except a small piece around Ben Lee, which contains, however, no Deer, being a sheep farm. The Deer inhabit the low moors, which are perfectly cut up with "peat-hags," and intersected by the wonderful ramifications of the sea and fresh-water lochs. There are no Deer on either Ben Lee or Ben Ebhal.

Those on the moors and islands of the lochs* are almost

* There is one large green, almost circular, island on Loch-nan-Ean—where there is an immense colony of the Common Gull (*Larus canis*, *L.*)—a particularly favourite haunt of the deer. Here Captain Feilden and I picked up several cast horns.

unapproachable. In the New Statistical Account of North Uist we find the following passage, which is worth repeating:—

“The mode of stalking these is so peculiar that we are tempted briefly to describe it. The sportsmen rendezvous at a place previously fixed upon, and each, with an attendant, is appointed to a pass along the lakes, which he cautiously approaches, and when all are presumed to be at their stations, another party with a small boat, provided for the purpose, come up as quietly as possible. The Deer, scared from their fastnesses in the islands, make for some of the passes, and it very rarely happens that a chance of a shot is not afforded to some one or more of the sportsmen concealed under the cover of the heather.”

During many years, however, none were killed at all; still they seemed to be decreasing in numbers. The gamekeeper at Loch Maddy in 1870 informed me that the practice of driving them had been given up, and that any which were ever killed were killed by fair stalking.

On the 10th May, 1870, when our ghillie—Robert Ross,* a Sutherland man—landed upon an island upon a loch near Loch Maddy, for the purpose of digging out a nest of Shiel-ducks' eggs, a stag jumped up from a hollow in the island almost at his feet. Robert noticed that it was lug-marked, and afterwards we were told that it was the solitary introduced stag from Skye.

In South Uist, though once plentiful, Deer are now extinct. In 1842 there was only a single hind in the whole parish, the rest having found their way northwards.†

They were extinct in Barra at that date, though many antlers found in the mosses testify to their former occurrence there.‡

Obs. American Deer (sp. ?) have lately been introduced by Lord Dunmore to the Island of Harmetray in the Sound of Harris.

* The melancholy death of poor Ross happened in the severe snow-storms of the late winter. On the 10th of January, 1879, he was returning home to Inverpolly from Loch Inver, in Sutherland, and while taking a short cut from the high-road to the house, his foot slipped near the top of a rock, and his dead body was found two days afterwards, with one of the arms broken, and otherwise sadly bruised. All our Sutherland party missed his cheerful companionship during this summer, none, perhaps, more than myself, who had known him for upwards of fourteen years.

† *New Stat. Acct.*, Inverness, p. 165. ‡ *New Stat. Acct.*, No. xxxi., p. 185.

They have since become so wild as to defy capture, and appear to be thriving, but I had no opportunity of seeing them.

The following weights are supplied to me by Mr. H. Greenwood, who had a shooting in Lewis. He writes—27th December, 1879, —“Deer here never require artificial feeding. As to weight after ‘grulloching’—

“September 12.—1 stag,	...	12 stones 11 lbs.
„ 24.—2 stags,	...	{ 13 “ 3 „
		{ 11 “ 12 „
“October 2.—1 stag,	...	13 “ 3 „
„ 4.—1 stag,	...	13 „ 9 „
„ 8.—1 stag,	...	14 „ 10 „
„ 13.—1 stag,	...	12 „ 10 „
„ 20.—1 stag,	...	13 „ 0 „

Mr. Greenwood adds—“The horns of these stags, though small, are well formed, and are said to be larger on the east coast, diminishing in size towards the west of Lewis.”

RODENTIA.

Muridae.

12. BROWN RAT.

MUS DECUMANUS (*Pall.*).

Brown Rats are abundant on most of the islands, and frequent greatly the sea-shore, where they live upon shell-fish and dead things thrown up by the sea, in this way to some extent acting as scavengers.

Martin tells us that “about 14 years ago a swarm of Rats, but none knows how, came into Rona, and in a short time eat up all the corn in the island.”* From the date of Martin’s first edition, this would be about 1689, and from that of the second edition, about 1702. He also tells us that they were very abundant at Rodil, where numbers of cats were employed for the purpose of exterminating them, and after a severe struggle “succeeded so well that they left not one Rat alive.”

Rats in the Hebrides also frequent the inland moors, far from houses, subsisting upon dead sheep, and, doubtless, also to some extent upon birds’ eggs. Their burrows may be seen by the sides of the inland lochs and tarns quite commonly; and they are also found, generally, upon the islands of the Sound of Harris.

* *Op. cit.*, 2nd ed., p. 25.

PROCEEDINGS OF THE
HOUSE MOUSE.

MUS MUSCULUS, *Lin.*

Common. It would appear that this species also frequents the cropped fields, because in harvest time they become much more abundant in the houses.

RODENTIA.

Arvicolidae.

COMMON FIELD VOLE.

ARVICOLA AGRESTIS, *De Selys.*

Occurs in North Uist and in South Uist. No mention is made of it by Macgillivray or previous writers, and considerable confusion existed concerning the Voles and Shrews of the Long Island, until in June, 1879, I fortunately succeeded in obtaining specimens of both for identification. This species is extremely abundant all over the hills, and in the "machars" or sandy meadows, and their runs in the grass are found to cross and recross in a perfect network in certain favoured localities. The shepherd dogs take great delight in hunting for them, and eat them with great relish. In autumn they are most abundant in the lower ground and around the farms, but in summer they are found all over the more uninhabited parts equally numerous.

RODENTIA.

Leporidae.

13. BROWN HARE.

LEPUS EUROPAEUS, *Pall.*

Introduced into Harris at Rodil, becoming very numerous, and numbers could be seen at one time crossing and recrossing the road between Rodil and Borge; but prior to 1870 they were much scarcer, and when I was there in that year I did not meet with a single example. In 1879, however, they appeared more abundantly, and, I was informed, had again largely increased.

Hares occurred in Lewis as early as 1842.*

They were also introduced into Barra, according to John Macgillivray.†

Buchanan puts on record the positive fact of the entire absence

* Wilson's Voyage, Vol. II., p. 120.

† *Op. cit.*

of Hares from all the Long Island in 1782-1790,* and Pennant likewise, in 1777.†

Mr. H. Greenwood includes both Brown and White Hares in a list of Mammals of the Lews sent to me, and adds—"White Hares are most plentiful towards the west coast of Lewis and Harris, where the ground is more mountainous."

14. WHITE HARE.

LEPUS VARIABILIS (Pall.)

This species (as well as the last) was introduced, I was assured, to the Island of Harris, at Rodil, about twenty years ago, and has since then spread rapidly all over Harris and Lewis. In the Forest in North Harris they are killed down at all seasons by the foresters as vermin. They come down from the hills to the hollows and mosses, even close to the shore, where I often saw them, and are generally distributed at all altitudes. They become white in winter, like those on the mainland, and retain the white coat a long time. I saw some as pure white as they could well be, at the end of April, whilst others were bluer. In all of them, however, I believe bluish patches appear at that season, if the wind raises the fur, as I often had opportunity of observing. When in Harris in 1870, I cannot say that I observed any marked difference in the size of the White Hares from those of the same species on the mainland. Mr. A. Williamson, however, who has had nine years experience of Lewis, "noticed in the Lews all animals and birds, —even the Snipe—were smaller than on the mainland. The Grouse were smaller, . . . and Hares little bigger than rabbits." The Salmon, of which he "in one season killed 90, getting with the fly in one day 19, averaged only $6\frac{3}{4}$ lbs."

This deterioration in size, usually accompanied with darker plumage or fur, is incidental to insular positions, and is what may be expected. Deterioration from an introduced stock may take some time to become very apparent, but a succession of extremely wet seasons, and late springs, may, very probably, hasten the

* Travels, p. 22.

† Lightfoot's "Flora Scotica." Pennant mentions a small sort of Hare—"a bad runner"—as occurring in Islay. In Mull the Irish Hare occurs, and I have shot them at Loch Bhuie, where, however, I understand they were introduced. In Lewis, on the Aline and Soval ground, Brown Hares are unknown. Mr. Williamson only met with the next species.

process. This visible deterioration appears to me to be only one link in a chain of destruction, decay, and final death of species; and in this place it may not be foreign to the subject to state that, with regard to grouse in the Long Island, this process seems to be steadily advancing towards the final act, assisted in some measure by severe and late springs. Mr. A. Williamson is also strongly of this opinion. He writes:—"After an experience of nine years, and giving much thought to the subject, I have come to the conclusion the grouse are there—in Lewis—slowly dying out, for which I blame severe and late springs."

RABBIT.

LEPUS CUNICULUS, *Linn.*

Rabbits were introduced to South Uist prior to 1842,* also, in Barra and Vatersay,† where they have been abundant since that date. Several attempts to introduce rabbits in Lewis have failed.‡ There were Rabbits in Colonsay in abundance in 1794.§ They have, however, been introduced successfully on an island in Loch Seaforth by Mr. Milbank.

The sandy downs, and grassy islands, and inland meadows of the west coasts of the Uists and islands to the southward, are in every way suitable for the species, but the rockier ground and moors of Harris and the east coast are likely to prevent it from gaining ground. The same deterioration above-mentioned is distinctly noticeable in the Rabbits upon the island in Loch Seaforth, and doubtless elsewhere.

In North Uist Rabbits have increased from an introduction in the south of the island about eight years ago, and are slowly spreading northward along the west coast. One was shot at Scolpig last year (1878), as I was informed by Mr. Macdonald of Newton.||

There are none at present (1879) in the islands of the Sound of Harris.

* *New Stat. Acct.*, No. XXI., p. 176. † Wilson's *Voyage*.

‡ Prof. Duns, *loc. cit.*, p. 620. § *Old Stat. Acct.*, Vol. XII., p. 332.

|| In the machars—or sandy meadow land—of North Uist are many holes scraped in the sand having every appearance of Rabbits' work. But these are made by the women of the island who carry away fresh white sand every morning to sand the floors of their houses with. When the Rabbits do reach northward, they will doubtless at once take possession of these partially formed burrows.

DOMESTIC ANIMALS.

Of these it is only necessary in this place to speak very shortly. The DOG appears to have been early domesticated in the Long Island, bones having been found in a "Pict's house" in Harris, carrying us back at least 1000 years, and so also with a small breed of SHEEP and a small-sized HORSE.*

Bones of *Swine* have also been found, but their age would appear to be doubtful,† as Martin mentions some facts which seem to cast doubt upon the asserted antiquity of shell-mounds in the Long Island.‡

Of other domestic and semi-domestic animals, it is only necessary to speak here of two. The WILD GOATS of Harris have very fine heads and horns, and, as far as wildness goes, are "as wild as the *fery* Deer themselves," as I was frequently told. I saw several in Harris, either in profile against the sky at the top of the great precipices in the Forest, or making their way along the ledges, where it is not always easy to discover them. The curious FOUR-HORNED SHEEP are to be seen upon several of the farms in Harris and North Uist. Mr. Macdonald, of Newton, usually keeps some of them. One which he gave some years ago to Lord Dunmore had five horns, the fifth projecting from the centre of the forehead.

Of extinct British species possibly we may find a trace of the WOLF, *Canis lupus* (Lin.), in the name Loch Maddy in North Uist, though the loch is more probably named from the two rocks near its entrance, called *Maddie gruamach* and *Maddie more*.

Remains of the SMALL FOSSIL OX, *Bos longifrons*, Owen, are referred to by Dr. J. A. Smith, as having been found in a Pict's House in Harris, as noticed by Dr. James M'Bain, R.N., *op. cit.* in note, *supra*: or in "Ancient Underground Building at Neibost in Harris," by Captain Thomas of H.M. Surveying Ship "Woodlark."§

* *Vide Proc. Royal Philosophical Society*, Vol. I., pp. 141-207—M'Bain. "Notice of various Osteological Remains found in a 'Pict's house' in the island of Harris."

† Feilden. *Proc. Nat. Hist. Soc. of Glasgow*, Vol. II., p. 58.

‡ *Op. cit.*, p. 64.

§ *Proc. Soc. Antiq. of Scotland*, Vol. IX., p. 634.—"Notes on the Ancient Cattle of Scotland."

V.—*On some New or Rare Hymenoptera.* By Mr. PETER CAMERON.

The species described by the author included *Limneria fusipes*, Holmgren, from Sutherlandshire; *L. vestigialis*, Ratz, bred from galls of *Nematus gallicola*—both additions to the British lists; *L. flaviventris*, Ratz, bred by Dr. B. White, from fir cones inhabited by *Eupitecta togata*, near Perth; *Torymus azureus*, Boh., bred from the same fir cones by Dr. White; and *T. caudatus*, Boh. (sec. Thomson), bred from fir cones collected by Mr. J. E. Fletcher, near Worcester, gathered to see if they would yield *Coccyx strobilana*. *T. caudatus* differs from *azureus* in its much longer ovipositor and more obscure coloration, &c., and is regarded by Thomson as a good species, but the contrary opinion is held by Mayr. *Allotria pleuralis*, Cam., a new species of parasitic Cynipidae taken in several localities in the west of Scotland. *Antaeon lateralis*, Thoms., from Dumfries, a species of *Oxyura* new to our Fauna. *Nematus ochropus*, Thoms., a saw-fly hitherto unrecorded as British, but taken so long ago as 1825 by the late Mr. J. C. Dale of Glanvilles' Wooton, in the south of England. There is a ticket attached to the specimen to the effect that it was bred from a "striped larva in willow." *Poecilosoma longicorne*, Thoms., likewise an addition, from various Scotch localities. There was shown along with it an apparently undescribed *Poecilosoma* from Rannoch. There were also exhibited two specimens of the fish parasite *Argulus foliaceus*, which emerged alive out of a water-pipe in a house in Apsley Place, having travelled all the way from Gorbals Water-works. The species does not appear to be very common in the district; but it has been taken by Mr. David Robertson in the Paisley Canal. *Daphnea pulex* and *Cyclops quadricornis* are occasionally found in our water-pipes, but neither these nor the *Argulus* can be regarded as injurious, nor as indicating impure water.

ADDITIONS TO THE LIBRARY.

SESSION 1878-79.

DONATIONS.

E. R. Alston, Esq.—Quarterly Journal of Geological Society.
Vol. XXXIV.

Journal of the Linnean Society. Botany :
Vol. XVI. Zoology: Vol. XIII.

Alfred Brown, Esq.—The Mollusca of the Firth of Clyde. 1878.

James Lumsden, Esq.—The Naturalist. Vols. I., II.

FROM SOCIETIES.

Amsterdam. Royal Academy of Sciences. Transactions. Vols.
I. to XIII.

Basel. Naturforschende Gesellschaft. Abhandlungen. Vol.
XVI. Parts III. and IV. 1878.

Bath Natural History and Antiquarian Field Club. Proceedings.
Vol. IV. Part II. 1879.

Belfast Naturalists' Field Club. Proceedings. Ser. II. Vol. I.
Part IV. 1879.

Berwickshire Naturalists' Club. Proceedings. Vol. VIII. Part
III. 1879.

Bremen Naturwissenschaftlicher Verein. Abhandlungen. Vols.
III. and IV. Vol. V. Part. I. Vol. VI. Part I. 1872-79.

Bristol Naturalists' Society. Proceedings. Vol. II. Parts II.
and III.

Brussels. Société Malacologique de Belgique. Annales. Tome
XI.

Brussels. Société Royale de Botanique. Bulletin. Vols. I. to
XVI.

Brünn. Naturforschender Verein. Verhandlungen. Band XVI.
1878.

Cambridge (U.S.A.) Entomological Club. Psyche. Monthly.

Cambridge (U.S.A.) Nuttall Ornithological Club. Bulletin.
Vols. I., II., III. Vol. IV. Parts I., II., and III. 1876-79.

- Chester* Society of Natural Science. Proceedings. No. 2. 1878.
- Cincinnati* Society of Natural History. Vol. I. Nos. I. and II. 1878.
- Danzig* Naturforschende Gesellschaft. Schriften. Band XIV. Heft III. 1878.
- Edinburgh* Botanical Society. Transactions. Vol. XIII. Part II.
- Florence*. Società Entomologica Italiana. Bulletino. 32 Parts. 1869-79.
- Frankfurt*. Senckenbergische Naturforschende Gesellschaft. Abhandlungen. Bände X. and XI. Berichte 1876-7-8.
- Glasgow* Philosophical Society. Proceedings. Vol. XI. No. 1. 1878.
- Görlitz*. Naturforschende Gesellschaft. Abhandlungen. Vol. XVI. 1879.
- Graz*. Naturwissenschaftlicher Verein für Steiermark. Mittheilungen. 12 Parts. 1870-79.
- Hague*. De Nederlandsche Entomologische Vereeniging. Tijdschrift. Deelen XIX., XX., XXI.
- Hamburg*. Naturwissenschaftlicher Verein von Hamburg-Altona. Verhandlungen. Neue Folge, Nos. I., II., and III. 1877-79.
- Heidelberg*. Naturhistorisch-medicinischer Verein. Verhandlungen. Vol. I. Parts IV. and V. Vol. II. Parts I.-III. 1876-79.
- Helsingfors*. Societas pro Fauna et Flora Fennica. Meddelanden. Parts I.-IV. Acta. Vol. I. Notiser. Part XI.
- London*. Royal Geographical Society. Journal. Vol. XLVII. Proceedings. Vol. I. Nos. 1-9. 1879.
- London*. Quekett Microscopical Club. Journal. Nos. 36-40.
- London*. Geologists' Association. Vol. V. Parts I.-IV. Report. 1878.
- London (Ontario)*. Canadian Entomologist. Monthly.
- Madrid*. Sociedad Española de Historia Natural. Anales. Vols. V., VI., VII.
- Manchester*. Geological Society. Transactions. Vol. XIV. Parts 20-22. Vol. XV. Parts 1-6.
- Manchester* Field Naturalists' and Archaeologists' Society. Proceedings. 1878.
- Metz*. Société d'Histoire Naturelle. Bulletin. Nos. 14, 15. 1876-78.

- Moscow.* Société Imperiale des Naturalistes. Bulletin. Année, 1877. Année, 1878. Nos. 1, 2, 3.
- Neufchatel.* Société des Sciences Naturelles. Bulletin. Tomes VIII., IX., X. Tome XI. Parts I. and II. 1868-78.
- Newhaven, Conn.* Academy of Arts and Manufactures. Transactions. Vol. IV. Part I. 1877.
- Norwich.* Norfolk and Norwich Naturalists' Society. Transactions. Vol. II. Parts IV. and V. 1878-79.
- Poughkeepsie.* Society of Natural Science. Proceedings. Vol. I. Part I. 1875.
- Prague.* Kön. böhmische Gesellschaft der Wissenschaften. Sitzungsberichte. Jahrgang, 1878. Jahresbericht, 1878.
- Padua.* Società Veneto-Trentina di Scienze Naturali. Tomo I. Numero I.
- Plymouth.* Plymouth Institution and Devon and Cornwall Natural History Society. Transactions. 8 Parts. 1867-79.
- Stettin.* Entomologischer Verein. Entomologische Zeitung. Jahrgang, 31-38.
- Schaffhausen.* Die Schweizerische Entomologische Gesellschaft. Mittheilungen. Vol. V. Parts 6 and 7.
- Salem, Mass.* Essex Institute. Bulletin. Vol. IX. 1877.
- Trieste.* Società Adriatica di Scienze Naturali. Bolletina. Vol. III. Vol. IV. Parts I. and II. 1877-79.
- Truro.* Royal Institution of Cornwall. Journal. Nos. 16 to 20. 1874-78.
- Washington.* Smithsonian Institution. Report for 1877.
- Washington.* U.S. Geological Survey, per Dr. Francis H. Hayden. Birds of Colorado Valley. Part I. By E. Coues. 3 Maps. Also 45 Miscellaneous Pamphlets.
- Watford.* Natural History Society. Transactions. Vol. I. Parts 9 and 10. Vol. II. Parts 1, 2, 3.
- Vienna.* K. K. Zoologisch-botanische Gesellschaft. Verhandlungen. Bände 26-28. 1876-79.

BY PURCHASE.

- Annals and Magazine of Natural History.
 Entomologists' Monthly Magazine.
 Ibis.
 Scottish Naturalist.
 Zoological Record.

LIST OF SOCIETIES, &c., TO WHICH THE PROCEEDINGS ARE SENT.

GREAT BRITAIN AND IRELAND.

- Bath Natural History and Antiquarian Society.
 Belfast Naturalists' Field Club.
 Berwickshire Naturalists' Club.
 Bristol Naturalists' Society.
 British Museum.
 Chester Society of Natural Science.
 Edinburgh Botanical Society.
 Geological Society.
 Entomologists' Monthly Magazine.
 Glasgow Geological Society.
 Mitchell Library.
 Philosophical Society.
 London Geologists' Association.
 Quekett Microscopical Club.
 Royal Geographical Society.
 Royal Microscopical Society.
 Manchester Field Naturalists' Society.
 Geological Society.
 Norfolk and Norwich Naturalists' Society.
 Paisley Free Library.
 Plymouth Institution and Devon and Cornwall Natural History
 Society.
 Scottish Naturalist.
 Truro.—Royal Institution of Cornwall.
 Watford Natural History Society.

CONTINENT OF EUROPE.

- Amsterdam.—Koninklijke Akademie van Wetenschappen.
 Basel.—Naturforschende Gesellschaft.
 Bremen.—Naturwissenschaftlicher Verein.
 Brussels.—Société Entomologique de Belgique.

- Brussels.—Société Malacologique de Belgique.
 Société Royale de Botanique.
 Brünn.—Naturforschender Verein.
 Danzig.—Naturforschende Gesellschaft.
 Florence.—Società Entomologica Italiana.
 Frankfurt.—Senckenbergische Naturforschende Gesellschaft.
 Görlitz.—Naturforschende Gesellschaft.
 Graz.—Naturwissenschaftlicher Verein für Steiermark.
 Hague.—Nederlandsche Entomologische Vereeniging.
 Hamburg.—Naturwissenschaftlicher Verein für Hamburg-Altona.
 Heidelberg.—Naturhistorisch-medicinischer Verein.
 Helsingfors.—Societas pro Fauna et Flora Fennica.
 Königsberg.—Physikalisch-ökonomische Gesellschaft.
 Liege.—Société Royale des Sciences.
 Madrid.—Sociedad Española de Historia Natural.
 Metz.—Société de Histoire Naturelle.
 Moscow.—Société Imperiale des Naturalistes.
 Neuchâtel.—Société des Sciences Naturelles.
 Padua.—Società Veneto Trentino di Scienze Naturali.
 Prague.—Kon-böhmische Gesellschaft der Wissenschaften.
 Paris.—Société Zoologique de France.
 Stettin.—Entomologischer Verein.
 Schaffhausen.—Schweizerische Entomologische Gesellschaft.
 Trieste.—Società Adriatica di Scienze Naturali.
 Vienna.—K. k. zoologisch-botanische Gesellschaft.

A M E R I C A .

- Boston.—Natural History Society.
 Cambridge Entomological Club.
 Nuttall Ornithological Club.
 Cincinnati Society of Natural History.
 Davenport Academy of Natural Science.
 London, Ontario.—Entomological Society of Province of Ontario.
 Newhaven, Conn., Academy of Arts and Manufactures.
 Philadelphia Academy of Natural Sciences.
 Poughkeepsie Society of Natural Science.
 St. Louis Academy of Science.
 Salem.—Essex Institute.
 Washington.—Smithsonian Institution.

U.S. Survey of the Territories, per Prof. HAYDEN.

NATURAL HISTORY SOCIETY OF GLASGOW.

Abstract Statement of Accounts—Session 1877-'78.

To Cash in Bank, per last Account, - - -	£40 14 8	By Rent and Attendance, - - -	£3 0 0
„ „ in Treasurer's hands, per do., - - -	2 2 5½	„ Postages, Carriages, &c., - - -	6 8 9½
„ „ per 126 Members' Annual Subscriptions, at 5s., - - -	31 10 0	„ Bookbinding, 1876-77, - - -	1 7 1
„ „ per 23 New Members' Entry-Money, at 10s., - - -	11 10 0	„ „Proceedings," Paper and Printing, - - -	33 15 6
„ „ per 2 Members' Arrears, at 5s., - - -	0 10 0	„ Magazines and Books, - - -	3 0 3
„ „ per 4 Life Members, at £5 5s., - - -	21 0 0	„ Cash in Bank, per Book, - - -	72 3 8
„ „ per 1 do., - - -	5 0 0	„ „ in Treasurer's hands, - - -	1 9 9
„ „ per Donation from a Member, - - -	5 0 0		
„ „ per "Proceedings" of Society sold, - - -	2 13 11		
„ Interest from Bank, - - -	1 4 0		
	<u>£121 5 0½</u>		<u>£121 5 0½</u>

GLASGOW, 14th September, 1878.—Audited, compared with Vouchers, and found correct.

(Signed) P. CAMERON.
SIG. SCHUMAN.



PROCEEDINGS

OF THE

NATURAL HISTORY SOCIETY OF GLASGOW.

SESSION 1879-80.

THE TWENTY-EIGHTH ANNUAL GENERAL MEETING,
ANDERSON'S COLLEGE BUILDINGS,

SEPTEMBER 30TH, 1879.

Professor John Young, M.D., F.G.S., President, in the chair.

The Treasurer submitted his Annual Financial Statement, which showed a balance in favour of the Society of £77 ls. 11d.

The Secretary read the Report of the Council on the business of last Session. Since last Annual Meeting the death had occurred of Dr. Hugh Colquhoun, an honorary member, and of Mr. George Thomson, a corresponding member, notices of both having been given during the past Session. Death had also claimed Mr. Thomas Chapman, who became a member in 1852, and was thus 27 years on the roll of the Society, during which time he filled various offices, being latterly one of the Vice-Presidents; and Mr. Alexander Donaldson, who had been a member for 13 years, and always took a deep interest in the progress of the Society.

The number of ordinary members on the roll at last Annual Meeting was 166; since then 16 names have been added, making a total of 182, from which has to be deducted for deaths, resignations, and removals, 8, leaving at present 174.

The usual number of meetings—eight—were held on the last Tuesday of each month from September to April, the attendance at all of which was satisfactory, many of the papers read being

important. Notices of the meetings appeared in various local and Edinburgh newspapers, and detailed reports were given in the *North British Daily Mail*. The proceedings were thus made, in some measure, available to members who were not present at the meetings, and in some instances the reports had been the means of inducing some to join the Society.

The printing of the *Proceedings* has made considerable progress, and a new part will shortly be ready for issue. It will contain two instalments of the "Catalogue of the Fauna of Scotland"—the Mammalia, by Mr. Edward R. Alston, F.Z.S., F.G.S., and of the Fresh and Brackish Water Ostracoda, by Mr. David Robertson, F.L.S., F.G.S.

Towards the close of last Session proposals were made by the Glasgow Society of Field Naturalists for an entrance into this Society, and these being favourably entertained, negotiations were entered upon by the respective Committees, resulting in a satisfactory issue; and at the closing meeting the union was consummated by the entrance of the members of the former Society into the Natural History Society of Glasgow. The Council regards this as an event of importance, which will not merely increase the number of members on the roll, but will serve to strengthen the Society and extend its usefulness, the Field Naturalists having given considerable attention to the study of Botany, a department of Natural History which has not for some years been so prominent at the meetings of this Society as it deserves. To meet the views of the Field Naturalists, the Society resolved to institute a Summer Session, extending from May to September. During this term excursions to places of interest will take place, and meetings for the exhibition of specimens and reading of short papers will be held, but no general business will be transacted.

At the commencement of the Twenty-Eighth Session it is gratifying to contrast the respectable position the Society now occupies, with its humble origin. The number attending its first meeting was only eleven, and since then its progress has been gradual, but constant and steady. We may therefore hope that it has still before it a long career of prosperity and usefulness, and that as one by one the older members leave us others may take their places and carry on the work. The Council trusts that in the Session now commencing it will be the aim of each member to do what in

him lies to make it more interesting and successful than any preceding one.

The Librarian reported that the books were all in good condition, and that a considerable number of members had made use of them. The sale of the Society's publications was steadily increasing, and they were to be had for sale in London and on the Continent. Exchanges were made with 64 societies—22 British, 13 American, and 29 Continental. Donations of 6 volumes have been made to the Library, and over 300 parts of the publications of other societies have been received.

Mr. Thomas King read the following Report on the proceedings of the Summer Session, for which he was Secretary:—

6TH MAY, 1879.

The first Summer Meeting of the Society, with which the Glasgow Society of Field Naturalists had just been incorporated, was held in Anderson's College this evening—Mr. W. J. Milligan in the chair.

A Report of the Society's excursion of the previous Saturday to Glenboig was given by Mr. Cairney, who had acted as conductor.

Mr. Crawford then read a paper "On Recent Discoveries in Spectrum Analysis and their bearings on the Kinetic Theory of Gases," exhibiting several forms of Crookes' Radiometer, and explaining Professor Pye Smith's new method of observing end-on spectra in gases.

Mr. Schultze gave a paper "On Immersion Lenses for the Microscope," and exhibited his beautiful and powerful instruments, through one of which was seen plainly—without any trouble as to focusing—the parallel lines on the diatom *Amphipleura pellucida*.

MAY 20TH, 1879.

Mr. Gregorson in the chair.

The Chairman exhibited specimens of *Acer campestre*, on which he made some remarks.

Mr. M'Kay gave an account of the excursion to Hamilton on the previous Saturday. The members of the party had inspected the ancient oaks—remains of the old Caledonian Forest—and the White Cattle. *Chrysosplenium alternifolium* was found.

Mr. Allan then read a paper containing observations on the effects of the past winter.

JULY 1ST, 1879.

Mr. W. J. Milligan in the chair.

Mr. Ewing exhibited an abnormal specimen of *Caltha palustris*, and reported the finding of the Adder's tongue—*Ophioglossum vulgatum*—at Milngavie.

Mr. F. G. Binnie exhibited specimens of *Planorbis complanatus*, Lin., collected by Mr. J. J. King, in Maxwelltown Loch, Dumfries, where it is abundant, and is the second known Scottish locality for the species. Mr. Haddin recorded it for Loch-end Loch, Edinburgh (*Proceedings*, Vol. I., p. 247); and Mr. David Robertson, F.L.S., F.G.S., writing more recently on its occurrence in the latter locality (*Proceedings*, Vol. III., p. 173), says—"It is somewhat singular that, while this shell is so plentiful all over England, Wales, and Ireland, the small patch of water near Edinburgh, known as Loch-end Loch, is its only known locality in Scotland." He adds further that the loch is being filled up through the emptying of the town refuse into it. Here it will probably soon be extinct. Mr. King's discovery will, however, enable it to retain its place in the Scottish Fauna.

Mr. Turner exhibited a large number of rare plants recently collected by himself. Among these may be mentioned—

Doronicum plantagineum.
Tulipa sylvestris.
Meconopsis cambrica.
Scrophularia vernalis.
Arum italicum.

Hippophae rhamnoides.
Papaver argemone.
Ligusticum scoticum.
Montia fontana.
Osmunda regalis.

Mr. A. S. Wilson then read a paper, entitled "Unwelcome Flower Guests," in which he compared a cleistogamous flower, such as those produced by the violet—the type of a self-fertilized flower—with ordinary flowers, and said that the comparison brought out that ordinary conspicuous flowers, in addition to the means of attracting certain classes of flying insects, were also provided with structures, the object of which was to prevent the access of small crawling and creeping insects, which could do no good in the way of transferring pollen, and thus effecting cross-fertilization. These obstructions might be ranged under the following heads:—1st, isolation of the flower-stalk in water; 2nd, viscid secretion on flower-stalk; 3rd, prickles and downward-pointing hairs

on the peduncle ; 4th, closed nectaries ; 5th, temporary closing of the flower ; 6th, inflated calyx ; 7th, diversion of the insects by attractive secretions on part of the plant other than the flower ; 8th, position and character of the petals.

JULY 15TH, 1879.

Mr. Thomas King in the chair.

Dr. Stirton exhibited *Woodsia hyperborea*, and some mosses likely to be found at Blackmount on the occasion of the Society's excursion there ; Mr. Broom exhibited *Echium vulgare*, *Anchusa sempervirens*, and *Sanguisorba officinalis*, from the Avon valley, west of Linlithgow ; and Mr. Stewart exhibited *Lastrea rigida*, from Arran—its first discovery in Scotland, also *Polystichum angulare*, from Arran—its first discovery there.

Dr. Stirton, F.L.S., then read a paper on Lichens, in which he showed the relation subsisting between them and the state of the atmosphere. Dr. Stirton stated that, when the environment of Lichens remains unchanged, they naturally live through several centuries, but are so sensitive to any alteration in the amount of moisture or of sunshine that they are easily affected for the worse, and are ultimately destroyed. Hence their great value in registering climatal changes.

JULY 29TH, 1879.

Mr. W. J. Milligan in the chair.

Dr. Stirton gave an account of the excursion to Black Mount. The weather was very unfavourable, but several rare plants were found, amongst which might be mentioned *Cornus suecica*, *Pyrola secunda*, *Lobelia dortmanna*, *Allosorus crispus*, and *Gnaphalium supinum*.

Mr. Thomas King then read a paper on "The Development of the Vegetable Ovule from its first appearance till its fertilization." The paper was illustrated by a number of preparations under the microscope, arranged in such a way as to show the progress of development. In a transverse section through the ovary of *Loasa* the ovules were seen as simple rounded swellings on the three placentas, while those of the *Mignonette* showed the rudimentary

coverings as rings encircling the base of the nucleus. In the ovules of *Funkia* the coverings were seen in different stages of incompleteness, and in those of the Violet complete. The raphe, embryo-sac, &c., were also shown; and the orthotropal, campylo-tropal, and anatropal ovules were respectively illustrated by those of Rhubarb, Orobis, and Violet.

AUGUST 12TH, 1879.

Mr. W. J. Milligan in the chair.

Mr. M'Kay reported on the excursion to Ben Vorlich, where the following plants were seen in flower :—

<i>Thalictrum alpinum.</i>	<i>S. hypnoides.</i>
<i>Silene acaulis.</i>	<i>Carduus heterophyllus.</i>
<i>Sibbaldia procumbens.</i>	<i>Gnaphalium supinum.</i>
<i>Epilobium alpinum.</i>	<i>Salix herbacea.</i>
<i>Sedum rhodiola.</i>	<i>Juncus trichumis</i> (in fruit).
<i>Saxifraga stellaris.</i>	<i>Luzula spicata</i> (in fruit).
<i>S. aizoides.</i>	<i>Carex rigida.</i>
<i>S. oppositifolia</i> (in fruit).	<i>Lycopodium annotinum.</i>

Mr. Stewart exhibited *Lastrea dilatata*, var. *alpina*, in three distinct forms, which had been sent to Mr. Moore as distinct species.

Mr. Turner then read a most interesting paper, entitled "Notes on the Botany of Avondale." This paper was intended as a slight contribution towards a plan of working which the author commended to the Society—viz., that a number of the members should each take up some limited area of the neighbourhood of Glasgow, and work it up thoroughly, so that in the course of a few years, by the combination of their labours, it would be possible to form a very complete flora of the district. Mr. Turner also proposed that a botanical register should be undertaken and regularly kept by the Society. Such a register would facilitate the work in a way that mere notices in the minutes never could do.

Mr. Cameron then exhibited some nature-printed plates of butterflies, by a new French process. In these the colours and markings of the wings and body were reproduced with the most marvellous accuracy, and with all the brilliance of nature, while the price was very moderate.

AUGUST 26TH, 1879.

Mr. Thomas King in the chair.

Mr. M'Kay reported on the excursion to Eaglesham, where little of interest had been found, except *Polygonum minus*.

Mr. Turner moved that a committee be appointed to keep a register of plants and their localities. The motion was agreed to. Messrs. Turner, M'Kay, and King were then appointed as members of the committee.

Mr. P. Cameron then read an interesting paper on the "Evolution of the Hymenoptera with regard to Larval Coloration."

23RD SEPTEMBER, 1879.

Mr. W. J. Milligan in the chair.

Mr. Allan gave an account of the excursion to Campsie, which was the last of the season.

Mr. Crawford exhibited *Trientalis europaea* from Perthshire, and Mr. M'Kay a branch of Evergreen Oak from Milngavie.

Mr. J. J. King gave an account of a visit he had paid during the summer to Hampshire, and exhibited some beautiful specimens of Lepidoptera which he had captured there.

Mr. Thomas King then read a paper on "Goethe's Essay on the Metamorphosis of Plants," published in 1790. An English translation of it appeared in Seeman's Journal of Botany, vol. i., 1863.

The reports were all unanimously approved of.

The election of office-bearers was then proceeded with, when the following list for 1879-80 was unanimously agreed to:—President—Professor John Young, M.D., F.G.S.; Vice-Presidents—John Young, F.G.S., John A. Harvie-Brown, F.Z.S., and W. J. Milligan; Secretary—Robert Mason; Treasurer—Robert J. Bennett; Librarian—Henry C. Young; Members of Council—Archibald Robertson, David Robertson, jun., Thomas King, John M. Campbell, Arthur Pratt, John Kirsop, James B. Murdoch, James Allan, and A. S. Wilson.

Mr. John Farquhar, 352 South Wellington Street, was elected an ordinary member.

On the motion of Mr. James Coutts, it was agreed to enter on

the record a notice of the death of Mr. Thomas Chapman, and the Secretary was instructed to forward an extract from this portion of the minutes to the widow and family of the deceased.

Mr. Thomas Chapman, who died on 27th August last, at the residence of his son, Dr. Chapman, in Hereford, was identified with the Society during the greater portion of its existence. He became a member in 1852, the year following its formation, and was thus connected with it for the space of 27 years. During that time he was regular in his attendance, and served on different occasions as a member of Council, for some time as Treasurer, subsequently as Librarian, and at two periods as Vice-President.

While taking an interest in all departments of Natural History, Mr. Chapman was more particularly devoted to the study of Entomology, especially of the family Lepidoptera, in which he was recognized as an authority. He possessed an extensive cabinet, which not only contained specimens of the native species but was enriched by contributions from many foreign countries with which he maintained an extensive correspondence. The *Proceedings* of the Society show the frequency with which he brought forward specimens for exhibition, as he allowed no opportunity to pass for securing anything that was new or rare which might add to the interest of the meetings.

Mr. Chapman was well known to many of the members, by whom he was much esteemed and respected, as he spared no pains to help such as were engaged in similar studies, or who might feel an interest in them. Being of a retiring disposition, he confined himself more to practical work than to writing or lengthened speaking on scientific subjects. The position he occupied will not easily be filled, and it is believed that the remembrance of his services and of his many good qualities will cause his memory to be long cherished in the Society.

It was also resolved to record the recent death of Mr. Thomas Anderson, of Girvan, who was elected a corresponding member in 1867. In the early years of his connection with the Society, Mr. Anderson brought forward on various occasions specimens of rare Star-fishes and Zoophytes from the shores of Girvan. He was the author, conjointly with Mr. Robert Gray, of a lengthened paper on the "Birds of Wigtownshire," which is published in the first volume of the Society's *Proceedings*. Of late years he devoted himself principally to the investigation of the Palaeontology of the

Girvan Valley, and had been the means of adding several new species to the list of Silurian fossils, which will be described and figured in the monograph now being published by Professor Alleyne Nicholson and Mr. Robert Etheridge, jun.

SPECIMENS EXHIBITED.

Mr. George J. Combe exhibited specimens of the Hazel-leaved Bramble, *Rubus corylifolius*, on which he made a few remarks.

The Secretary exhibited eggs of *Cygnus nigricollis*, *Chauna chavaria*, *Ciconia maguari*, and *Polyborus thaurus*, which had been brought from Cape San Antonio, in the province of Buenos Ayres, by Mr. Ernest Gibson, corresponding member.

Mr. John M. Campbell made some remarks on the habits of the different species, and it was stated that the specimens had been presented to the Kelvingrove Museum.

PAPER READ.

Ornithological Journal of the Winter of 1878-79, with Collected Notes regarding its effects upon Animal Life, including Remarks on the Migration of Birds in the Autumn of 1878 and the Spring of 1879. By Mr. JOHN A. HARVIE-BROWN, F.Z.S., M.B.O.U.

The following attempt to chronicle the abnormal effects of an unusually severe winter cannot lay claim to any approach to completeness. Living at an inland locality myself, I had not the same opportunities of observation which occur to the resident near the coast lines, the principal effect upon bird-life at inland localities being simply the general absence of it, except around the farmsteadings and in certain sheltered localities. I was in hopes of receiving more assistance from the members of our own Society—some of whom, at all events, live in localities suitable for observations being made; though I have received some interesting notes from one or two members, amongst whom I may mention Mr. J. S. Dickson.

Several papers have already appeared upon this subject, amongst which I may mention the following, to all of which I am largely indebted for material for the present collection and compilation of items:—

Professor Duns read a paper at a meeting of the Royal Physical

Society of Edinburgh, "On the Influence of the Recent Storm on Bird-Life," of which he has kindly forwarded me a copy.

Mr. George Sim contributed a short but able paper on "The Effect of the Late Storm upon our Wild Animals in the North-east of Scotland" to the *Scottish Naturalist*, April, 1879, No. xxxiv., p. 84.

Mr. A. Brotherston, of Kelso, contributed an interesting paper, "Notes on the Effects of the Past Winter in the South-east of Scotland," to the *Scottish Naturalist*, April, 1879, No. xxxiv., p. 81.

Mr. A. Brotherston also has another paper, "Notes on the Effects of the Past Winter," published somewhat later than the last-mentioned, in the "*Proceedings of the Berwickshire Naturalists' Club*," and I am obliged to the author for a separate copy of his paper, as also for one of his "Zoological Notes" (*op. cit.*, p. 521), in which he makes references to various facts of interest.

Mr. Robert Service has reported upon "The Winter and Birds," in the *Dumfries Courier* of 25th March, 1879, referring principally to the South-west of Scotland.

Mr. John Cordeaux has treated of the "Early Migration upon our East Coast—England—in the Autumn of 1878," in the *Field and Zoologist*. I am indebted to him for a copy of this paper.

Mr. Robert Warren has an able paper on "The Effect of Severe Frost on Animal Life as observed in the County Mayo," in the *Zoologist* for July, 1879, which should be read in this connection.*

Dr. Buchanan White has some "Notes of the Spring of 1879," in the July number of the *Scottish Naturalist*, p. 132, principally Botanical, but with a few references to Birds and Quadrupeds.

Mr. J. Hardy, of Old Cambus, has some interesting notes in

* Those who are interested in the effects of the winter upon Fish should read a paper in the "*Journal of the Scottish Meteorological Society, New Series*, Nos. lvii., lviii., lix., by Archibald Young, Commissioner of Scottish Salmon Fisheries, entitled "On the connection between the Severe Winter and Spring of 1878-79 and the Failure of the Spring Salmon Fishing in the Early Rivers."

Mr. Cordeaux has also a paper, "Our Notes from North Lincolnshire," in *Zoologist*, 1879, p. 371, which may be consulted in this connection. In it some parallel observations may be found upon the scarcity of spring migrants and the delay of migrants, and consequent hurrying north of these species at a later date. These may be compared with my remarks in this paper upon the crowding upon our latitudes of certain other species, such as the Willow Warbler, &c.

the "*Proceedings of the Berwickshire Naturalists' Club*," 1879, p. 527, entitled "Miscellanea, Extracts from Correspondence, &c." I am much indebted to Mr. Hardy for various other items, and a most interesting correspondence, besides a copy of this paper.

Mr. Robert Gray has "*Ornithological Notes*" (*op. cit.*, 498), which are also useful in this connection.

Mr. George Muirhead contributes "*Additional Notes on Birds in the Neighbourhood of Paxton*" (*op. cit.*, p. 503).

Mr. T. H. Gibb also contributes some "*Notes on Birds in 1878-79*," from the neighbourhood of Alnwick, on the Eastern Border (*op. cit.*)

Mr. Robert Service has a later and more complete paper than that the title of which is given above, viz., "*Effects of the Weather of the past Twelve Months upon Animal Life*," referring principally to the South-west of Scotland. This paper is reported in the Dumfries papers of 8th and 12th November, 1879, and will appear *in extenso* in the *Transactions of the Dumfries and Galloway Natural History and Antiquarian Society*, session 1879-80, in due course. I have made copious extracts from it, but those interested in the minutiae of this subject ought to consult it separately.

Mr. Hastings, Naturalist, Dumfries, read a paper on "*Rare Birds with the Hard Winter*," at meeting of the *Nat. Hist. and Archaeol. Soc. of Dumfries*, on 5th December, 1879.

The Duke of Argyll had a letter in the *Times* about the last week of December, 1879, on the subject, and some correspondence resulted therefrom. I am sorry I did not have an opportunity of seeing this.

Various scattered notices of the effects of this severe winter will also be found in the local newspapers and journals, such as the *Inverness Courier*, *Dundee Advertiser*, *Oban Times*, and others. From these sources, together with private correspondence and a small share of personal observation, and from investigations made during the summer and spring of 1879, I have taken the items hereafter mentioned under the headings "*Migration of the Autumn of 1878*;" "*Journal of the Winter of 1878-79*;" and "*Observations on the various Species which came under notice*;" and the whole paper is intended to include notes upon the species up to the date of reading this paper, viz., the 30th September, 1879.

I repeat, this report is very incomplete, but it is only by UNITED WORK that a LARGE amount of such statistics can be collected.

The arrangement of them is simple enough, and it is hoped that in time they may develop useful results.

To many kind correspondents—far too numerous to mention in this place—I desire to offer my best thanks.

I may add here that it is my intention to keep notes from this date onward of a similar nature, and I will be glad at any time to receive the smallest contributions for future reports on Mammals or Birds. I earnestly solicit the co-operation of all members and others who desire to see an annual and full report on this subject compressed into the space of one paper.

I.—MIGRATION OF THE AUTUMN OF 1878.

All accounts agree in recording the unusually early and rapid migration of birds during the autumn of 1878. They appeared upon the Sound of Iona, in Mull, fully a month earlier than usual—except Woodcocks, which arrived, as usual, about the 12th October. Snipe were extremely abundant in many localities. Here, in Stirlingshire, I never saw more than we had in the end of September up to middle of November; but from various localities an unusual scarcity of the Jack Snipe is recorded. I never saw fewer of the latter here. The very dry summer of 1878 sufficiently accounts for the crowding of our marshes with the common species, and the rapidly approaching winter, probably, for the scarcity of the Jack Snipe.

Mr. W. Boyd writes to me regarding the migration in Mull:—“In the month of October I was fishing on Loch Assapol, near Bunessan. Almost every day I saw flock after flock of little birds—Larks, Buntings, Robins, and even Wrens—flying across the loch. All these birds were steering the same course, having apparently come from the outlying Hebrides, *via* Tyree, Iona, up the Ross of Mull, and were steering for the mainland. Fresh arrivals of different kinds of Duck rested, and then passed on. Wild Geese and Swans were seen far up in the air, all taking a bee-line for the South.”

Larks, Buntings, Robins, and Wrens are all common in the Outer Hebrides. Therefore these flights observed by Mr. Boyd in all probability had their starting-point in the Long Island. They steered the same course—a south-easterly one—which Wild Geese and Swans were seen to take high up in air. But that all

the Wrens migrated from the Outer Islands is not the case, as many remained throughout the past winter in North Uist, as they usually do, as I ascertained when there this summer. The winter, however, in North Uist was not by any means so severe as in Harris, nor was the spring so late and cold. Snow lay much more persistently in Harris than it did in North Uist.

In December Mr. Boyd went out to Tyree, and he and Mr. Henderson both remarked "the extraordinary scarcity of common birds, and the unusual number of winter visitors. The whole island was full of Wild Geese, and on one fresh-water loch more than sixty Swans had taken up their winter quarters." Batches of Snipe were observed to arrive, but as a rule they did not remain long. This was after the usual time of migration, and they were at a loss to account for it. One day, however, every Snipe they put up, instead of flying a bit and settling again, rose high in air, and went off due south-east as far as they could see, right away across the sea to Mull. The remark was then made, "The sooner we go south for powder and provisions the better, we are going to have an arctic winter." They had no reason afterwards to regret that they at once acted upon the suggestion.

On returning later, many Gadwall were seen, and five were shot in one day, in an hour or two, amongst other wild fowl. All the lochs being frozen up, the Ducks had resorted to salt water, and those obtained were shot from the shore as they flew past.

Mr. Robert Service, in his excellent paper, of which I have given the title above, writes as follows:—"Amongst the summer warblers some curious changes resulted from the ungenial weather of the summer months. The Sedge-warbler, Blackcap, Chiff-chaff, Wood-warbler, and Willow-warbler were all in augmented numbers. In the autumn of 1878 the Golden-crested Wren, Great Tits, Blue-tits, Cole-tits, and Long-tailed Tits passed through the district in larger numbers than usual, getting out of the way, as the sequel proved, of the coming severe weather, with unerring instinct."

We find an indication, in the movements of birds at Tyree and Mull, of a treble migration, the earlier ones in October probably coming from the north-east—Norway, Sweden, and North Russia—being an extension of the same migration which passes Heligoland; and of a migration coming from the north-west. The absence of Bewick's Swan on the west coast of Scotland, and the abundance of the Hooper, rather points to a north-west origin than

to a north-east origin.* I have been able also to trace the Tyree flock of Swans as having in all probability passed over North Uist; and a later one from localities nearer home—the north of Scotland and the Orkney Islands. Local migrations, caused by the severity of the winter, were observable also on our east coast. Grouse were seen crossing the Moray Firth in December and January, flying southward. The inclination of migrations seems to be to reach first the coast lines or great valleys, and then to follow them; and this is especially noticeable in the autumn migration, when all our estuaries are crowded with Dunlins and Waders, but many of these same estuaries deserted by them during their more direct progress in spring. Mull being the nearest (southward) land to Tyree, the birds would make direct for it, and, according to the local winds, would hug the shelter of the land or head their flight across the promontories.

On the Solway Firth early notice of the coming winter was afforded by the arrival of vast numbers of wild fowl, and towards the end of the storm their numbers exceeded anything within the memory of the oldest fishermen (R. Service, *Dumfries Courier*, 25th March, 1879). Unusual numbers of sea-fowl were seen upon the Irish coasts also, as I am informed by Mr. Robert Warren, and so with numerous other localities.

Herr Gaetke, the well-known naturalist of the “Little Red Rock in the Sea”—Heligoland—that wonderful resting-place of vast multitudes of migratory birds, has reported that while in ordinary seasons the autumn migration of birds often continues until the end of February—until, in fact, it is almost time for them to return again—in the autumn of 1878 *every migratory bird had sped past by the end of November* (*fide* J. Cordeaux, in *Zoologist*, quoting Gaetke).

Mr. Stevenson writes from Norwich on the 11th January, 1879:—“No rare birds have been killed. The storm began too early, and all the rare things went further south.” Mr. Robert Warren, of Mayview, Ballina, Ireland, reports similarly. He says:—“I did not meet with a rare northern bird, not even an Iceland nor a

* Subsequent experience in 1879-80, however, causes this statement to be modified, as large numbers of Bewick's Swan—and possibly of the doubtful species, *C. americanus*—occurred on the west coast, at Islay and elsewhere. A fuller account of these will be given in our Report for 1879-80.

Glaucous Gull. I suppose they all went further south, looking for a warmer climate."

A theory was started to account for the unusual severity of the winter. The hot summer of 1878 is supposed to have loosened an unusually large quantity of polar ice, which floated further south than in ordinary seasons. This affected the atmosphere, and, making it colder, the reaction upon the floating ice prevented it from melting as soon as is usually the case. The unusually early migration of birds, and the haste with which they passed, favour the opinion that winter had set in unusually early in the north of Europe. Even as late as March, 1879, vessels were beset and damaged by icebergs off the mouth of the Gothenburg river and seaward. The *Marjory* was holed on the starboard bow by an iceberg, and the *Frithjof*, from Gothenburg, on arrival at Granton, reported that she had been much detained by icebergs in the river and at sea (*Edinburgh Courier*, March 18th, 1879).

We are not prepared to take up this as the natural cause of the severe winter, nor to enter into the deeper considerations of the eccentricity of the earth's orbit and deflection of the Gulf Stream. It will be quite sufficient to chronicle the facts without dipping into the speculative part of the subject. The ease with which Arctic expeditions penetrated to Franz Josef Land, and made the North-east Passage (Nordenskjöld), also indicates an unusual loosening of Arctic ice; and the fact of an unusually fine summer in Iceland in 1879, and an extremely wet one in Great Britain, appears also confirmatory of similar causes and effects.*

* The following are among many similar reports from other parts of Europe, illustrating the effect of the severe weather, which it would be almost an endless task to collect and arrange with any hope of completeness:—"THE HARD WINTER AND THE WILD FOWL.—The Geneva correspondent of the *Times* writes:—The severity of the weather has brought immense flocks of Wild Ducks into the Val de Travers, where the streams, rich in trout, remain unfrozen owing to the sheltered position of the valley. To make head against the invasion and prevent the extermination of the fish, the Government of Neuchatel have prolonged the shooting season, which had already expired, for eight days. Another interesting fact in natural history is the unwonted presence at Geneva of thousands of Lake Gulls. They fly all day long in the neighbourhood of the Pont du Mont Blanc, disputing with the Swans the bread thrown by visitors into the river. The home of these graceful birds is among the rocks on the Savoyard side of the lake, and on their arrival here two months ago they were

II.—JOURNAL OF THE WINTER OF 1878-79.

The first real indication of winter we had was on the 27th of November, 1878, when, during the night, a heavy fall of snow covered a large portion of Scotland, and, being accompanied in some places by wind, drifts took place even at this early stage of the proceedings of this memorable winter of 1878-79. A drift on the Fintry Road, between Todholes Farm and Fintry (Stirlingshire), was between four and five feet deep, and impassable to horses. One cart-horse breasted it, but, as described to me, “her fore-legs jist gaed frae her, wi’ her breest agin’ the snaw.” This was on the 28th of November.

A sharp frost then set in, and continued without intermission until the last day of the year 1878. By this time a vast accumulation of ice had formed, and on the Carron river (Stirlingshire) I measured virgin ice nine inches thick on the still reaches the day before the thaw began, on the 30th of December; and I was assured of its being twelve inches thick in other places. The Forth was frozen over above Stirling Bridge, and carts crossed it.

The exceeding stillness of the frosty air at the commencement of the storm must have been noticed by many as indicating the severity of the frost. Walking along the river-side on the look-out for Ducks, the bed of the river was almost hidden from my view by the thick incrustation of frozen snow upon the alders and willows.

A rapid thaw then began, and by the third day the river ice was broken up, and for the most part floated away; but large masses of pure blue ice were scattered along the margins of the rivers, left high and dry by the subsiding floods. I measured many of these blocks, and found the ice from six to ten inches thick, which, allowing for the effects of the thaw, may be said to represent a greater thickness. These blocks afterwards lay there regarded as the harbingers of a hard winter, as, indeed, they have proved to be.”

And again:—“EXTRAORDINARY CAPTURE OF SEA BIRDS.—The *Cornishman* narrates an unprecedented and accidental take of birds. On the St. Ives fishing-boat *Davis* hauling in her nets on Friday morning, in addition to about 100 mackerel there were 400 Gulls, Kittiwakes, and ‘Murrs’ in the meshes. One hundred were alive and were liberated, 300 were dead and were taken to Penzance, where they sold for 2s. 6d.”

This last occurred towards the end of the storm, and may or may not have been directly connected with the severe weather.

for weeks without change. I refer here to the River Carron, in Stirlingshire. Jack Frost resumed his sway again on the 3rd of January, 1879.

On the 2nd of December I was at Leadhills, in Lanarkshire, having walked from Crawford, and returning to Crawford by Elvanfoot. On a small pond above Leadhills curling was going on even at this early date; but the high altitude of Leadhills accounts for the severity here—over 1200 feet.

On the 24th December my valued correspondent, the Rev. Geo. Gordon, of Birnie, wrote to me:—"We are now passing through a season which, for upwards of two weeks, has as extensively and firmly interfered, by snow, between many of our wild animals and their natural food as I recollect any winter to have done."

Accounts from various districts of Scotland, amongst others the coast of Banff, and in Lewis, Tyree, and Mull, also from Ireland and the Scilly Isles, show what immense numbers of Woodcock and Snipe were killed towards the end of December, while other localities seemed to be scarcely visited by them at all. Inland localities had at this time been long since deserted.

The thaw, we have seen, lasted but a short three days, and was not enough to clear the ponds, or lakes, or stagnant water, of their thick coverings of ice. The frost recommenced operations on the 3rd of January, and continued uninterruptedly till the 13th, with considerable severity. Curling and skating had continued almost without interruption.

9th Jan., 1879.—The ice upon an artificial pond on Sheriffmuir was on this date nearly two feet thick.

On the 13th a slow thaw, with rain, but no wind, lasted two days, and frost began again on the 15th; but the frost was never so intense as in December.

The *Times* says—"The essential characteristic of the winter of 1878-79 is 'long-continued moderate frost.' By its quiet persistence, without spasms of sudden severity, it has attained a *minimum* of cold which is the lowest in the last 21 years—for November with four exceptions, for December with one, and for January without a rival. . . . During the last 91 years 'only four winters can be found to match its severity.'"

By the 13th of January birds had almost entirely disappeared from Tongue, in Sutherland, and by even an earlier date from

many inland localities in England. At the beginning of the frost Fieldfares and Redwings had been "more abundant" in Norfolk than had been ever seen before [I have similar reports from many localities]; but very soon dead and dying were picked up, and finally all birds disappeared, except a few pet Robins, &c., near the houses.

By the 23rd of January it was reported that such snow had not been known in Paris since 1861. It lay six inches deep in the Boulevards, and 7000 men were engaged to sweep the streets.*

In Sutherland Rooks did not leave Tongue, but migrated every day for food to Durness and Far-out-Head, a point of land which runs out seaward, and, as Mr. John Crawford told me, was, he believed, clear of snow.

On the 25th of January Loch Lomond presented a wondrous sight, and 15,000 people are said to have been skating and curling upon it between Balloch and Inchmurrin (*vide* daily papers).

Great mortality amongst the birds—game-birds and others—was now reported by gamekeepers; and small birds were found frozen to the branches of trees in Sutherland.†

Lake Windermere was reported, on the 27th January, to be frozen over a larger extent of its surface than can be remembered since the very severe winter of 1854-55.

Great drifts of snow have been constantly occurring and recurring in different parts of the North of Scotland, but principally on the Caithness line of railway. During the continuance of the storm two men were employed always in carrying the mails into the further districts of Sutherland and Caithness, as well as of other parts of the Highlands. It was not considered safe for one man to travel alone.

The average temperature for 24 hours ending at 8 o'clock this morning (27th Jan.) was 27° Fah.

28th January, 1879.—Almost all bird-life has been annihilated around Tain, in Ross-shire, by this date, as I am informed by Mr. Thos. Mackenzie.

29th January.—Gartmorn Dam, Alloa, has been bearing for eight weeks—"unprecedented in the history of the present generation" (*Alloa Advertiser*, 29th January, 1879).

* *Glasgow Evening Citizen*, 27th January, 1879.

† *Ibid.*

30th January.—Curious to observe, that two variegated plane trees, notwithstanding this continued frost, are thrusting out shoots. These trees stand at either end of Dunipace House, and are close to the windows. In March (6th), when I returned home after a month's absence, these buds were no further developed, and little difference was observed upon them until towards the end of the month.

At Candlemas, or a little before it, we had a high storm of wind, with thaw. Robertson, in his "Agriculture of Kincardineshire," p. 396, tells us that "The Green Plover or Peesweep arrives here so very correctly about Candlemas, that the storm, which generally happens about that season of the year, goes by its name—The Tchuchet Storm." It was not until nearly a fortnight later that they put in an appearance, only to be again driven away by the deep fall of snow on the 12th and 13th of March (*q.v.*)

16th February.—Six inches of snow lying at Galashiels, and more or less over all the South of Scotland. A train stuck in a snow-wreath at Dalwhinnie, 1400 feet above the sea. In Caithness trains again stuck fast. Telegraph posts blown down. The locality of one train not known. Such were some of the reports of the daily papers for this date.

The *Scotsman* reported, on the 24th February, that "The Cheviots have now been covered with snow for sixteen weeks. A fresh fall yesterday at Peebles was nearly six inches. Hay is getting scarce. Outdoor labour at a standstill for eleven weeks. Frost with great severity again in the West of Scotland. Loch Lomond is again safe for skating. Frost at Huntly was at least as keen as at any previous period of the winter. Sheep in some places are dying by the score. After a week's labour the surface-men have succeeded in cleaning away the snow on the Caithness Railway."

From various places it is again reported that game and small birds are suffering severely. At Pitsligo, Aberdeen, and indeed generally along our coasts, great numbers of birds resort to the sea-beach. Even Wrens, Starlings, and Rooks left the inland districts, and were seen among the rocks on the Berwickshire coast.

The Spey was frozen over for several weeks in many places.

21st February.—Another great drift on the Caithness line. One hundred men are engaged in a cutting where there is an

average depth of fourteen feet of snow. They cleared a mile. Still six miles to clear, which is expected will be done by Saturday next (1st March).

21st February, 1879.—All kinds of wild animals, such as Deer, Hares, and Rabbits, also Birds, are dying for want of food (report from Alyth, Forfarshire).

21st February.—A thaw has as yet only reached three inches into the ground at Hawick. Deep snow in Caithness, and in Dumfriesshire; Alyth (16 to 18 inches, and 30 to 34 in the north of the parish); also at Aberfeldy, Brechin, Aberdeen (keen frost); Peterhead, Loch Alsh, and Kirkwall (keen frost).

Ice on Loch Vennacher when at thickest measured 16 inches, and on Loch Lubnaig about 10 inches, as I am informed by my friend, Mr. J. H. Buchanan, of Leny.

It may prove useful in this connection to reissue the following record of the weather up to the end of February, as given in the *Field* of 28th February, 1879:—

[The following interesting letter from Mr. G. J. Symons, F.R.S., one of our highest authorities on meteorology, appeared in the *Times* of the 2nd inst., and as it affords reliable statistics on the subject inquired about, we reprint it for the information of our readers:—“As we have just passed through the coldest January for at least twenty-one, and, I believe, for forty-one years, following a December which was also, with one exception, the coldest for twenty-one years, I presume some particulars respecting the present and previous winters will be acceptable. The observations which I shall quote will be my own, back to November, 1858, and prior to that the most trustworthy tables for Greenwich at present attainable. It may be well to add that the averages for Greenwich and for this high part of London are nearly identical. In the first place, it is necessary to give an abstract of the observations of the last twenty-one years, from which we learn—(1) That the average *maximum* temperature of November was the lowest during the period with two exceptions, that of December the lowest with one exception, and that of January the lowest of the whole period; (2) that the average *minimum* of November was the lowest during the period with four exceptions, that of December the lowest with one exception, and that of January the lowest; (3) that the mean temperature of the three months was not only 5° below the

average, but also lower than in any previous year out of the twenty-one.

Winter.	Average Maximum.			Average Minimum.			Mean Temperature.			
	Nov. Deg.	Dec. Deg.	Jan. Deg.	Nov. Deg.	Dec. Deg.	Jan. Deg.	Nov. Deg.	Dec. Deg.	Jan. Deg.	Nov.-Jan. Deg.
1858-9	46.0	44.5	44.8	33.6	34.6	34.2	39.8	39.6	39.5	39.6
1859-60	48.0	40.8	44.7	36.7	31.6	35.0	42.2	36.2	39.9	39.4
1860-1	46.0	40.5	38.4	36.4	32.1	28.9	41.1	36.3	33.6	37.0
1861-2	47.3	45.7	43.5	34.2	35.1	33.7	40.7	40.4	38.6	39.9
1862-3	43.9	47.0	46.2	34.4	38.5	37.6	39.2	42.7	41.9	41.3
1863-4	50.7	48.7	41.0	40.1	36.9	32.5	45.4	42.8	36.8	41.7
1864-5	48.8	42.3	40.9	35.3	34.4	31.5	42.1	38.3	36.2	38.9
1865-6	50.6	46.5	47.6	40.0	38.5	38.3	45.3	42.5	42.9	43.6
1866-7	51.0	48.1	39.7	38.4	37.9	29.3	44.7	43.0	34.5	40.7
1867-8	47.7	42.3	41.5	35.9	32.5	33.0	41.8	37.4	37.3	38.8
1868-9	47.2	50.7	46.3	36.5	41.0	35.9	41.9	45.9	41.1	43.0
1869-70	49.1	43.3	43.4	37.4	33.3	34.4	43.3	38.3	38.9	40.2
1870-1	48.0	38.3	37.4	36.2	29.9	29.5	42.1	34.1	33.4	36.5
1871-2	43.6	42.7	46.1	32.8	34.2	36.3	38.2	38.5	41.2	39.3
1872-3	50.9	47.0	46.7	40.2	38.2	38.3	45.5	42.6	42.5	43.5
1873-4	50.1	45.8	47.4	38.8	35.8	35.9	44.5	40.8	41.6	42.3
1874-5	47.4	38.1	48.2	36.9	28.7	39.2	42.2	33.4	43.7	39.8
1875-6	48.1	42.9	42.5	37.2	34.8	31.5	42.7	33.8	37.0	39.5
1876-7	49.7	47.8	48.5	38.8	40.4	37.4	44.2	44.1	43.0	43.8
1877-8	52.3	45.6	45.2	39.6	35.5	35.5	45.9	40.5	40.4	42.3
1878-9	44.9	38.2	35.8	34.8	29.5	28.7	39.9	33.9	32.2	35.3
Mean	48.2	44.1	43.6	36.8	34.9	34.1	42.5	39.5	38.9	40.3
Highest	52.3	50.7	48.5	40.2	41.0	39.2	45.9	45.9	43.7	43.8
Lowest	43.6	38.1	35.8	32.8	28.7	28.7	38.2	33.4	32.2	35.3

In the following small table I have collected all the instances in which the three months seem to have been as cold as, or colder than in those just past. It shows that there are only four other instances in ninety-one years:—

MEAN TEMPERATURE.

Winter.	Nov. Deg.	Dec. Deg.	Jan. Deg.	Mean Deg.	Winter.	Nov. Deg.	Dec. Deg.	Jan. Deg.	Mean Deg.
1788-9	40.6	29.0	33.4	34.3	1829-30	39.3	34.9	30.7	35.0
1794-5	43.3	36.8	23.9	34.7	1878-9	39.9	33.9	32.2	35.3
1813-14	40.2	36.6	26.9	34.6					

If, instead of the three months, we confine our attention to the two months which had the lowest temperature, we shall still find very few cases in which the mean temperature of December and January has been as low as in 1878-9. The following are all the instances:—

MEAN TEMPERATURE.

Winter.	Dec. Deg.	Jan. Deg.	Mean Deg.	Winter.	Dec. Deg.	Jan. Deg.	Mean Deg.
1788-9	29.0	33.4	31.2	1813-14	36.6	26.9	31.8
1794-5	36.8	23.9	30.4	1829-30	34.9	30.7	32.8
1796-7	30.4	35.4	32.9	1878-9	33.9	32.2	33.1

The individual months which have had a lower temperature are rather more numerous; but even they are not more than nine or ten in a century, as is shown by the following table:—

MEAN TEMPERATURE.

December.				January.			
Year.	Deg.	Year.	Deg.	Year.	Deg.	Year.	Deg.
1788	29·0	1844	33·0	1795	23·9	1826	32·0
1796	30·4	1846	32·9	1814	26·9	1829	31·7
1798	33·7	1874	33·4	1815	31·9	1830	30·7
1799	32·8	1878	33·9	1820	31·7	1838	28·9
1840	33·3			1823	31·8	1879	32·2

“The whole of the foregoing facts prove that the distinguishing feature of the winter of 1878-79 has been constant low temperature, and thereto it is desirable to add that its essential characteristic has been long-continued moderate frost, without any of those sudden periods of intense cold when the thermometer even in the neighbourhood of London runs down nearly to zero, as it did in 1855, in 1860, and in 1867.”

On the same day there appeared another interesting letter from Mr. Thomas L. Plant, the well-known meteorologist, of Birmingham. He mentions several severe winters, notably in 1813-14, when the frost lasted from December 26 to March 21, the mean temperature in January, 1814, being 26·8. In this winter the Thames was frozen over. In the winter of 1819-20 the frost lasted from November to March; in 1839 there was an eight-weeks' frost, the mean temperature for January being 28·5; in 1855 (during the Crimean war) the mean temperature for January and February was 31° and 29° respectively; the mean temperature of thirty days ending January 16, 1861, was 26°. Mr. Plant adds that the Christmas Eve of 1860 the thermometer registered 34° of frost, or 2° below zero, which finds no equal in his records since January, 1838. The next severe winters were in 1870-71. Mr. Plant states that the mean temperature in the Midlands in December last was 31°, and in January 29·8°. We may add that on Christmas Day, 1860, the thermometer at Nottingham registered 13·8° below zero, as vouched for by Mr. E. J. Lowe, of the Beeston Observatory—the mean temperature there on that day being 4° only, being 32½° below the average of forty-three years.]

March.—Effects of severe winter are disastrous in many botanical gardens, notably as reported at Manchester:—“There has not been such severe weather since December, 1860, nor such

a prolonged frost since the memorable winter of 1838. During the last eighteen years efforts have been made to replace the many fine trees and shrubs destroyed in 1860, and now wide-spread destruction has come again."

After an interlude of spring, which lasted during the first few days of March, a great snow-storm again covered the earth in a white mantle. Flocks of Finches had reappeared on the scene, and Rooks had got so far advanced with their building operations. High gales, however, had interfered with their work. In Banffshire, wreaths of snow lay from 3 to 5 feet deep, and from 4 to 7 inches in the open; and generally over Scotland winter again reigned. Trains were blocked up. From Orkney along all the east coast, frost and snow. Passengers from Aberdeen to Wick by steamer had to be landed at Thurso on the north coast, owing to blinding snow-drift on the east coast.

Five inches of snow fell in Stirlingshire on the 12th March. General fall over the whole country. Reports from Burntisland, Dunfermline, Leven, Alloa, Auchterarder, Denny, Stow, Galashiels, Earlston, Kelso. Heavy snow and intense frost on nights of 13th and 14th. Country roads blocked up. Inhabitants of Strath Braan, Perthshire, and Amulree, and Glen Quoich, were shut out from rest of the world by snow-drifts. [A useful summary of the weather up to 14th appeared in the *Scotsman* of March 14th.] Snow storm continued till 17th. Icebergs are reported in the papers off Gothenburg, and vessels damaged by collision with them.

On 19th, rain and thaw, which continued; but all through April cold east winds, occasional falls of snow, and bitterly inclement weather. Snow fell heavily and whitened the ground on the 12th—the day on which Swallows usually arrive in Stirlingshire. In Lincolnshire no spring migrants had arrived on the 20th, and everything points to a late spring. On the morning of 3rd May $\frac{1}{4}$ inch of ice formed in Stirlingshire, and keen frosts, succeeded by hot sun and dry east winds, prevailed. Scarcely any growth of grass is observable in Argyllshire inland, and very little in Stirlingshire. Grass grew nearly an inch on the night and morning of 26th-27th April when we had a shower of rain, but little difference since then up to May. Buds upon variegated planes—before mentioned—only showing green, 2nd of May, on the western exposure, but not yet showing green on the eastern exposure (in Stirlingshire). Thus these trees which began to bud

in the end of January, have by the beginning of May scarcely begun to push out their green leaves.

The following is the newspaper report for 9th May, 1879:—
“WINTRY WEATHER.—Snow fell heavily at Kelso yesterday morning, and the hills in the neighbourhood are quite covered. Our Thurso correspondent says the accounts from the hills are sad as to the havoc which the inclement weather is making among the sheep; and lambs, it is said, are dying in hundreds. Flockmasters are consoling themselves with the possibility of saving the ewes. The weather is dreadful—more like mid-winter than the month of May.”

Similar accounts reach me from several parts of the Highlands; and snow-storms, even at this late date, were recurring on the east coast of England.

Very general are the reports of the unusual scarcity of birds in our woodlands, especially along the east coast, and even Sparrows seem to have greatly decreased in numbers in some localities.

While this scarcity occurred in Scotland, in the southern counties of England unusual numbers of Thrushes were hatched, being no doubt a large proportion of our Scottish population of ordinary seasons.

Insect and vegetable life is quite a month late in Dumfriesshire [R. Service, *in lit.*, May 15th].

Similar accounts reach me from Ireland. Mr. Robert Warren writes (May 19th, 1879):—“The country looks quite depopulated of the usual hedgerow and field inhabitants. All have suffered, but some have been nearly cleared out altogether. With regard to this place,” continues Mr. Warren, “which contains about 200 statute acres, including 40 acres of wood of over 50 years’ growth, and distributed in various small woods and screens, the fields all divided by white-thorn hedges from six to fifteen feet high, and altogether most favourably circumstanced for our small birds, what have we left to stock it this spring? I can only see one Thrush, two or three Blackbirds, but not a hen-bird or a nest has been seen of either. One or two pairs of Missel Thrushes and one nest found; a couple of pairs of Cole-tits; two or three pairs of Blue-tits; one Great-tit; two or three pairs of common Wrens; not a golden-crested Wren to be seen. One solitary old Cock-sparrow is the sole remnant of a little colony. The Chaffinches

have kept up their numbers the best of all the Finches. I think the Goldfinches suffered most. Yellow Hammers are fearfully thinned out."

As will be seen further on, the above remarks by Mr. Warren are equally applicable in Scotland in most instances.

May—June.—Even in May the scarcity of our most familiar resident species was painfully apparent, especially such as are known to subsist principally upon insect food, such as Creepers, Gold-crests, Tits, &c. These remarks do not apply to the really migratory species, such as Swallows, Swifts, Cuckoos, &c., which, though very late of arrival, do not, as a rule, appear to have seriously decreased in numbers. [Exceptions will be found under the different species.]

In the beginning of June ice strong enough to have permitted of curling is reported to have been found on one of the lochs beside Lochnagar, at an altitude of little more than 2000 feet [*Scot. Nat.*, July, 1879, p. 134].

The effects of the winter upon animal life were different in different localities. Inland localities were denuded of bird-life, except around the towns and farm-houses, where birds were abundant. Finches and Buntings flocked in from various districts, but Thrushes and many other species deserted the inland districts entirely. Around Kelso, as reported by Mr. Brotherston, birds remained fat and in good condition, and birds generally appeared in that district to be as abundant in the following summer as in ordinary years. [*Vide* Mr. A. Brotherston's "Notes," *Proc. Berw. Nat. Club*, before referred to.] But, judging from most other reports, this state of affairs must have been exceptional on the east coast or at inland localities, except where unusually well sheltered and wooded.

In the valleys and other more sheltered localities the scarcity (and, perhaps, even the lateness of arrival) of some of our summer species was not so remarkable. Thus, in the vale of Menteith, Stirlingshire, Tree Pipits, Martens, Swallows, and other summer species appeared to be almost as numerous at the end of May as in other seasons. In more exposed situations, however, the terrible scarcity was very apparent.

In Islay, as in most insular localities on the west coast, the winter was not so severe as on the mainland or on the east coast of Scotland. Still the winter was much more severe than usual.

All the lochs were frozen, but the ice was not very thick, and the sun had great power in melting it. Red Deer, Roe Deer, and Fallow Deer did not suffer at Kildalton, but Hares and Rabbits died in some numbers. The shore birds and regularly recurring migrants appeared and departed about the same time as usual. Many birds not commonly seen and strange to the people spent last winter in Islay; and in January and February many small birds died. I am indebted to my friend, Mr. F. S. Mitchell, for the above notes on Islay.

In a general report upon the winter in Islay, prepared for me by Mr. F. S. Mitchell, and quoting from the log of Mr. Chisholm, there occurs the following passage:—"While going from Bowmore to Portnahaven on January 10, 1879, we had frost at Bowmore and pretty sharp cold. On arriving a mile beyond Port Charlotte we found no snow, nor had there been any during the winter in that part, nor more than a very slight sprinkling in the whole parish of Kilchonan. The weather, by all accounts, was milder in Islay in winter than any place in Britain except the Channel Islands, but the spring migrants arrived late."

In the Outer Hebrides in June, vegetation was far further advanced than at any other locality in Scotland that I had seen. June in Uist was for the most part warm and genial, notwithstanding that north and north-east winds prevailed here, as elsewhere in Scotland, all through the summer.

Few of the birds which are usually resident in the Long Island migrated, or were much affected by the severe winter. Twites collected as usual in flocks around Newton and other favourable localities, and Wrens remained as usual. In Harris, however, which is more exposed and higher than Uist, small birds died in some numbers, and one Deer succumbed.

As the autumn of 1879 advanced, and the time for the great migration approached, I communicated with various correspondents, asking them to keep me acquainted with the bird-life on the coasts and in other localities, but I do not expect to make much use of these reports or correspondence, until I receive at the end of the year the various schedules which have been issued by Mr. John Cordeaux and myself to the principal keepers of the lighthouses, with the sanction and approval of the Brethren of the Trinity House and the Commissioners of Northern Lights. The subject of the Migration of Birds on our coasts will in future form material for a

separate Report, with which, however, my Annual Report to this Society will be continuous, and closely related.*

MAMMALS.

RED DEER, ROE DEER, FALLOW DEER.

One correspondent writes me:—"In the severity of the past winter a great number of young Deer succumbed, and in some places full-grown stags and hinds. At the present time they are extremely lean [May, 1879]. As an instance of what cold and hunger reduced some of them to last winter, I may mention that a neighbouring shepherd, one night, as he went to feed his cows before retiring to rest, found a hind lying down against his byre door, but on seeing him she got up and went off. On rising next morning the first thing he did was to go to the byre, which was under the same roof as his own dwelling, to feed his cattle, and, to his astonishment, he found a two-year-old hind lying, stiff and stark, dead against the door." This was in Ross-shire.

I have several other reports of Red Deer having succumbed to the severity of the storm in Harris, Sutherland, and other localities, but the mortality arising directly from this as regards Red Deer has not been great. With Roe Deer it is different. Many Roe died even in comparatively well-sheltered situations, as at Loch Inver, in Sutherland; and the Fallow Deer at Rosehall suffered considerably.

The Deer in the various forests were reduced to skin and bone by the end of May or earlier, and it was with difficulty they were driven away from the farm-yards. In Mar, Invercauld, Balmoral, and other forests they were fed regularly [*Journal of Forestry*,

* Our first Report has been published since the above was written, and arrangements for further extension of our observations have been made, and additional stations secured, against our second report in 1880. [See "Report on the Migration of Birds in the Autumn of 1879," by John Cordeaux and John A. Harvie-Brown—*Zoologist*, 1880, May, pp. 161-204.]

A second "Report on Scottish Ornithology," also, forming a continuation of the present paper—for 1879-80—was read to this Society on 30th March, 1880.

June, 1879, p. 146]. In Islay and the islands generally, however, both Roe and Red Deer stood the winter well, the climate of Islay having been reported as being milder than any other part of Britain, except the Channel Islands, during last winter. No decrease amongst birds has been noticed in Islay, except amongst the Thrushes (*Turdus musicus*), which disappeared.

In the S.W. of Scotland Roe Deer received "a considerable accession" to their numbers, according to Mr. Service, and "committed much damage to the young plantations." This is no doubt due to a local migration caused by a scarcity of food.

Of a good many hundreds of sets of Deers' horns obtained at Blair Athole, there was only one royal, and that a poor one. Great deterioration is noted in Red Deers' horns generally.

RABBITS.

Rabbits seem to have escaped uncommonly well in most places. Here, in Stirlingshire, however, they suffered very much, some I shot as early as the close of December being mere bags of bones; and after the final thaw I found a good many lying dead, their bones picked by the rooks. A Ross-shire correspondent, before mentioned, found them survive the winter uncommonly well, even at a considerable altitude above the sea, but many reports reached me of their having suffered in other districts. On Loch Awe side they remained in very fair condition during all the storm. In Ross-shire, though they survived for the most part, many were seen in almost the last stage of weakness. "Sometimes," writes Mr. M'Lennan, "when one came suddenly upon them, in trying to get away, they would stumble and fall from sheer weakness, and then, finding they could not run and regain their holes, they would sit in the snow and squeal in a most piteous manner." In Islay Rabbits stood the winter well [Mr. Chisholm]. Dr. Buchanan White records that Rabbits were put to such straits for food that they barked even some of the larger trees in January [*Scot. Nat.*, July, p. 132]. In the S.W. of Scotland Mr. Service estimates that "fully one-half of the Rabbits perished on some estates. On Mabie their skeletons could have been picked up actually in hundreds."—[*Dumf. and Gall. Sat. Standard*, Nov. 8th, 1879.]

SQUIRREL.

Various accounts reach me of the scarcity of this animal in

many localities. Mr. Jas. Graham, gardener, near Moffat, when reporting in my behalf to Mr. Robert Service, regarding the dates of first appearance of the Squirrel in Dumfriesshire, adds :—"They have never been abundant here, and I have only seen one this summer. I think the past winter has had a severe effect upon them."

A perceptible increase in the numbers of Squirrels upon Castlemilk estate, Dumfriesshire, took place every year after their first appearance there, until 1878, when their numbers might be about four times that of 1854 [when they were comparatively scarce]. Mr. Johnstone, forester at Castlemilk, reporting to Mr. Service, adds—"Their numbers this year—1879—are much less, which I attribute to the long and severe winter." Similar reports reach me from other parts of Scotland, and a general decrease is noted by many observers—amongst whom I may mention Mr. Duncan Dewar, at Remony, Loch Tay. Mr. Service says :—"Squirrels were all but totally exterminated, and since last December he had only seen one." [*Op. cit.*, Nov. 8th, 1879, p. 4.]

Later in 1879, however, it is reported to me that, around Perth, and in the woods of the lower Tay valley, Squirrels were never more abundant than they were in December. This distinctly indicates extensive migrations, and I have similar reports from the Vale of Menteith and elsewhere—viz., fluctuations in the population of Squirrels, evidently caused by local, or it may be even more extensive, migrations. It is perhaps needless to point out the almost self-evident fact, that unless suitable avenues of escape, and sufficiently continuous shelter is afforded for such migrations, the species must decrease in numbers.

Now, all this is interesting in the particular case of the Squirrel, as tending to strengthen the opinion of several of my correspondents, that the extinction or almost total extinction of the species in Scotland was in some measure hastened by "a succession of severe winters." The following passage—extracted from the MS. of an essay "On the Squirrel in Scotland," at which I am at present working—is appropriate in this connection :—

"After passing through a winter of unusual severity—1878-79—our thoughts are, not unnaturally, turned to consider some of the severe winters which have occurred before. It is not long since a writer in one of our Scotch papers gave a resumé of these, and it is not without significance that two of the most terrible

occurred just about the times between which it may be supposed the Squirrel became scarcer, or extinct. One was in 1740, and it continued for five months, and "destroyed vegetation of all kinds over the country." The next occurred in January, 1795, when "thousands of sheep were lost and a number of shepherds perished." In 1788-9, 1794-5, 1796-7, the mean temperature was equally low with that of 1878-79. It is this succession of hard winters which one of my correspondents specially alludes to, "as having had effect in hastening the decrease of the Squirrel in some localities, and its extinction in others."

It must be remembered that in those days the area of woods of refuge for the species was much more circumscribed than it is now, and consequently extermination would be more rapidly accomplished.

FISH.

It is reported to me by Mr. F. S. Mitchell, who visited Islay in May, 1879, and took notes for me upon the effects of the winter, that Fish, during the frost, left Lochindall, in Islay, for the deep sea, and I have general and similar reports from various places on the west coast.

BIRDS.

OSPREY.

PANDION HALIAETUS (*Lin.*).

Whilst fishing in Loch Awe on the 30th April, 1879, my friend, Mr. W. Horn, and I saw an Osprey, which came close overhead, and we had a fine view of it. It was being chased by Crows and Gulls. It came over our heads four times, hovered, with heavy flapping, and feet hanging down, over "The Minister's Bay," near Taycreggan, but did not dash down to fish. About 6.30 p.m. we again saw it opposite to Loch Main, Bhalloch, and about the same hour it (or another) was reported to have been seen about the islands, 6 miles further down the loch, near Dahmally.

An Osprey was also seen at Kirkmichael, Dumfriesshire, in the end of September, 1878, as reported by Mr. Robt. Service [*Dumf. Courier*, 25th March, 1879].

ROUGH-LEGGED BUZZARD.

BUTEO LAGOPUS (*Gm.*).

Only one heard of in Berwickshire, where in ordinary seasons they appear not uncommonly on migration [J. Hardy, *in lit.*, 9, III., 79]. This is probably the specimen referred to in Mr. Geo. Muirhead's article, seen on various occasions on Lamberton Muir, during a fortnight of the December storm.

HONEY BUZZARD.

PERNIS APIVORUS (*Lin.*).

Two Honey Buzzards, which I exhibited to the Glasgow Natural History Society on 30th September, 1879, kindly forwarded by Mr. P. Henderson, of Dundee, were shot in Forfarshire in the same month. The female (sex ascertained by dissection by Mr. Henderson) was shot at Mill Hill, on Colonel Ogilvie's farm, on the estate of Lord Kinnaird, about eight miles westward from Dundee, on the 10th September. Its crop and gizzard were both filled with the larvae of wasps, and also a few pieces of the mature insect, but not the slightest trace of fleshy matter was to be seen anywhere during the dissection of this individual. The male (sex also ascertained by dissection) was procured near Balmuir, about four miles northward from Dundee, by Mr. F. B. Sharp, Fern Hall, Broughty Ferry, on the 13th September. Its crop and gizzard were nearly empty, and contained only a few semi-digested larvae of wasps and a small quantity of brownish pulpy matter, consisting of the half-digested flesh and hair of some small quadruped, probably that of a mouse, because, on close inspection, the hair was not long enough for that of a rabbit.

Mr. Henderson, who supplied the above carefully-noted and interesting particulars, adds:—"These are the only authentic instances of its occurrence in this neighbourhood for at least fourteen years. In June, 1866, I dissected one—a dark-coloured male—killed at Panmure, about eleven miles north-east from Dundee. Its crop was crammed full of pheasant chicks, along with considerable portions of shells of the eggs that had contained

them. The chicks were fully developed, and were nearly ready for hatching. I counted eighteen feet and a corresponding number of heads, which were those of young pheasants without a shadow of doubt, the egg-shells bearing out the other indications. This bird was perfectly gorged to the throat, and must have been scarcely able to fly. Two other Buzzards were seen since the occurrence of these last ones, both of which were to the westward of Dundee, and near the place where the first-mentioned bird was shot. Should any more occur, I shall not fail to give you full particulars. The light-coloured bird is the female, the dark the male."

In 1871 I was successful in obtaining two eggs of this species, taken in Scotland on the 3rd July. In reply to queries put to our correspondent by Captain Feilden, the person who found the nest gave us the following particulars:—

"The birds were noticed about a week before the nest was found. They had been coming regularly to the same locality for the last five or six years. The nest was built in a Scotch fir, in the fork of the tree, and was as large as a rook's, and was lined with wasps' nests. I saw the nest harried. I did not take the eggs myself, but I assisted in taking them. The old birds flew overhead when the nest was harried, but not before then. I believe they leave this locality about the middle of September. I do not think they will lay again this season."

Captain Feilden blew these eggs, and reported them to be quite fresh.

For other localities where the species has been obtained, or has been recorded as breeding, see Mr. Robert Gray's "Birds of the West of Scotland," p. 48.

In addition to those recorded by Mr. Gray and to the above, one—a young male—was recorded as shot at Kilberry, Argyllshire, in the end of September, 1875, by Mr. Campbell of Kilberry, and was placed on record by Mr. Gray and Mr. Lumsden at the third meeting of the Natural History Society of Glasgow of that year—[v. *Proceedings*, Vol. III., p. 31].

If these records and accounts be compared, there will, I think, be found some reason to believe that these Forfarshire birds—male and female—were probably birds having their breeding range in Scotland. As most of the localities where the species has been recorded as breeding in Scotland are to the northward of the

mass of the localities where they have been recorded as shot on migration, it seems more than likely that some of these obtained are British bred birds, or British breeding birds. I am particular in alluding to this here, as it is desirable to trace out the exact lines of migration of individual species, and every record of service in this direction may prove useful afterwards.

Another Honey Buzzard was seen for some days frequenting Penmanshiel Wood, near Oldcambus, Berwickshire, about the 18th September, as related to me by Mr. Hardy.

Obs. Negative. No Buzzards or Goshawks were seen this season—1878-79—in North Berwick, where they often appear in ordinary years, as I am informed by Mr. Jas. Hardy [*op. cit.* 5, II., 79]. Rare birds indeed are unusually scarce everywhere this winter, for reasons already given—the suddenness, severity, and early arrival of the winter.

MERLIN.

FALCO AESALON (*Tunstall*).

Accessions to their numbers were observed in the S.W. of Scotland during the winter by Mr. Service. The species, he writes, “became quite common.” [Report of paper, *loc. cit.*]

SNOWY OWL.

NYCTEA SCANDIACA (*Lin.*).

Lately several White Owls, supposed to have come from Norway, have been shot in Lewis [*Glasgow Weekly Mail*, 25th January, 1879]. It is still somewhat doubtful whence come the Snowy Owls which visit Lewis almost every year.*

* Mr. John Cordeaux and myself have lately taken up the subject of Migration of Birds upon our coasts, and by sanction of the Commissioners of Northern Lights and Elder Brethren of the Trinity House, have enlisted the services of the Lighthouse keepers to fill in circular schedules upon the autumn migrations at the various stations, which are to be returned to our hands by the 23rd of December. It is hoped and expected that a series of such observations, extending over a number of years, and, taken in conjunction with similar ones taken in Heligoland by Herr Gaetke, and at other localities, may in time result in a somewhat more perfect knowledge of the migrations of various species of Birds, and also be found of use from a meteorological point of view. I will be glad to correspond with any of our members regarding this subject, or to receive hints and notes at any time.

TAWNY OWL.

STRIX STRIDULA, *Lin.*

Mr. Robert Gray records an increase of this species in the Eastern Counties of Scotland during the winter months, and arrives at the conclusion "that the accession to its numbers is due to the arrival of migratory flocks from northern latitudes." Mr. Gray adds, "I have examined upwards of twenty specimens all in the clear grey plumage which I believe distinguishes these migrants." [*Proc. Berw. Nat. Club*, 1878-79, p. 498.]

Obs.—Owls and hawks generally were observed by Mr. Service to be much emaciated. He found a skeleton of a Kestrel on Marthrown. This has significance with regard to the general scarcity of small birds, also, of course.

MARTIN.

CHELIDON URBEICA (*Lin.*).

Mr. Hardy saw a pair on the 4th May playing round a cave at Siccar Point. None seen at Dunipace up to 9th May.

SAND MARTIN.

COTYLE RIPARIA (*Lin.*)

One is recorded on the 31st April at Perth, on which morning the ground was white with snow. [*Scot. Nat.*, July 1879, p. 132.]

SWALLOW.

HIRUNDO RUSTICA, *Lin.*

Appeared at Callander on 19th April, 1879; Dunipace, 20th and 22nd. At Taycreggan, Loch Awe—first seen, and *only one*—2nd May. Swallows did not remain continuously at their summer haunts up to middle of May, except in sheltered localities. In Berwickshire a swallow was seen on the 1st May. Two played about along with seven Sand Martins on the sea-banks. Not so abundant as usual [J. Hardy]. One was seen near Perth on 31st April, on which morning the ground was white with snow. [*Scot. Nat.*, July 1879, p. 132.]

SWIFT.

CYPSELUS APUS (*Lin.*).

The first seen at Dunipace was on the 16th May.

The first seen at Dumfries was on the 11th May, and again on

the 14th. They seem to have arrived very generally over the country about this time. They were later also of departing in the autumn; those later of departing being probably birds deterred from going far north by the cold spring and summer, and crowded down upon our latitudes. Swifts were last seen in Berwickshire by Mr. Hardy on the 12th September.*

KINGFISHER.

ALCEDO ISPIDA, *Lin.*

Very unusual numbers are reported in autumn, 1878, through the central southern counties of Scotland, and the bird-stuffers were receiving them in great numbers. Later in the autumn this large migratory flight arrived in the counties of Dumfries and Kirkcudbright, as recorded by Mr. Robert Service [*Dumfries Courier*, 25th March, 1879], on the banks of the Nith, Urr, and Dee. They left for the south about the middle of December. The first I again observed at their breeding haunts was on the 4th April at Dunipace. I cannot remember that they ever so completely deserted the central counties of Scotland before, though in most seasons a partial migration takes place, all blanks being usually filled by an immigration of birds from further north. On our coast line they frequent open tidal ditches, and a local migration takes place from inland to the coast. This winter, however, they were quite absent from both resorts. Recorded also from Midlothian as a rarity [*Zool.*, May, 1879, p. 220]. Professor Duns, in his paper above referred to, gives a list of nine preserved by one bird-stuffer in Edinburgh alone, between December 7th, 1878, and January 11th, 1879. "Some of the birds," he tells us, "were in extremely low condition." Mr. Robert Gray records that "about twenty were obtained in the neighbourhood of Edinburgh in the course of six weeks during the present winter" [*Proc. Berw. Nat. Club*, 1878-79, p. 499].

HOOPOE.

UPUPA' EPOPS, *Lin.*

A male Hoopoe was shot by the under-keeper to Mr. Baird of Elie, at Elie House, Fifeshire, on the 8th May, as recorded by Mr. J. J. Dalgleish in *Zoologist* for June, 1879, p. 268.

* The late stay of Swifts in various parts of England has been freely commented upon in our periodicals. [Vide *Zoologist*, October, 1879, p. 423.]

CREEPER.

CERTHIA FAMILIARIS, *Lin.*

The Creeper was quite driven off by the severity of the winter, and all April their absence from woods in which they were usually abundant was quite remarkable. They did not begin to reappear here until the beginning of May. I saw the first here on the 4th of May, and Mr. Hardy records having seen one at Oldcambus on the 11th. I have little doubt that these and other species returned to Loch Awe and western localities sooner than they did here.

WREN.

TROGLODYTES PARVULUS, *Koch.*

Disappeared from most inland localities and took to the coast line, in common with many other species. Thus, they appeared commonly along the Berwickshire coast, and elsewhere, feeding amongst the tangle on the shore, but finally left even this locality after the storm had continued a week or so [J. Hardy, *in lit.*]. Wrens only beginning to reappear on Heligoland—where there was dreadful weather then—in the end of April—and so with Redstarts. Little else seen returning [J. Cordeaux, *in lit.*]. Wrens reported very scarce from various localities. In the outer Hebrides the Wren was not migratory. It remained in North Uist all last winter. But multitudes of Birds, amongst which were many Wrens, were seen by Mr. Boyd flying across Loch Assapol, near Bunessan, having come, apparently, from the outlying Hebrides, *via* Tyree, Iona, up the Ross of Mull, and were steering for the mainland. I am under the impression that the Wrens which were seen by Mr. Boyd probably had their original starting point from Faroe, Iceland, and north-east, and possibly also from the more northern districts of Scotland, Orkney, and Shetland, while some may have started from Harris and Lewis, where the snow and frost were much more severe than in North Uist, and from which islands I have no positive statement as to their remaining all winter. Judging, however, from local reports on other species, and the nature of the winter generally in Harris, I would imagine that it was quite probable that Wrens left Harris in the depth of the winter of 1878-79.

Wrens remained scarce at many localities. Mr. Hardy, writing in September to me, says :—"I have not seen a Tit or a Wren for a

very long time." Wrens did not reappear in Berwickshire till 10th November, 1879, when three were seen in as many localities.

A similar report reaches me from the Lightkeeper at The Little Ross Lighthouse on the Solway Firth. Complaining of unusual scarcity of birds, he writes—"I attribute the scarcity of birds this season to the severity of last winter, which I know has occasioned them to die in thousands. The Redbreast and Wren used to be very common here in winter, but I saw none of them this year, except one Redbreast, which was on the 20th September." The scarcity of birds on migration in 1879 is, however, partly due also to a prevalence of N.W. winds driving the body of the migrants further south, as is proved, I think, by the unusually large body of autumn migrants upon the English east coast. [*Vide* Cordeaux, "Our Notes from North Lincolnshire in autumn of 1879," *Zool.*, Jan., 1880.]

WILLOW WARBLER.

PHYLLOSCOPUS TROCHILUS (Lin.)

Willow Warblers were present on Loch Awe side, around Taycreggan, by the 28th April. I had not observed any previously either in Stirlingshire or at Callander. On the 28th they appeared in Berwickshire, and continued. On the same day I found them on Loch Awe side, and in a few days after they were abundant in all sheltered places, but especially in larch plantations. I found them in the garden of Newton House, North Uist, in June, and was informed that they appeared there for the first time three years before [say 1876].

The result of my observations during the summer of 1879, so far as I have been able to judge, tells me that various summer migrants to our shores are more than usually abundant this summer, though they were late of arrival as a rule. The deterrent influence of the late cold spring made them late of arrival, and to some extent no doubt shortened their journey. We find proof of this also in the large numbers of Song Thrushes breeding in the south of England and the corresponding scarcity in Scotland, or indeed almost total absence in some districts. Mr. Hardy, writing to me in September, 1879, says—"The most numerous summer birds were the Willow Wren and the Whitethroat." In one place in Berwickshire he reports them in May as "sometimes as numerous as bees, but little song amongst them."

WOOD WARBLER.

PHYLLOSCOPUS SIBILATRIX (*Bechst.*).

Arrived at Oldcambus, Berwickshire, on May 12th, and again on May 23rd, which, there, was a great day of migration of various species.

WHITETHROAT.

SYLVIA RUFA (*Boddaert*).

Has been abundant this summer, as reported by several correspondents, and observed by myself in autumn before they migrated.

GOLDEN-CRESTED WREN.

REGULUS CRISTATUS, *Koch*.

The glens of Mull were simply swarming with this species, and several species of Tits, during migration in October, but very few were seen after December [*J. H. ex ore*]. Up to 9th May only one Gold-crest had been seen by Mr. Hardy, and that in furze. Woods around Dunipace, where they used to be seen plentifully, appear almost quite denuded of them. Up the river Almond, in Perthshire, where there used to be hundreds, this year there is not a single one to be seen, as I am informed by Mr. Maloch. It would be interesting to know if these birds have crowded down to, and proved very abundant in, lower latitudes this season, as in the case of the Thrushes. A general scarcity is recorded in migration of autumn of 1879.

ROBIN.

ERITHACUS RUBECULA (*Lin.*).

Remained about houses, but a diminution of their numbers observed in April, 1879. Robins sought shelter in rabbit-holes at Taycreggan, Argyllshire, and many were caught and killed by the rabbit-catcher's ferrets, as were also some Larks and Chaffinches [*q.v.*]. Robins died, it is believed, as much from cold as hunger, as pointed out by Mr. Robert Service in the *Dumfries Courier* [25th March, 1879]. After the severe frost of 13th-14th December a gardener found three lying close to the fire, two dead and one dying [*loc. cit.*]. Robins remained unusually scarce all summer, but in certain sheltered and favourite haunts I recognized, both in May and in September, the *genius loci*, in the shape of the "old resident," the Robin. Thus in the Vale of

Menteith, in this county, and in Perth, the Robins seemed not to have suffered so much as in some more exposed localities.

BLACK CAP.

SYLVIA ATRICAPILLA (*Lin.*).

Is reported as almost absent in 1879 from Ireland. Rev. Chas. W. Benson received no notice of its occurrence. It is rare and local, however, in Ireland, as also are the Tree Pipit, Wood and Garden Warbler.

WHEATEAR.

SAXICOLA OENANTHE (*Lin.*).

The first I saw in Stirlingshire was on the 4th April. The first observed at Leny, Callander, was on the 23rd April. It is curious that they do not appear to breed upon the Braes of Doune, though apparently suitable. Possibly the geological formation may supply a cause for their absence here. They are abundant in the central range of hills of Stirlingshire. I observed Wheatears to be unusually abundant this summer in Sutherland. Though late of arrival and late of breeding [or shall we not rather say *because* late of arriving and breeding?], the Wheatear seemed more than usually abundant. On the Stirlingshire coast, in the first week of September, 1879, Wheatears—young principally—were more abundant than I ever remember seeing them before. On the Berwickshire coast they were first observed by Mr. Hardy on the 30th August, and not again after the 1st September.

WHINCHAT.

PRATINCOLA RUBETRA (*Lin.*).

May 4.—Whinchat first seen at Oldcambus, Berwickshire [J. H.]. Seen again on the 12th.

MARSH TIT.

PARUS PALUSTRIS, *Lin.*

Swarmed in the Glens of Mull in October. I am strongly of opinion that these early migrants are of Scandinavian origin, and that very possibly, had some of these Marsh Tits been preserved, they would have turned out to belong to the northern form *P. borealis*, if not of still more eastern origin.

COLE TIT.

PARUS ATER, *Lin.*

In a squirrel's dray at Remony, Loch Tay side, Mr. D. Dewar found two Cole Tits, dead and quite dried up with the frost. They had crept into the squirrel's nest for shelter during the hard winter [*ex ore*, 14th Oct., 1879].

BLUE TIT.

PARUS CAERULEUS, *Lin.*

Decidedly scarcer in spring of 1879. Reported so from Berwickshire, Aberdeenshire, Argyllshire, and elsewhere, and the same observed in Stirlingshire. Of four fed by Mr. Hardy only one appeared after the thaw. It seems more than probable that many Birds died of a *surfeit* after the thaw came. [See also WATERHEN, page 176.] Tits remained scarce all summer, except in very sheltered and favoured localities, and so scarce that a few noted as late as October 30th, 1879, are mentioned in Mr. Hardy's notes.

LONG-TAILED TIT.

ACREDULA ROSEA (*Blyth*).

Swarmed in October in the Glens of Mull [J. H., *ex ore*]. Reports of deaths reached me later in the season from several localities. Mr. Robt. Service notes it near Dumfries [*Dumf. Courier*, 25th March, 1879], where the death in one instance is recorded, as the little bird was found dead, head and shoulders buried in the snow, having died apparently without making a single struggle, and probably dropped head first dead from its perch. I found birds in former winters similarly situated, and also Redpoles frozen to their perches, dead.

PIED WAGTAIL.

MOTACILLA LUGUBRIS, *Temm.*

Appeared at Cockburnspath, Berwickshire, on the 18th March, and here—Dunipace—on the 22nd. During a week spent at Loch Awe, between April 28th and May 3rd, only two were seen, and these on the 2nd of May. [This is noted in connection with the scarcity of some species this summer—1879.] It must not be understood, however, that, because some species were scarce, all small birds were similarly affected by the winter and late spring

as regards numbers. Thus, while we had this summer an unusually large breeding population of some summer migrants which have a far northern summer distribution, these having been driven further south by the winter, and delayed in returning, and having been therefore unusually crowded upon our latitudes, we had also a great decrease in the numbers of others, such as the Common Thrush, which, however, made an unusual call upon the insect population of the south of England, as elsewhere referred to.

MEADOW PIPIT.

ANTHUS PRATENSIS (Lin.).

In April their scarcity upon the moors and hills of Stirlingshire and S. Perthshire, and I have no doubt elsewhere, was quite remarkable. They appeared to me to be scarce at most localities throughout the summer. In autumn, however, they appeared to be even more numerous than in ordinary seasons.

ROCK PIPIT.

ANTHUS OBSCURUS (Lath.).

The Rock Pipit is reported as scarcer than usual during the summer of 1879 upon the Berwickshire coast [J. Hardy].

TREE PIPIT.

ANTHUS TRIVIALIS (Lin.).

First appeared at Oldcambus 14th May. First appeared at Dunipace 16th May, when I saw one pair. Found Tree Pipits building their nest on 25th May.

Among eggs collected at Remony, Loch Tay side, Perthshire, by Mr. D. Dewar, I recognized several of the Tree Pipits. The exact distribution of this species in Scotland is not fully worked out; therefore my mention of locality.

The Rev. Chas. W. Benson of Dublin records that he has no account this year of the Tree Pipit in Ireland.

MISSEL THRUSH.

TURDUS VISCIVORUS, Lin.

One was seen as late as the last week of January by Mr. Hardy in Berwickshire [*in lit.*, 5th February, 1879], but they are decidedly scarcer throughout the country, as I

can gather from my own observations here, as well as those of correspondents in Berwickshire and various other localities. I saw a pair on the west side of Loch Awe in the end of April. They remained scarcer than usual throughout the summer. In autumn [September] I saw large flocks, however, in the Vale of Menteith, a warm and well-sheltered strath. Usually shy, they came along with Common Thrushes and other species to feed at a window-sill in Paxton House [*auct.* Mr. Geo. Muirhead]. Gradually increased in numbers in many localities up to the late severe winter, which caused their migration and consequent local decrease. A few died.

FIELDFARE.

Turdus pilaris, *Lin.*

Fieldfares early suffered from the storm, but not to the same extent as Redwings. Still, large numbers were found dead, and the coast line, brook sides near the sea, open commons, and some of the Western Islands, were strewed with their wings and other remains. I have reports from a large number of localities both on the east and west coasts. Inland localities were very soon deserted by them; in Stirlingshire few died, except in the town of Stirling, where boys were also catching them and Redwings with their caps [D. Bruce, *ex ore*]. Fieldfares and Redwings reappeared near Kelso on the 10th March [A. Brotherston]. Mr. Service records their unusually early and large arrival in the autumn of 1878. In 1879 their arrival was overdue quite six weeks in the S.W. of Scotland on the 8th November [*loc. cit.*], and fewer than usual were seen in the spring of 1879.

THRUSH.

Turdus musicus, *Lin.*

These migrated southward at an early date. They had entirely left Sutherland [Tongue district] long before Christmas. A few were overtaken by the storm, and died, but the bulk appear to have escaped to the south. Thus, a few were found dead at wall-sides in Berwickshire by Mr. Hardy. During some mild days at the beginning of March a few Thrushes were heard to sing, as at Dunipace and Callander [J. H. Buchanan, on 3rd March]; but their song soon ceased. All April was remarkable for the absence

of song in the woods. At Dunipace I only heard three individuals sing, where we usually have a couple of dozen.

Still reported scarce—remarkably so—up to the end of April, as in Glen Almond, Perthshire, where usually there are hundreds in spring. Mr. Maloch, of Perth, only saw and heard two in two days. Penmanshiel Wood and Dunglass Wood, in Berwickshire, Mr. Hardy writes me, “are very lone and unpeopled:” during a walk of two miles in the former he only heard one Thrush, and on the 5th May saw only one in Dunglass. Up to 22nd May the same scarcity was noticed by me at Dunipace. None were heard at another locality mentioned by Mr. Hardy, and only one was found by him along the banks of the river Eye.

Unusual numbers are reported to have bred, however, in the south of England, probably a large proportion of them being our Scottish birds.

In Islay, Thrushes appear to have been the only birds affected by the severity of the winter and spring. They disappeared altogether [Mr. Chisholm, *vide* F. S. Mitchell].

No improvement in their numbers appears to have taken place during the summer, so we may safely conclude that the greater number remained further south to breed. Their almost total absence from our turnip fields in September is also strong evidence of their scarcity here and further north.

Thrushes were destroyed by Rooks during the winter [T. H. Gibb, *loc. cit.*].

REDWING.

Turdus iliacus, *Lin.*

Mr. J. H. Gurney, junr., reports to me that Redwings and Fieldfares were more abundant in Norfolk than he ever saw before. “But,” he continues, “I soon began to pick up dead and dying, and very few of those that remained survived.” This refers to the early part of December. A boatman with whom I am acquainted, on the Firth of Forth, living near Aberdour, told me he picked up thirty dead Redwings and a few Fieldfares in about ten minutes, lying around his house. In Berwickshire, and indeed very generally, their unusually large numbers in autumn, at the beginning of the storm, were noted, as also the great death amongst them later. Mr. Hardy writes (5th February, 1879):—“The wings and tails are still scattered about in the open, and in sheltered places where

they had resorted for food." Similar accounts reached me from N. Aberdeenshire [Pitsligo], and various other localities. Above fifty were caught in one garden in Stirling by boys. The same is reported by Mr. George Sim from Aberdeenshire; by Mr. Robert Service, Dumfries; Mr. Brotherston, Kelso; and almost universally. The deaths must have been enormously large. Mr. Maloch found a great many Fieldfares and Redwings dead. "There is a small island with a tower built upon it in the middle of the Tay at Broughty Ferry. Inside the tower the ground was almost covered with dead Fieldfares and Redwings, they having gone in for shelter and died." A supposed instance of the nesting of the Redwing this summer in England is given in the *Zoologist* for November.

BLACKBIRD.

TURDUS MERULA, *Lin.*

Even Blackbirds are reported to have left many localities entirely, or to have greatly decreased in numbers. One pied Blackbird, Mr. Gurney writes me, "which had migrated before, however, preferred this time to remain and brave it out; and at last he came to the window to be fed, and at length allowed himself to be fed regularly" [J. H. G., *in lit.*, 30th January, 1879]. At Dunipace we had five Blackbirds which we fed regularly at the door all through the winter, but the silence of the cold spring of 1879—few bird-voices being heard—indicated a decrease in numbers. A few dead Blackbirds are reported from several localities, but they do not seem to have suffered to the same extent as Redwings and Fieldfares. A few were found dead by the sides of walls at Oldcambus. One Blackbird here lost its tail, which became frozen to the snow while it was being fed. Five of the feathers I picked up, bound together by a lump of frozen snow. The bird was afterwards seen flying about. Blackbirds remained scarcer than usual throughout the summer, except at localities on the west coast.

WHITE'S THRUSH.

TURDUS VARIUS, *Pallas.*

"One was shot at Hardacres, near Kelso [in last week of December, 1878]. Unhappily, the young farmer who shot the bird did not know its value, but partially skinned and ate the treasure, the wings and head and throat only being preserved to

decorate the head-dress of his sister. Mr Brotherston of Kelso at once perceived its rarity and value, and was permitted to preserve the mutilated remains for the Kelso Museum. They are quite enough to prove the identity of the bird, and, preserved as Mr. Brotherston has done, with extended wings, head, and throat, may so be disposed in a case that the parts wanting may not be much missed." [Dr. F. Douglas, Kelso, *in lit.*, 29th January, 1879. See also, for detailed account of this bird, *Proc. Berw. Nat. Club.*, Vol. VIII., p. 518.]

Mr. A. Brotherston also informs us that another of the same species was seen on January 19th, 1879, by Mr. A. Steel, close to Kelso Bridge. "Both birds were solitary." [*Loc. cit.*]

DIPPER.

CINCLUS AQUATICUS, *Bech.*

"More than two-thirds must have perished or migrated from the S.W. of Scotland before the winter ran its course" [R. Service, *loc. cit.*], and a diminution of their numbers was evident in the spring in Stirlingshire.

WAXWING.

AMPELIS GARRULUS, *Lin.*

On 29th December [Sunday] my friend, Mr. J. H. Buchanan, saw a Waxwing in the pig-stye at Leny, Callander. In the middle of February, 1879, five Waxwings were seen in Banff [Thos. Edward, *Zool.*, May, 1879, p. 217]. They fed upon Rowan-berries. Another was killed on 3rd November, 1878, at Broxburn, and sent to Mr. Robt. Small, bird-stuffer, Edinburgh, for preservation.

ROOK.

CORVUS FRUGILEGUS, *Lin.*

Some of the effects of the winter upon this species have been rather curious. In January Rooks migrated daily from Tongue to Durness to find their food at Far Out Head, a point of land that runs out seaward, and is clear of snow [J. C. *in lit.*, 13th January, 1879.] Mr. J. Crawford at Tongue, almost simultaneously with myself in Stirlingshire, made the note that at the least indication of a thaw Rooks stay at home. Much "cawing" and repairing of old nests took place at Dunipace the morning I received Mr. Crawford's

next letter [30th Jan., 1879], whereas previously they had invariably left for the coast at Dunmore, and for the neighbourhood of towns. Curiously, at this date two variegated plane trees were throwing out shoots. Rooks, though in flocks as usual, have begun to renovate their old nests. But their labours were very short-lived. The male and female are assiduous in protecting each other from their neighbours, though they do not hesitate to steal from one another, as no doubt all who have lived close to a rookery have observed [*Journal*, 31st Jan., 1879]. On the Farm of Mains of Biffle a Rook found underneath the snow is supposed to have been thus buried for six weeks, as related in the *Aberdeen Free Press* as follows:—

“On Saturday last, while the servants upon the farm of Mains of Biffle were lifting—or rather digging—turnips out of the snow, they came upon a small black hole in the otherwise uniformly snow-covered field. On inspection the hole was found to serve as the ventilator of an apartment in which a Crow was imprisoned. It would seem that this bird, probably about the commencement of the storm, had taken refuge from the snowdrift between two drills of turnips and had been covered. By his ineffectual struggles to free himself, he had formed sufficient space to allow of his moving about, but when the blowing had ceased he must have been more than a foot below the surface of the snow. About the middle of last week, the snow had so far melted that the crust above the feathered prisoner was only a few inches thick, and doubtless the natural heat remaining in poor ‘Dick’ had completed the hole which was observed by the men. When taken out the Crow seemed more dead than alive, being reduced almost to a skeleton for want of food. A few hours of heat and comfort, however, brought him round. Later in the day he was able to pick at a turnip, and on the day following his release he found his way to a neighbouring wood. This poor bird must have been at least six weeks entombed in the snow.”

Rooks fed freely upon the wagon grease made from palm-oil refuse, and frequented collieries, railway stations, &c., as pointed out by Mr. J. S. Dickson at a former meeting of this Society. Mr. Dickson wrote to me:—“I have observed them force open the grease-box lids of the wagons, when they were so stiff that I had difficulty in doing so with my fingers. If they get the least crack where they can insert their beaks, by repeated wedging they soon

open them. They are often, when so employed, surrounded by an admiring flock of Starlings, Chaffinches, Yellow-Hammers, Sparrows, &c., which pick up the particles scattered by the Rooks."

At Dunipace, in March, Rooks, which were sadly dejected by the late falls of snow, and were desultory and often interrupted in their building operations, had many consultations as to what was best to be done. By the 17th of March, however, they seemed to settle down to more steady work. I have reason to believe that some had already laid eggs before the severe snow-storm of March, which filled their nests with snow. One morning—that of the snow-storm (16th March)—the Rooks rose in a body to set out for Dunmore, where they usually go in severe winter weather. Two or three pairs separated and returned and settled on their nests, but ultimately were driven off by the continued gale and snow, and were obliged to follow their companions.

Rooks were put to various straits for food. I found a dead hedgehog clean picked by Rooks, and the carcasses of rabbits and hares were fed upon by them, as I found their foot-prints on more than one occasion round the skins and bones. Rooks were seen to attack and kill a Curlew (or some large wader) as it sat on a rock on the sea-shore at Corran Ferry, in Argyllshire, and afterwards devour it [J. J. D., *ex ore*, as told to him]. And they are reported to have sought out and fed upon the carcasses of other fellow-sufferers [R. Service, "*Dumfries Courier*," 25th March, 1879]. Though emaciated, I cannot, however, think that any appreciable number succumbed. There is a considerable increase in our Rookery at Dunipace this year, being 400 nests against about 350 last year. Rooks in Ireland became quite carnivorous, feeding on dead and dying small birds [Robert Warren, *in lit.*], and observers in other places record the same.

STARLING.

STURNUS VULGARIS, Lin.

Deserted the north of Scotland at an early date, but present all winter in central counties of Scotland, living in company with Rooks, and frequenting the railway stations, and feeding upon the grease in the boxes and on the wheels. I saw several picking up scraps of this kind at Larbert Station on the 21st February, and similar accounts reached me from Glasgow and other localities [*vide* Rook, *ut supra*]. They often disputed possession of the choice

morsels with Jackdaws, and even Rooks. Starlings completely disappeared from the neighbourhood of Dumfries in the end of November, 1878, and did not reappear till the beginning of March. It is not uninteresting to compare the reports from different localities in this way, as it indicates different conditions and degrees of severity of the winter at these different localities. By 15th May not one Starling in twelve had returned to their breeding haunts in Dumfriesshire, and a decided diminution in numbers was observable everywhere in Scotland during April and the first week or ten days of May. Flocks of thirty or forty, however, appeared a few days later, but did not disperse. Last year young were hatched out by this time, but this year the few early arrivals are only laying. Local migration of Starlings is noticed by Mr. Geo. Muirhead [*op. cit.*], also of their assembling in evergreens at Mordington House, Berwick, last autumn.

CHAFFINCH.

FRINGILLA COELEBS, *Lin.*

Unusually abundant in autumn of 1878. A large proportion remained along with other hard-billed species, and did not suffer, as the farm-yards proved their salvation. The same opinion is held by my correspondents in the more northerly parts of Scotland, and here there appears to be little diminution, if any, in their numbers. Chaffinches, besides other small birds, were glad sometimes to seek shelter and warmth in rabbit burrows, as was related to me by a rabbit-catcher and boatman at Taycreggan, Loch Awe. The steep bank facing the south was the same place where Woodcocks congregated [*see* WOODCOCK, p. 174]. Mr. Geo. Muirhead, however, records their disappearance, in December, 1878, from his neighbourhood, but immense numbers flocked into Alnwick [J. H. Gibb, *loc. cit.*].

COMMON SPARROW.

PASSER DOMESTICUS (*Lin.*).

Decidedly scarcer at Dunipace. Indeed in some localities, where formerly scores were seen in May, hardly one is to be found. They are said also to be scarcer in Berwickshire. In the carse-lands of Stirlingshire, however, no diminution in numbers was noticeable at the end of summer, and by the autumn they appeared in scarcely

diminished numbers at their old haunts further inland, indicating therefore only a local migration.

HAWFINCH.

COCCOTHAUSTES VULGARIS, Pallas.

Six Hawfinches were caught at Costerton, East Lothian, one day in the end of January, as I am informed by my friend, Mr. W. Horn [*in lit.*, 2nd February, 1879].

GREENFINCH.

LIGURINUS CHLORIS (Lin.).

Greenfinches did not suffer. Very abundant in autumn [or more observed owing to their crowding around the farm-houses, where they obtained abundance of food?] Specially noticed as abundant from many localities.

TWITE.

LINOTA FLAVIROSTRIS (Lin.).

The Twites in the Long Island did not migrate, but assembled in flocks as usual around the farm-houses.

LINNET.

LINOTA CANABINA (Lin.).

In ordinary seasons Linnets, which breed in great numbers amongst whins at Oldcambus, Berwickshire, remain in the neighbourhood all winter. This season they left in a body before the storm commenced. The same was observed here—Stirlingshire—and similar reports reached me from various localities.

A single Grey Linnet returned to Cockburnspath on 28th March [J. H., *in lit.*, 4th April, 1879], but by the 9th only three were visible, the only return from a large flock bred there. Continued rarer than usual in Berwickshire all summer.

REDPOLE.

LINOTA RUFESCENS (Vieillot).

Mr. Service records the Redpole as abundant in the spring and summer of 1879 in Dumfries, and remarks the unusually warm lining of the nests, these being *plentifully lined with feathers*. In northern countries—Norway and N. Russia—Redpoles' nests are

very commonly, if not invariably, lined with feathers. Were these additions to the Redpole population of Dumfries birds crowded down from more northern countries, bringing their nest-building instincts with them; or were they simply native birds adapting their nest-building to suit the unusually cold season? Such inquiries appear to me worthy of consideration, as they may have considerable bearing upon dispersal of species, change of habits, &c.

YELLOW HAMMER.

EMBERIZA CITRINELLA, Lin.

Remained all winter in central districts of Scotland, but in diminished numbers, many having gone further south. They fared pretty well in the farm-yards.

REED BUNTING.

EMBERIZA SCHOENICLUS, Lin.

First seen on April 6th at Dunipace. They, as usual, entirely left inland localities early in the winter.

SNOW BUNTING.

PLECTROPHANES NIVALIS (Lin.).

Seen in November in Stirlingshire, also on December 3rd in Lanarkshire, also in November near Dumfries [R. Service], but appears generally to have fled further south during the winter.

LARK.

ALAUDA ARVENSIS, Lin.

Disappeared, except where fed. In Stirlingshire, at one or two localities where this was done, they became pretty tame. They were also commoner in the vicinity of large public works and towns—as at Bonnybridge Foundry, Stirlingshire—than elsewhere, finding, no doubt, some slight difference in temperature. They disappeared from the neighbourhood of Oldcambus and reappeared in the beginning of March [J. H., *in lit.*, 9th March, 1879]. Larks sought shelter in rabbit burrows at Taycreggan [see CHAFFINCH, p. 162]. Their scarcity in April, both on lowlands and moors, in Stirlingshire and S. Perthshire was quite remarkable. At the lonely house of the forester of Fannich Forest [Ross-shire], a Lark and a Blackbird—the only small birds seen for several weeks—

fed amicably together [John Maclellan, *Inverness Courier*, 24th April, 1879]. This instances how completely some districts were denuded of bird-life.

Large flocks were seen on Lamberton Farm, in Berwickshire, in January, 1879, near the sea-side, as recorded by Mr. Geo. Muirhead. There the land was nearly clear of snow.

An increase in their numbers during the breeding season of 1879 was observed in S.W. Scotland, where of late years they have been on the decrease [R. Service, *loc. cit.*]

WOODPECKER.

PICUS MAJOR, *Lin.*

A Great Spotted Woodpecker (an adult female) was shot near Callander on the 24th April, 1879. [A "Black and White" Woodpecker was seen on the Ross of Mull. I mention it as tending to show that this early migration—in October—was probably of Scandinavian origin. I believe that more careful observation at certain localities upon our west coast will result in some curious discoveries in the facts connected with the autumnal migration of birds.] Mr. Maloch, of Perth, saw two (a pair) of these birds near Kinross. A female was shot at Quixwood, Berwickshire, about the beginning of February, 1879 [Mr. George Muirhead], and another was received by Mr. Hastings, naturalist, Dumfries, for preservation.

STOCK DOVE.

COLUMBA OENAS, *Lin.*

A Stock Dove was shot at Haggerstone, south of Berwick. It was in the company of Wood Pigeons [James Hardy, *in lit.*, 5th February, 1879]. Mr. Robert Gray also records one shot on the 11th March, 1879, in the woods of Dunse Castle, Berwickshire, "out of a flock of more than a dozen;" and of late years several others have been recorded as breeding or having been shot in Scotland, indicating a northward extension in Great Britain of its breeding range.

WOOD PIGEON.

COLUMBA PALUMBUS, *Lin.*

Had left Sutherland—Tongue district—entirely, shortly before the 13th January [J. C., *in lit.*, 13th January, 1879]. Half a

dozen reappeared at Tongue about the 27th-30th, induced to return by a temporary thaw [J. C., *in lit.*, 30th January, 1879]. Resorted to the sea-coast in N. Aberdeenshire [Rev. A. Grigor, Pitsligo, *in lit.*, 24th February, 1879]. Reported as appearing in vast flocks around N. Berwick, making great havoc amongst the turnips. Few of them perished during the storm, and most of those shot were in good condition [Dr. J. L. Crombie, *in lit.*]. Such was not the case, however, in many other and more inland localities, as in Stirlingshire, near this, where Wood Pigeons which remained were dreadfully emaciated. Dr. Duns also notices that many were seen around Dunse; and some were found dead in Inverness-shire.

It was not till the second week in January that dead birds were found near Dumfries [R. Service, *Dumfries Courier*, 25th March, 1879]. In Aberdeenshire they were found lying dead by the dozen in turnip fields, and Mr. Geo. Sim relates that "one gentleman saw, on his estate, some of this species feeding on a dead companion."—[*Scot. Nat.*, April, 1879, p. 84.]

A pair of Wood Pigeons were seen in Eig this summer [1879, *auct.* J. J. Dalgleish, *ex ore*].

I saw Wood Pigeons at Rodel, in Harris, in June this year. I did not learn in what year they first made their appearance at this locality, the only likely spot in Harris to shelter them.

In the *Zoologist* for October, 1879, it is recorded that no less than 20,529 Wood Pigeons were killed in Banffshire in three years [p. 428].

ROCK DOVE.

COLUMBA LIVIA, *Brisson*.

Every one questioned around Kilchoan, in the west end of Ardnamurchan, agrees about the unusual scarcity of Rock Pigeons in 1879, and they are supposed to have been killed or forced to migrate by the severity of the weather. I remember seeing quite a large flock around Kilchoan two years ago. Two or three birds were all I saw there in October of the present year.*

* Mr. J. Cordeaux notes that dead Rock Doves were found in "great numbers" on the Yorkshire coast, quoting Mr. Bailey. [*Zoologist*, March, 1879, p. 127.]

BLACK GROUSE.

TETRAO TETRIX, *Lin.*

Numbers frequented all the patches of corn near moorland, and, as one person informed me, "very many did not go back to the hill again." At Taycreggan nearly 100 Black Game were shot in one small field by one gun. This is quite unprecedented in the locality. A Black Cock was found frozen to a hedge "many miles seaward of the heather hills and alder glens" [T. H. Gibb, *loc. cit.*]

GROUSE.

LAGOPUS SCOTICUS (*Lath.*).

Grouse, by the 3rd of February, were not much affected by the severe frost and snow. One correspondent believes, instead of harming them, it will do them good: "The ground will be opened up and cleansed by the frost, and weakly birds will be killed off." They were, however, reported to be dependent upon the keepers for food at several periods through the winter at several inland localities; and a flock—or pack—was seen in December crossing the Moray Firth, and making for the Banff coast, as I am informed by my friend, Mr. Thomas Mackenzie, Tain. During January a Grouse came to one of the villa gardens in Callander regularly for food for many days together [J. H. Buchanan, *in lit.*].

Mr. A. Williamson, of Edinburgh, who has had much experience of Grouse in the Hebrides, is of the opinion that Grouse are slowly dying out in Lewis. He writes: "After an experience of nine years, and giving much thought to the subject, I have come to the conclusion that Grouse are there slowly dying out, for which I blame severe and late springs" [*in lit.*, 26th March, 1879]. It will be interesting to note if the unusually late frosts and cold spring of 1879 bear this out in any tangible statistics. Grouse were scarce on the high grounds, and very plentiful on low moors, in April. This is very generally reported, and might be expected when the higher grounds were covered with snow long into the summer. At one time Grouse were so hard up for food that they were seen to follow in the tracks made by the herds of deer in immense flocks [*Journal of Forestry*, June, 1879, p. 146].

Grouse were not apparently affected by the weather in Ardnurchan, or generally in the West of Scotland, up to beginning of April [J. J. Dalgleish, *ex ore*]. They have suffered, how-

ever, at some eastern and inland localities, as in Aberdeen [Geo. Sim] and elsewhere. The wet weather, which deluged the eastern—and most—parts of Scotland, killed many young Grouse after hatching time, but on the whole sportsmen had no reason to complain. In W. Sutherland Grouse are more abundant this year than they have been for six or eight years back, but there it has been comparatively fine weather during all the nesting season, while the summer was, as in the Western Islands, unusually dry. Generally, Grouse have been plentiful and healthy.

Some appearance of disease was visible towards the end of September and October, 1879. In one district of Perthshire, where I shot Grouse in October, every day several birds were obtained showing signs of disease. There is almost an entire absence of fresh young heather, and there was scarcely any bloom this year at all.

A local reappearance of Grouse, on a moor some time denuded of them, is recorded by Mr. Geo. Muirhead—Lamberton Muir, Berwick.

Grouse were scarce in some parts of the west coast owing to the very wet season. Though fairly plentiful early in the summer, and unaffected by the severe winter and spring, the wet summer banished them or killed them outright.

In this connection may be read an interesting paper, entitled "A Gossip about the Grouse Family," in *Bailey's Monthly Magazine* for November, 1879.

PTARMIGAN.

LAGOPUS MUTUS, *Leach.*

Even this bird of the snows and mists yielded in some instances to the severity of the season so far as to descend to the low grounds. One was seen sitting on the roof of a house in the Fannich Forest, Ross-shire, as related by Mr. John Maclellan [*Inverness Courier*, April 24, 1879]. In Assynt, Sutherlandshire, Ptarmigan came down to the range of cliffs called the Stronchrubie rocks, just above Inchnadamph, quite 1000 feet below their usual range.

QUAIL.

COTURNIX COMMUNIS, *Bonn.*

Quails are reported to have vanished from the counties of Dublin and Wicklow since the severe winter [Rev. Charles W. Benson, *in lit.*].

PARTRIDGE.

PERDIX CINEREA, *Charleton.*

Reports reached me from several localities of the deaths amongst Partridges, but especially serious ones from Aberdeenshire, where in some districts they died in large numbers, and some estates were nearly depopulated. Mr. Geo. Sim reports to this effect in the *Scot. Nat.* [Ap., 1879, p. 84], where he has some well-chosen remarks on the "Effects of the Winter, &c." In the Oban district Partridges suffered also, and "are now scarce," but not so scarce but that another breeding season will fill up the blanks [*Glasgow Evening Citizen*, 31st March, 1879]. The wet summer has made matters still worse in many districts of Scotland, and it is feared now—August—that it will take some time to replace the stock of Partridges. In other localities they seem not to have suffered at all, and it is not always easy to account for this variation.

LAPWING.

VANELLUS CRISTATUS, *Meyer.*

Large numbers of wings and remains of Lapwings and other species were seen in Tyree, the whole island being strewn with them in December [J. Henderson, *ex ore*]. Lapwings deserted many localities, but clung to isolated places here and there with great tenacity. They frequented a stony field close to Rosehearty, in N. Aberdeenshire, until the storm temporarily abated, when they all left [Rev. A. Grigor, Pitsligo, *in lit.*]. They completely disappeared from the neighbourhood of Dumfries in the end of November, and did not reappear until the beginning of March [R. Service]. "We do not remember," writes Mr. Service, "ever to have seen these birds leave us in winter before" [*Dumfries Courier*, 25th March, 1879].

The Lapwings usually arrive with great punctuality in spring, about the term of Candlemas, so accurately indeed—as Robertson tells us in his "View of the Agriculture of Kincardineshire"—"that the storm which generally happens at that season of the year goes by its name—'The Tchuchet Storm.'" They were quite a fortnight late of arriving this year; and in April I noticed at their breeding places a decided diminution in their numbers, which was also remarked upon by others equally well acquainted with the localities. Whether this diminution is generally noticeable I

cannot say, but certainly it is so in some districts. While along Loch Awe Lapwings bred about the usual time, they were considerably later in the east, and at many inland localities. Lapwings' eggs are sent up to the London Market from the Loch Awe district in large numbers.

In Dumfriesshire Lapwings were only hatched by the middle of May.

GOLDEN PLOVER.

CHARADRIUS PLUVIALIS, Lin.

Large numbers on the coast of N. Aberdeenshire in the end of February [Rev. A. Grigor, *in lit.*, 24th February, 1879]. They do not appear entirely to have left us, but did not return to their breeding haunts until quite a fortnight—in some localities three weeks—after their usual time of arrival. They were still frequenting the low fields in flocks or pairs as late as the 23rd April, at Callander. A good many were found dead or dying in Islay [F. S. Mitchell, *in lit.*] in January and February. The autumn flocks in the carselands and coast of Stirlingshire appear to be as large as usual, but a good many birds remained longer than usual on the high lands of Perthshire.

DOTTEREL.

EUDROMIAS MORINELLUS (Lin.).

For some interesting notes on this species, see Mr. Geo. Muirhead's article [*Proc. Berw. Nat. Club*, VIII., p. 506]. They appear much more rarely now than formerly on Lamberton Moor on the spring migration. It seems to me uncertain if this is entirely owing to their scarcity at their breeding haunts as compared with former times. I cannot, however, consider them as really a scarce bird in Scotland in the breeding season.

WHIMBREL.

NUMENIUS PHOEOPUS (Lin.).

Unusually large numbers of Whimbrels appeared in Ireland on their spring migration, as reported to me by Mr. Robert Warren. This, no doubt, is occasioned by the migration being delayed, and larger bodies of birds collecting together before starting. *Unusually large* numbers were also reported from North Uist in May; and, upon our Stirlingshire coast in autumn—end of August and beginning

of September—Whimbrels were more than usually plentiful. In most seasons it is a rare bird on the Stirlingshire coast.

These records point, I think, to unusual crowding of the species upon latitudes further south than their ordinary range, owing to the extra severity of the spring at localities upon their northern limits.

Mr. Cordeaux also records their commonness on the Lincolnshire coast [*in lit.*], and mentions that the last Whimbrel passed that district as late as the last week in July, 1879. Comparing this with my autumn observation on our Stirlingshire coast, the time between the end of the spring migration and beginning (?) of the autumn return journey of this species, did not extend much over a month, which I hold to be another indication of the Arctic nature of our climate in these days.

HERON.

ARDEA CINEREA, *Lin.*

In Berwickshire Herons were not observed in their usual winter haunts. One young one was found dead upon a frozen ditch at Arden, Lochlomond [J. Lumsden, *in lit.*] In Stirlingshire a few remained on the coast, but not so many as usual; while in the Kelso district they did not seem to be much affected [A. Brotherton, *Scot. Nat.*, 1879, p. 82], but rather to thrive. They were shut out from their food-resorts in Dumfriesshire, “and a good many died from hunger” [R. Service]. A rat was found in the stomach of one. In an ordinary season, however, I have found the Heron swallowing the Water Vole: it is part of its regular food when obtainable.

NIGHT HERON.

NYCTICORAX GRISEUS (*Lin.*).

A fine specimen of that rare and interesting bird the Night Heron was shot on 23rd May on a tree on the banks of the Black Devon, adjoining Alloa Park policies, by one of Lord Mar's game-keepers. So far as is known, this appears to be the second or third example which has been met with in Scotland, and there is no record of any having been seen since 1823.

BITTERN.

BOTAURUS STELLARIS (*Lin.*).

Mr. James D. Dougall exhibited to the members of this Society a specimen of the Bittern, shot in the end of December last on

the River Echaig, Argyleshire, by Mr. Cousins, keeper to Mr. Duncan, Benmore. The stomach contained the remains of a small rock cod.

Another is recorded from the Allerburn, near Lilburntown, Berwick, shot by Mr. Arthur B. Collingwood on the 10th January, 1879.—[*Proc. Berw. Nat. Club*, 1879, p. 528.]

CURLEW.

NUMENIUS ARQUATA (*Lin.*).

Curlews do not appear to have suffered much, if at all, and remained plentifully in their usual winter quarters, but were quite a fortnight late in returning to their breeding haunts. At Callander they had not laid eggs by the 23rd April, and were still in flocks. There does not appear to be any diminution in their numbers either here or at Callander, and few had begun to sit in Dumfriesshire by the middle of May.

In some parts of Ireland numbers of the skeletons of Curlews were seen; for instance, in the county of Fermanagh, as I am informed by my friend Mr. Stirling, of Garden, Stirlingshire. On the coasts of S.W. Scotland they were observed to be emaciated [*R. Service, loc. cit.*].

As late as June 12th, as reported to me by Mr. Hardy, a single Curlew was left unpaired, but afterwards disappeared, and was again seen on July 12th. This was in the neighbourhood of Cockburnspath, Berwickshire.

REDSHANK.

TOTANUS CALIDRIS (*Lin.*).

Arrived at their breeding haunts if anything later than usual, but not so late as Plovers and Lapwings, and in distinctly diminished numbers. They had not begun to lay at Loch Mochaik, near Doune, on the 22nd April.

GREENSHANK.

TOTANUS GLOTTIS (*Pallas*).

Greenshanks were somewhat more common at Grangemouth than in most autumn migrations. I shot one on the 1st September, and saw another; and Mr. R. Gray also takes notice of their being commoner than usual on the Firth of Forth [*Proc. Berw. Nat. Club*, 1878-79, p. 499]. I did not observe that they were more than usually abundant at their summer haunts in Sutherland.

GREEN SANDPIPER.

HELODROMAS OCHROPUS (*Lin.*).

In July, after heavy rain, on the 17th, a single Green Sandpiper was seen, and continued for a few days in the dean at Oldcambus [J. Hardy, *Prcc. Berw. Nat. Club*, 1879, p. 528]. Three appeared on the Aln in summer, and remained until late in the autumn [T. H. Gibb, *loc. cit.*].

WOOD SANDPIPER.

TOTANUS GLAREOLA (*Lin.*).

One was shot on the 3rd October, 1878, by Sir George H. Leith-Buchanan, Bart., near the mouth of the Endrick, Dumbartonshire.

GODWIT.

LIMOSA LAPPONICA (*Lin.*).

Late in September this year—1879—Bar-tailed Godwits—adult birds shot on our coast—retained a portion of the summer plumage. Last year in September I observed that Knots also retained a very considerable portion of their summer dress at the same time of year. In previous seasons I have never noticed this in Knots or Godwits on the Stirlingshire coast.*

RUFF.

MACHETES PUGNAX (*Lin.*).

A Ruff was shot on the Duke of Montrose's estate, near Drymen, Stirlingshire, on or about the 9th September, as I am informed by Mr. Maloch, gunmaker, Stirling, to whom it was sent for preservation. Ruffs and Reeves are not uncommon in the east of the county about the time of migration—I have shot five or six in a day—but their occurrence further west, as in this instance, is rarer.

GREAT SNIPE.

GALLINAGO MAJOR (*Gmelin*).

A solitary Snipe is reported as having been shot at Carsaig, Mull, by Mr. Archd. MacLean, of Pennycross.

* Similar records of several species of birds, which have a far northern breeding range, retaining till a later period than usual their summer plumage, are given by Mr. J. H. Gurney and others [*Zoologist*, November, 1879].

SNIPE.

GALLINAGO GALLINARIA (*O. F. Müller*).

Unusually abundant in November, 1878, here, and generally in Scotland. [Jack Snipe unusually scarce.] Their habits in Tyree were quite different from what they are in ordinary seasons. All seemed anxious to press southward, and, when flushed, took right away in that direction. They all left our marsh here in a single night—the 1st of December. No less than 1303 were shot on one shooting in S.W. of Ireland, mostly by one gun [v. *Field*, March 1, 1879], in 50 days' shooting. Snipe and Jack Snipe were very abundant in most localities in the autumn of 1878, probably owing to the unusually dry and fine summer and autumn of that year, which drove them down off the moors to favourite marshes, and brought them more together.

Mr. T. H. Gibb makes some remarks on their great abundance also in the eastern counties of Scotland during the winter. “Mr. Chas. Purvis, of Alnwick, computed a flock, which he sprung from the moats which surround the ruins of Dunstanborough Castle, to have been composed of at least fifty individuals” [*loc. cit.*].

Snipe appeared to be unusually scarce, however, in the marshes in many parts of Scotland up to the end of August, 1879. This was doubtless owing to the unusually large area of feeding ground supplied by the very wet summer. On 1st September no Snipe were found in the salt-marshes of Stirlingshire, but on the 2nd over 30 were flushed in one little corner. I believe these Snipe to have been of foreign origin, as it is only after frost in ordinary seasons that Snipe frequent our salt-marshes in this county. Up to the date of reading this paper Snipe remained scarcer than usual in our inland marshes, the continuous wet weather sufficiently accounting for their wider dispersal over the country. In our own marsh—where, in the autumn of 1878, I saw as many as 50 in a day—this year, as yet, I have only seen about a dozen altogether.

It is reported from Ireland that unusually large numbers of Snipe did not migrate further north in the spring, but remained to breed in the Irish bogs and mountains, crowding down on our latitudes.

WOODCOCK.

SCOLOPAX RUSTICOLA, *Lin.*

Woodcocks from Norway and North of Europe arrived upon our coasts about the usual time, but local migrations of very large

proportions took place later. During a storm in December, 1878, "nearly 500 Woodcock were killed along the shore between Lossiemouth and Burghhead [in Elgin], on the shore of the Moray Firth—supposed to have come from the opposite side of the Firth, if not from the still further north" [Rev. Geo. Gordon, Birnie, *in lit.*, 24th January, 1879]. Woodcock "of late" had left Sutherland [Tongue District, J. C., *in lit.*, 13th January]. In three days Angus MacLean, gamekeeper to Mr. W. S. Parker, lessee of the Soval shootings, Lewis, bagged to his own gun 51 Woodcock. MacLean walked on the first day 14 miles on snow 2 feet deep before he fired his first shot. Woodcock are reported also as unusually abundant in Norfolk at the beginning of the storm [H. Stevenson, *in lit.*]. Other accounts of numbers of Woodcock killed will be found in *Inverness Courier* of February 1st. In Ireland, between December 12th and February 18th, on a shooting in the S.W., one gun killed 290 Woodcock [*Field*, 1st March, 1879]. 80 Woodcock were shot in three days in the Ross of Mull [J. H., *in lit.*]. At Taycreggan, on Loch Awe, which did not freeze over, 67 Woodcock were shot in one small wood, from time to time, by one gun [*ex ore*]. This was in the beginning of January. About 30 couple were shot in two days on Tyree.

Woodcock were starved and found dead and dying in Ardnamurchan, numbers being picked up, and others caught alive by dogs [J. J. Dalgleish, *ex ore*]. Woodcock suffered also in Aberdeenshire, Mr. Geo. Sim having found some reduced almost to skeletons.

Though abundant on the coast of Elgin and Banff, inland localities were almost destitute of Woodcock, and the same remark applies to almost all inland localities in Scotland. In Eig, as I am informed by Mr. J. J. Dalgleish, who visited the island this summer, and took notes, as many as 17 and 18 were killed in a day, in the winter of 1878-79. Mr. R. Service reports Woodcock as unusually plentiful in the breeding season of 1879, on the estate of Mabie, Dumfriesshire. This appears like a crowding down of the species on our latitudes.

Their unusual scarcity on migration during the autumn of 1879 is reported to me by the light-keeper at Little Ross Lighthouse, in the Solway Firth. My correspondent writes—"The Woodcock, also, used to be common here, but I saw none this year."

Larger numbers than usual are reported as remaining to breed

in Ireland, as I am informed by Rev. Chas. W. Benson, of Dublin, and others. [So also with *SNIFE*, *q.v.*]

RED-NECKED PHALAROPE.

PHALAROPUS HYPERBOREUS (Lin.)

On June 9th Sir John Orde and I saw about four pairs of Red-necked Phalaropes at one locality in North Uist, and took a nest with three eggs. It was believed, however, that, although some were already laying, all had not arrived at their breeding haunts, all species of birds being considered later this season in breeding in the Outer Hebrides.

GREY PHALAROPE.

PHALAROPUS FULICARIUS (Lin.)

One of these birds was distinctly identified by Mr. A. Burn-Murdoch, swimming amongst sea-weed, near the base of Ben Hiant, in Loch Sunart, Ardnamurchan, on 26th September, 1879. Two are recorded as shot by Mr. Hastings, Dumfries [*loc. cit.*].

COOT.

FULICA ATRA, Lin.

Coots, which are rare birds on Loch Awe, appeared in hundreds a week before the final break-up of the storm. They were wild and unapproachable. They crowded the loch below Taycreggan, and departed in a northward direction after a few days. Mr. A. Brotherston reports that in the Kelso district they did not seem to fare so well as the Water-hens, which latter were very fat. [*See WATER-HEN.*]

WATER-HEN.

GALLINULA CHLOROPUS (Lin.)

Water-hens suffered severely from the winter. Many came regularly to farm-houses and cottages to be fed while the storm lasted. One at Callander, as I was informed by my friend, Mr. J. H. Buchanan, "came from the Keltie to a cottage on Cambusmore, and entered the house. One day the people, by way of a treat, gave it some of the hot peelings of potatoes at dinner time. It eat away very busily, and then lay down and died, having, evidently when in a state of starvation, overeaten itself." Three or four frequented our gardener's cottage here all through the

storm. Also the same recorded from various other localities, such as Auchenfroe, Cardross—where one also died of overfeeding—Arden, &c., Dumfriesshire, *auct.* R. Service, who thus instances its scarcity there:—"So scarce had they become that only one nest rewarded my searches in the breeding season, whereas 50 or 60 could formerly have been found on Troqueer alone."

CORNCRAKE.

CREX PRATENSIS, Bechst.

The scarcity of the Corncrake has been of late years very generally remarked upon in various parts of Scotland. No diminution of its numbers appears to have taken place, however, in the Hebrides, where, in the summer of 1879, it was exceedingly abundant.

WATER RAIL.

RALLUS AQUATICUS, Lin.

Extremely abundant, apparently, all over Scotland. Great numbers were shot and preserved by local birdstuffers. Seventeen were shot in one day on the Tay estuary by Mr. Maloch, Perth. Water Rails—three pairs—bred in Eig this summer—1879. [*Auct.* J. J. Dalgleish, *ex ore.*] Extremely abundant over many parts of Scotland. Fifteen sent to one birdstuffer in Edinburgh [R. Gray, in *Proc. Berw. Nat. Club*, 1878-79, p. 500].

SPOTTED CRAKE.

PORZANA MARUETTA (Leach).

This species has occurred more commonly than usual. Mr. Maloch pursued one for a long time on the Tay side the day he shot 17 Water Rails. I saw one in our own marsh here, and another was seen another day. [Recorded also from Dumfries by Mr. Hastings, *loc. cit.*]

GOOSE.

ANSER, sp.!

A very large flock of Grey Geese [probably Grey-lag or Bean] passed northward over Loch Awe on the 2nd May, which is just one month later than usual. They were flying low, and were apparently tired.

The following account of the slaughter of Wild-Geese in the

north went the round of the northern papers. These were probably Brent Geese, which have been unusually plentiful in our seas and firths this winter:—

“ALNESS.—SLAUGHTER OF WILD GEESSE.—The *Invergordon Times* says that in the shop of Mr. Hugh Munro, merchant, Alness, there were, on Monday last, no less than 300 Wild Geese, the bulk of which were shot by Captain Spicer. It is added that Captain Spicer has been successful in taking down fifty-six geese with one shot.”

For three weeks in April Wild Geese frequented the upland farms in Berwickshire, and as late as 28th April.

PINK-FOOTED GOOSE.

ANSER BRACHYRHYNCHUS, *Baillon.*

One was shot at Callander this winter by Mr. MacDougall. They were reported as unusually plentiful and tame. This is almost undoubtedly the common wild Grey Goose of our East Coast, the Bean being really the rarer species of the two. Their condition was reported as bad. Mr. R. Gray says some he examined “were in a state of great emaciation” [*Proc. Berw. Nat. Club*, 1878-79, p. 500].

BARNACLE GOOSE.

BERNICLA LEUCOPSIS (*Bechst.*).

Reported as unusually abundant this year on the Island of Colonsay, Argyllshire; and also at other stations along our west coast, as in the Solway Firth [R. Service]. They fed inland during the day along the banks of the Nith. One gamekeeper near Dumfries shot 15 in one day [*auct. cit.*]. A Barnacle Goose lingered in the Sound of Harris till an unusually late date this summer, and was seen there by Mr. John MacDonald on the 17th June. Barnacle Geese leave North Uist *en masse* usually about the middle of May.

WHITE-FRONTED GOOSE.

ANSER ALBIFRONS (*Gmel.*).

Recorded as unusually abundant, and visiting localities on our east coast not generally frequented by them, as at Kincardine on Forth [*v.* also R. Gray, *Proc. Berw. Nat. Club*, 1878-79, p. 500].

SWAN.

CYGNUS, sp.?

Wild Swans were unusually plentiful, yet not as plentiful as in some other milder seasons. A flock of 60 took up their winter quarters on Tyree, and others were seen on migration high in air, passing south. Several were seen on the Berwickshire coast. One shot was *Cygnus immutabilis*, another was *C. bewickii* [J. Hardy, *in lit.*, 9th March, 1879]. Four Wild Swans frequented Edenmouth, St. Andrews; one was shot. A flock visited Loch Lomond, and were heard flying overhead by a party of woodmen, and seen next morning swimming in the bay. It is only in very severe seasons that Swans visit Loch Lomond. Swans were unusually abundant on the Tay estuary also. Three or four were shot at Newburgh [P. D. Maloch, *in lit.*], and various parties were seen passing southward over Loch Awe, but none alighted. A good many were shot upon the Berwickshire coast during the winter [*Proc. Berw. Nat. Club*, 1879, p. 530], and they were more than usually abundant on the English coasts. [For full account of *C. immutabilis*, see also Mr. T. H. Gibb's paper, in *Proc. Berw. Nat. Club*, viii., p. 511; also, particulars of Bewick's Swan, *loc. cit.*]

In June, 1879, I was informed that one of the 60 Wild Swans which wintered in Tyree, having been wounded, remained behind the others. It was afterwards caught on the ice by some boys, and taken to the factor's place, where it was let loose along with a tame one.

A flock of between 70 and 80 Wild Swans passed over Newton in North Uist, towards the south-east, and 8 wintered on the Loch at Scolpig. This flock, in all probability, is the one which wintered on Tyree, and, if so, it may afford evidence of Icelandic and not of north-eastern origin.

WIDGEON.

MARECA PENELOPE (Lin.).

Widgeon have been plentiful in the estuaries. At the end of April numbers were frequenting Loch Vennachar and Loch Mohaick, near Doune, and the males were apparently in full summer plumage. This is a species whose breeding limits may be expected to extend considerably southward of their present range.

PINTAIL.

DAFILA ACUTA (*Lin.*).

Specimens have been observed. One was seen in Firth of Forth by Mr. J. H. Buchanan [*in lit.*, 1st Jan., 1879]. Two were seen by Mr. J. Henderson in Tyree [*ex ore*]. And 3 males were obtained at Bowhill, Selkirkshire, in the last week of February and on the 14th March [R. Gray, *loc. cit.*].

WILD DUCK.

ANAS BOSCHAS, *Lin.*

Unusually large numbers of Mallards frequented our streams in Stirlingshire for a week or ten days at the beginning of the storm. During that time, while the frost hung heavily on the aspens and willows by the brooks, I usually succeeded in bagging two or three or four Duck every forenoon. Later they disappeared from inland haunts and took to the estuaries in surprising numbers, where they remained all winter, only coming inland when the short temporary thaws took place. Their unusual abundance on the Firth of Forth was several times noticed by myself both at Bo'ness and lower down the Firth; and similar reports of their great numbers have reached me from Aberdeenshire, Forfarshire, and Berwickshire, on which latter coast Mr. Hardy one day counted 170 in a flock. In the beginning of February I saw also very large flocks in Dalgetty Bay and at Aberdour, in the Firth of Forth; and I heard also of their extreme abundance in Mull and Tyree, and elsewhere on the west coast. At Loch Awe, which was not frozen over, Ducks of various species were more numerous than on any former occasion which my informant could remember (he is 52 years of age); but a gamekeeper assured me that many died, and, at the breeding season of 1879, there was "not one for twelve Ducks nesting on the Loch side," as compared with last season. In end of April I found remains of more than one Duck on the islands and shore. Wild Duck in masses were last seen on the Berwickshire coast by Mr. Hardy as late as the 29th April. Their scarcity at many localities was not probably so much from actual deaths as from the unusual lateness of the spring, though deaths also occurred. On May 5th, or a day or two sooner, a nest of 11 hatched out at Dunipace. The nest was in an open grass field. A perceptible increase in the numbers of Wild Duck was observable about the

15th May here, so that while some early ones hatched out by the 5th, many had not arrived at their breeding haunts, or were just arriving. Many died also on Loch Tay side.

The observations of the summer go to prove that Wild Duck were unusually plentiful, caused, it is believed, by the deterrent effects of the late spring upon the northward migration, the latter being therefore restricted.

As early as 18th September, 1879, Ducks began to frequent salt water [J. H., *in lit.*].

GADWALL.

CHAULELASMUS STREPERUS (*Lin.*).

These appeared plentifully at some localities upon the west coast. I know of between 30 and 40 having been shot by one shooting party, and of as many as five having been killed in a few hours. They were mingling with other Wild Duck, and were frequenting salt-water lochs. I received two specimens—both males—from Mr. Henderson, of Phionphort, Mull, which were, along with others, shot by him about the middle of November, but apparently they moved further south later in the season this year. There can scarcely be a doubt that the Gadwall is a regular visitor to our west coast, where it usually winters on some of the most suitable islands.

Mr. Gray also records the occurrence of this species on Loch Leven in the last week of December, 1878; and another on the Forth, at Kincardine—a young male—on the 14th March, 1879 [*loc. cit.*].

TEAL.

NETTUM CRECCA (*Lin.*).

Teal have been unusually scarce all winter, and I am inclined to think they were amongst the first birds to take their departure southward. The scarcity of the species has been very generally remarked upon, and in spring, during April, they did not return in such numbers to their breeding haunts. By the middle of May, however, they began to reappear somewhat more plentifully. From many localities they have been almost quite absent from beginning of December until middle or end of April. I cannot think that Teal this summer, and up to the end of August, or later, was nearly as plentiful as in ordinary seasons.

GARGANEY.

QUERQUEDULA CIRCIA (*Lin.*).

A male Garganey was shot by the gamekeeper at Kirkmichael, in Dumfriesshire, on the 1st of December.

SHOVELLER.

SPATULA CLYPEATA (*Lin.*).

On the 16th August, 1879, I shot a Shoveller near Keith, in Banffshire; and six or seven other Duck, which got up at the same time out of the marsh, were also of this species, and probably a brood. This is a species which we may expect will breed more freely in this country than it has done hitherto. What effect the late spring may have had in bringing this about is as yet hard to say. The keeper at Keith had never seen the species before. Quite probably we may have to thank the severe winter and late spring for this instance of the Shoveller having bred and reared its young in Scotland. Others have been recorded as occurring at Jedburgh, —in May, 1878. A female shot there had an egg almost ready for extrusion. It was shot by Mr. Adam Elliot, Screamerston. We cannot urge too earnestly that birds which are likely to stay and breed with us should not be destroyed. The Wild Bird Act appears to be a dead letter.

Another Shoveller was shot at Kirkmahoe, in August, which Mr. R. Service thinks must have been bred in this country.

POCHARD.

FULIGULA FERINA (*Lin.*).

Amongst many Widgeon, Mallard, and Teal, upon Loch Mohaik, near Doune, I saw a pair of Pochards on the 22nd April, and pointed them out to Mr. J. H. Buchanan, who was with me. On a second visit to the same locality on the 25th May, Mr. Hamilton Buchanan and Mr. John Gibson, of Edinburgh, discovered the nest and eggs, which fact will be found duly recorded by Mr. Buchanan in the *Proc. Royal Phys. Soc.*, 1878-79, p. 105.

I am favoured with the following abstract of his remarks upon the nest and eggs by Mr. Hamilton Buchanan :—

“The nest was placed among very tall reeds, and was similar to a Coot’s in structure. It was lined with a small quantity of down, and contained six eggs, all with one exception being deeply incu-

bated. The embryo fully confirmed the species. The gamekeeper had taken two eggs from the nest on the previous Monday. Both Mr. Gibson and I saw the bird fly off the nest, which it did not do until we were within ten yards of it. The eggs measure from $2\frac{6}{18} \times 1\frac{2}{3}\frac{3}{2}$ to $2\frac{1}{2} \times 1\frac{1}{3}\frac{1}{2}$."

Much cry was made in a local paper about the taking of this nest of eggs. For scientific purposes—the evidence of an extension of the breeding range of any species—I hold that naturalists are quite entitled to take birds' eggs, on ground where they have liberty to do so from the proprietor, and especially such as those of our rarer Ducks, which are known to be extending their distribution, and where it is advisable to record these steps of advance. Where the discovery is put to a useful scientific purpose, we cannot regret the act, and the act is necessary if the record is ever to be of any real value afterwards.

Obs.—It appears desirable that attention be paid to the late stay, in spring, of Scoters and Velvet Scoters upon our coasts. [See also remarks on this head by Mr. R. Gray, *Proc. Berw. Nat. Club*, viii., pp. 75 and 501.]

EIDER DUCK.

SOMATERIA MOLLISSIMA (*Lin.*).

Commenced paying their spring visits on the Berwickshire coast much about the usual time, but in small parties [Jas. Hardy, *in lit.*, 5th Feb., 1879]. Eider Ducks common on Berwickshire coast [J. H., *in lit.*, 9th March, 1879]. Seven males and seven females off the coast of Berwick, at Cockburnspath, 4th April [J. H., *in lit.*, 4th April, 1879].

TUFTED DUCK.

FULIGULA CRISTATA (*Leach*).

An immature female, unable to fly, was shot on Hoselaw Loch, by Mr. A. Robertson, on the 20th August, 1879. Hoselaw Loch is between two and three miles from Yetholm Loch, as I am informed by Mr. A. Brotherston, of Kelso, who preserved the specimen. [For account of the breeding of the Tufted Duck of late years in the South of Scotland, see "Zoological Notes" by Mr. Brotherston, in *Proc. Berw. Nat. Club*, p. 521.] A Tufted Duck was found frozen to the ice near Kelso [*op. cit.*].

GOLDEN-EYE.

CLANGULA GLAUCION (*Lin.*).

A pair seen by Mr. Lumsden on Loch Lomond as late as 30th April, 1879. Three Golden-eyes remained off the Berwickshire coast as late as the 3rd May [J. Hardy]. Golden-eyes are reported to have bred in a hollow tree at a locality in the south of Perthshire this summer—1879. The young were taken and an attempt made to rear them, but they all died.

KING DUCK.

SOMATERIA Spectabilis (*Lin.*).

Plentiful in beginning of January about Dundee [J. Henderson, *in lit.*].

At St. Kilda, in June, a party of gentlemen saw a Duck standing or walking upon a rock, upon which too great a surf was running to allow of their landing from the boat. One of the party,* who was a good ornithologist, described the bird minutely to me, and both he and I came to the conclusion that it could hardly be any other bird than a male King Eider. He described it to me on board the s.s. "Dunara Castle," immediately after having seen it. I am particular in mentioning this, as I have for some years noticed the tendency of several northern species of Duck to extend their breeding range in a southerly direction.

GOOSANDER.

MERGUS MERGANSER, *Lin.*

It is feared that the pair of Goosanders mentioned by Mr. J. H. Buchanan in his paper "On the Birds which have been observed in the Parish of Callander, Perthshire" [*Proc. Royal Phys. Soc.*, 1878-9, p. 61], as having bred last year near that, have been shot, and are now in Mr. Small's shop, Edinburgh. Goosanders were unusually abundant in the Kelso district, and were very fat, being gorged with trout and parr, and also eels, as reported by Mr. A. Brotherston [*"Scot. Nat.,"* April, 1879, p. 82]. There is evidence of a still further southerly extension of the breeding range of the Goosander in Scotland, and their breeding is annually becoming more and more general. A pair remained all summer on the

* Mr. Boyd, of Greenock, since deceased.

Tay, above Perth, in 1879, and doubtless bred there. Mr. J. H. Buchanan is at present engaged in preparing a paper upon "The Goosander in Scotland."*

SMEW.

MERGUS ALBELLUS, *Lin.*

A specimen of this comparatively rare British species was brought in for preservation to Mr. Hastings, Dumfries, which had been shot during the storm in the neighbourhood [R. Service, *loc. cit.*].

BLACK-THROATED DIVER.

COLYMBUS ARCTICUS, *Lin.*

There is evidence of this species extending its breeding range southward, as they have been found occupying localities hitherto untenanted by them. A pair was shot at a small loch near Taymouth Castle, and preserved for his Grace the Earl of Breadalbane by Mr. Maloch, of Perth. A pair frequented a loch quite in the south of Perthshire. Unfortunately, one of them was caught and drowned in a pike-net. I remember, about the year 1870, that their range did not come further south than the neighbourhood of Pitlochry.

LITTLE GREBE.

PODICEPS MINOR (*Gm.*).

Unusually plentiful during the first few weeks of the frost, and as long as any open water remained on the pools and streams. One which I shot contained in its stomach remains of minnows and small fish, besides water insects. In 1870 and 1874 Grebes were noted by Mr. R. Service as unusually abundant on the rivers in the S.W. of Scotland, and the same thing was apparent this winter. Mr. A. Brotherston notes the Little Grebes in the Kelso district as in good condition, and found in the stomach of one a quantity of salmon roe [*"Scot. Nat.,"* April, 1879, p. 82]. He also records that "the feet of several Grebes and Ducks were frost-bitten, part of the toes and web being lost" [*Proc. Berw. Nat. Club*, 1878, p. 538].

* Since read to the *Royal Phys. Soc.*, 17th December, 1879, and printed in the *Proceedings*.

GREAT CRESTED GREBE.

PODICEPS CRISTATUS (*Lin.*).

Mr. Robert Gray records a specimen shot at North Berwick in the second week of January, and another, at Portobello, in the last week of February, 1879 [*loc. cit.*].

RED-NECKED GREBE.

PODICEPS RUBRICOLLIS, *Latham.*

A fine specimen shot at Coldingham, Berwickshire, on the 14th February, 1879, and recorded by Mr. R. Gray [*op. cit.*, p. 502].

SCLAVONIAN GREBE.

PODICEPS CORNUTUS (*Gm.*).

A specimen is recorded by Mr. R. Gray, "found dead upon the shore near Dirleton early in March [*op. cit.*, p. 502]. Another, which I have examined, and two or three others, were obtained on the Tay estuary by Mr. Maloch, Perth.*

RAZORBILL.

ALCA TORDA, *Lin.*

About the end of February and beginning of March there seems to have been considerable mortality amongst Razorbills on the Berwickshire coast [*J. Hardy, in lit.*, 9th March, 1879].

Inquiries instituted and observations made in St. Kilda and the Shiant Islands, and other rock-bird stations, show that no appreciable difference took place in the time of their laying. They cannot be said to have been affected by the cold spring, and the same remark applies to rock-birds generally.

LITTLE AUK.

MERGULUS ALLE (*Lin.*).

Large numbers of this species were caught or shot at inland localities in the counties bordering the Firths of Forth and Tay,

* The recurved bill of the Eared Grebe (*Podiceps auritus*) is sufficient to distinguish it at any age from the Horned or Slavonian Grebe (*Podiceps cornutus*). Macgillivray puts the description in plain language. Describing the former, he says [*Brit. Birds*, vol. v., p. 270]:—"Somewhat inferior in size to the Slavonian Grebe, this species is distinguished from it by the peculiar form of its bill, which is curved a little upwards at the end, and depressed at the base."

and in Forfarshire. I have records of specimens obtained at Blairadam, in Fife [about 19th Jan., 1879], Loretto, near Musselburgh, the previous week. Up to 19th Jan., Mr. Small, naturalist, Edinburgh, had received 5 for preservation. Three were captured during the winter in the S.E. of Scotland [A. Brotherston]; and Mr. P. Henderson, Dundee, gives an account of many which were found, some dead, at inland localities, in Forfarshire [v. "*Land and Water*"]. Regarding these last, the Rev. J. E. Somerville, writing to Mr. James Lumsden, says:—"The birds seem to have been thirsty, and drank freely after having water given to them" [*in lit.*, 22nd January, 1879].

Concerning this appearance of the Little Auk in Forfar, Mr. Henderson writes, under date of 1st January, to Mr. Lumsden:—"A great flight of Little Auks has occurred here within the last few days, and they have been found distributed over an area of 8 or 9 miles in length, by about 3 in breadth, and mostly on dry land, some at great distances and heights from the sea, and some have been picked up dead on or near the beach. I saw a flock of about 40 yesterday, as I took a stroll towards Broughty Ferry, and the fishermen told me that the boys were catching them at the back of Broughty Castle. Others were procured on streams." Further particulars will be found in "*Land and Water*" of 11th Jan., 1879.

One was found as far inland as seven miles west of Perth [Dr. Buchanan White in "*Scot. Nat.*," July, 1879, p. 132]. Six are recorded from localities in Berwickshire [*Proc. Berw. Nat. Soc.*, 1879, p. 530], one being found on a moor many miles from the German Ocean [T. H. Gibb, *loc. cit.*].

MANX SHEARWATER.

PUFFINUS ANGLORUM, *Temm.*

Mr. Gray records examples in the Firth of Forth, and observes that they have come to the Firth within the past three years in considerable numbers. They remain between four and six weeks. These birds are usually obtained in August, and seen in flocks in the Firth. I have myself obtained a specimen here, it having been knocked down by a telegraph wire, near Larbert. Their great assemblages in summer seem to take place off the north end of Colonsay, on the west coast of Scotland, not far distant from

their breeding haunts; and again off the Islands of Orkney to the west, and off Cape Wrath, in Sutherland.

LITTLE GULL.

CHROICOCEPHALUS MINUTUS (*Pallas*).

An immature specimen of this species was shot in Berwickshire on the 14th August, 1879. I saw the specimen in the premises of Mr. Hope, naturalist, George Street, Edinburgh, on the 18th September, where it had been sent for preservation. While comparatively rare upon our Scottish coasts, the Little Gull occasionally appears in large numbers a little way further south upon the English coast. Breeding in large numbers on the Russian lakes of Ladoga and that district, their line of migration would appear, in such seasons as they visit us, to be down the Baltic, and so to the English coast. By Mr. A. Brotherston's "Notes" [*Proc. Berw. Nat. Club: loc. cit.*] it will be seen that Coldingham Loch is a favourite resort of the species, where one in Mr. Wilson's (of Coldingham) collection was obtained, and where Mr. A. Brotherston saw another in 1877.

COMMON GULL.

LARUS CANUS, *Lin.*

This and the next species were often seen during the storm feeding on the offal in the streets and ashpits, and disputing with the sparrows [*R. Imrie, loc. cit.*].

BLACK-HEADED GULL.

CHROICOCEPHALUS RIDIBUNDUS (*Lin.*).

An unusually rapid moult took place in this species this spring [1879]. Numbers of the same flock accomplished a full moult in three days, as observed by Mr. P. D. Maloch, Perth; and a very similar rapid moult was observed here by myself, when birds frequenting our river Carron, as they always do in spring, changed from mottled heads to black in two, or at most three, days. Some birds frequented our river course and low fields quite three weeks later in spring than usual. One breeding place, 7 miles from here, is dried up, and all the birds have left.

I visited a large colony near the Port of Menteith, on the 22nd May, when the birds appeared to be engaged in incubation.

GLAUCOUS GULL.

LARUS GLAUCUS, O. F. Müller.

This species did not appear in any great numbers on our coasts this winter. A fine adult male was received by Mr. A. Brotherston—in full winter plumage—which was shot on The Magdalene Fields, Berwick [*op. cit.*, A. Brotherston].

In the early autumn of 1879 Glaucous Gulls appeared at Kincardine on Forth. One was shot and another seen on the 1st and 3rd September by Mr. Arthur Dundas, Carron Hall.

ICELAND GULL.

LARUS LEUCOPTERUS, Faber.

In Mr. Small's shop, Edinburgh, on the 12th May, I saw, in the flesh, an immature Iceland Gull, which had been shot in the Firth of Forth. The wings and tail were very much shattered by the shot, but were also very much abraded, so that it had almost the appearance of an escaped bird, possibly from some one of the whaling vessels returning from the sealing. It was described as "very tame," which is quite the reverse of our experience of them in our seas on a former season [*v. Proceedings*, 1872-73, p. 210].

SKUA.

STERCORARIUS, *sp.* ?

An unusually large migration of Skuas (*Lestridae* of four species) will come to be spoken of more fully in my next report and in another place besides. Meanwhile it is sufficient to record here that they appeared in October and November at a great many localities along our east coast. I have records of a great number; twenty-six Pomatorhine Skuas came to one birdstuffer alone in three weeks, shot in the Firth of Forth. A few, comparatively, also occurred on the west coast and islands.

TERN.

STERNUS, *sp.* ?

The destruction of Terns' eggs is really deplorable, besides that of almost every other species which breeds upon Tent's Muir, in Fife. Not for the first time in his letters to me does Mr. Henderson, of Dundee, describe the awful mischief committed on this breeding haunt by boys who come out from Dundee and elsewhere, and harry the nests, and destroy wholesale all the eggs they come across. Mr. Henderson states that the Terns are "positively

getting driven away by the continuous and wholesale destruction of their eggs. In this case the Protective Acts are a perfectly dead letter. The eggs are destroyed in thousands. Terns, Ring Plovers, Dunlins, Lapwings, &c., are suffering dreadfully. Scarcely a single bird gets flown ; and as for Shieldrakes and Eiders, every egg is blown or boiled. Such is the state of matters here. You may make use of this statement at your meeting, and I can substantiate every word to be correct."

Have we not a "Society of Field Naturalists" at Dundee? I think so. And is it not part of their duty to try and prevent this destruction? It ought to be considered part of the duty of every local Natural History Society to do so. Pressure should be brought to bear on the magistrates, continued and repeated until something is accomplished.

OCTOBER 28TH, 1879.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr. A. J. Grant was elected a corresponding member, and Professor J. Bailey Balfour, Messrs. James C. Christie, and James Eggleton, ordinary members of the Society.

SPECIMENS EXHIBITED.

The Secretary exhibited a collection of Silicious Sponge Spicules, Conodonts, and Fish Remains, which he had obtained at Laigh Baidland, on an excursion of the Society to the Dalry district during last summer. He said—The spicules are those of *Hyalonema Smithii*, which were first found in Carboniferous strata in the lower limestones at Cunningham Baidland, by Mr. John Smith, of Kilwinning, and the Conodonts, which are of a considerable variety of forms, are to a large extent similar to those found by Mr. Smith at Glencart Bridge, and brought before the Society during last session. The chief interest attached to the present collection is because it comes from a different locality, and one which had not before been visited by the members of the Society. Several of the Conodonts are nearly identical with those figured from the Palaeozoic rocks of Russia, and the Devonian and Carboniferous formations of North America; but, as is well known, their relation to any of the families of the marine fauna is still undetermined—some writers referring them

to Annelides, some to Crustaceans, and others to fishes. Along with the spicules and Conodonts there were also found, in some abundance, scales and teeth of placoid and ganoid, and vertebral bones of osseous, fishes in fine preservation. While therefore some of the forms of Conodonts may be referred to Annelides and Crustaceans, the large number of fish remains found in the deposit is a strong argument for the greater portion of them having an affinity with that family. The quarry at Laigh Baidland, which is in the lower limestone, has never been of large extent, and has not been worked for many years; the strata exposed are therefore of limited extent. The remains are found in a dark-coloured shale interbedded with the limestone, which, in its weathered condition, is of a deep chocolate colour—due to an infusion of iron, or probably manganese. The decomposed limestone obtained from the fissures does not contain many organisms. There is abundance of *Lithodendron junceum*; *Heterophyllia mirabilis*, with portions of the hooklets attached, sparingly; plates of two species of *Archaeocidaris*; portions of various Crinoids; four species of Entomostraca of the genera *Cythere*, *Bairdia*, and *Leperditia*; one species of Polyzoa, *Diastopora megastoma*; and remains of *Productus* and other Brachiopods, with a few univalve shells, but these are in limited quantity and not well preserved.

Mr. Arthur Pratt showed a series of mounted specimens from the same locality, among which was an example of a small species of Trilobite.

After some observations by the Chairman,

Mr. John Young, F.G.S., remarked upon the care with which Mr. Mason had worked out the Microzoa from this deposit, and stated that upon the slides exhibited would be found many organisms of interest which had not been obtained in such abundance in any of the other quarries of the district. Amongst them was a fine series of the anchoring rods of the Glass Sponge (*Hyalonema Smithii*), first discovered in the limestone strata of this district, and numerous vertebral bones of small fishes. Mr. Young stated that, from no other locality in which the remains of Conodonts had yet been noted, had similar small vertebrae been recorded. They are here found varying from half a line to one-eighth of an inch in diameter; and being free from the matrix and finely preserved, their form could be clearly ascertained. He was in hopes that the finding of these vertebrae and other small

plates and scales of fishes in this deposit, along with the teeth-like Conodonts, would yet help us to arrive at some knowledge as to the nature of the fishes to which they belonged. While there was evidence of various genera of Conodonts in the Scottish limestones, those of *Prionodus* and *Polygnathus* seem to have been most abundantly represented; but doubtless more light would yet be thrown upon these interesting but obscure organisms.

Mr. Peter Ewing exhibited a specimen of *Stachys palustris*, which showed a considerable divergence from the normal type. Instead of the two opposite leaves which this species usually has, the specimen showed three, the same arrangement being carried out with the bracts and other portions of the plant, while the stem and branches were hexagonal instead of the usual four-sided form. It was found growing with others in water, which might account for the divergence; but as its root could not be obtained, no satisfactory cause could be assigned for the abnormal conditions.

Mr. Robert Turner exhibited a specimen of *Potamogeton zizii*, a species intermediate between *P. lucens* and *P. heterophyllus*, to both of which it bears a resemblance. It has been observed in many parts of the north and centre of Europe, but only within the last few years has it been distinguished in this country, its name not having been determined with certainty till the present season. For its discovery in Scotland we are chiefly indebted to Mr. A. Brotherston, who found it growing in shallow water in Cauldshiels Loch, near Melrose, Roxburghshire.

Mr. John M. Campbell showed a fine specimen of the Condor (*Sarcorampus gryphus*), which had recently been received from Chili. Mr. Campbell gave a detailed description of the character and habits of this vulture, which builds its nest on the peaks of the Andes at an altitude of from 10,000 to 15,000 feet. They measure in length from 3 to 4 feet, with an expanse of wing of from 8 to 10 feet. They feed principally on dead carcasses, but will sometimes unite in attacking living animals, such as the Guanaco, Llama, Puma, &c. The Chilians destroy numbers of them, as they frequently attack young goats and lambs. There is said to be another species of Condor than the above, which Sharpe names *S. aequatorialis*, and of a smaller size. An apparently adult individual of this species was living in the Zoological Gardens, Amsterdam, in the spring of 1873. Darwin, in his "Voyage of the Beagle," gives an interesting account of the Condor.

PAPERS READ.

I.—*Apiarian Notes in Argyllshire for 1879.*

By MR. R. J. BENNETT.

In January and February the severe frost made it impossible to open the hives. Later on I discovered two of my best stocks were nearly lost, as the intense cold had caused them to eat all the honey around the cluster—thus dispelling the popular delusion that bees during frosty weather lie dormant and consume no stores. In preparing for winter, passages should be made through all combs, so that the bees may easily get at their food. I again pay a high tribute to the use of the Quilt, as last year it carried off all damp vapours from the atmospheric influences, and this year any that may have arisen from the compact clustering of the bees, passed into the quilt and were quickly dispersed.

On March 5th I examined stocks, and was amply rewarded for the trouble, finding all in a very fair condition, with the exception of the two above-noted. After the four months of protracted frost and snow (any variation being only sleet or rain), I dusted liberally with pea-meal as a substitute for pollen, and began stimulative feeding. It was well that I did so, as from this date till the close of the month there was hardly a day that hives could have been opened. Never do I remember seeing the country so far behind. Crocuses, primroses, wallflowers, and similar flowers, which are generally abundant by this time in our gardens, had not yet made their appearance.

In April flowers began to show, and the willows, which had almost stood stationary for the past two months, made a fresh start. With the ingathering of pollen and artificial feeding, breeding began, and hopes were raised that all our cares and troubles for another season were over.

On May 7th I examined stocks, and found stores nearly consumed in every hive, in two cases almost beyond hope of recovery, clearly showing that, up to this date, the bees had not procured any honey from outside sources. On the 24th inst. I attended a sale of bees at Dalry, and bought nine stocks, two of which were pure Ligurians. This, I may mention, was the best sale of bees I have ever seen or heard of in Scotland, about eighty persons being present, which shows a growing interest in Apiculture.

June is usually a busy month with living and increasing stocks. On the 5th I examined hives, and was perfectly amazed at their poverty. In only two cases were they in a fit condition for swarming, and in one of them five queen cells had been torn open, and, no doubt, the princesses destroyed. From the 9th till 11th there were storms of thunder, lightning, and rain enough to deluge all the bees in Argyllshire. On the 20th I removed eleven stocks two miles from my apiary close to a clover field, in the hope, if weather at all favourable did come, they would easily secure a rich harvest, but alas! up till the end of the month they scarcely found a bare existence, and out of the whole stock there was not a single swarm.

July, like June, proved cold, bleak, and wet, and it was pitiable to see the bees darting out and in, and after weary labour returning to their hives with empty sacs. Here I had recourse to the same treatment as in 1877, and during the month fed liberally every hive in the apiary. At the end of the month I had the pleasure of meeting Mr. Thomas A. Newman, Chairman of the North American Bee-keepers' Association, who had come at his own expense to Europe to report progress in the science of Apiculture—and here I may state what our friends on the other side of the Atlantic are doing. Professor A. J. Cook has regular classes for teaching theoretical and practical Apiculture; and, notwithstanding that many of his students have been engaged for years in the study, there are hundreds of things yet to be discovered in connection with the mysteries of the hive, and the lives of its inmates. There are over 70,000 people engaged in Apiculture in America, and why should the people of Great Britain lose a million pounds sterling a year for the want of a little knowledge how to keep bees to collect the fragrant sweets?

August opened well, and again hopes were raised, as in the first three days more honey was stored than during any month of the year. Having purchased some Italian queens at Perth Show, three of them were at once introduced into the apiary, the wisdom of which step was apparent later on. On the 16th I again examined the hives and found plenty of workers in all, but not two pounds of sealed honey in any one of them. But when August closed, our hopes of reaping any harvest went with it, rain taking the place of sunshine. Though it began with promise, it ended in disappointment.

September, as a rule the great heather-honey harvest month, was this year like its predecessors, bleak, cold, and wet. The heather never burst into bloom at all, and the hills around the Holy Loch, generally clad at this season with brilliant purple, presented a gloomy brown appearance. On the 20th I examined the apiary, and decided to bring home the eleven stocks taken away in June with the view of reaping a rich harvest of clover and heather honey, for, in the quaint words of the gardener, "with the exception of thae Italian boys, the rest have naething ava but the skeps and the brods." On the 23rd I sent 280 lbs. of sugar to be made into syrup for winter feeding.

On the 4th of October I weighed all the hives, and found the gross weights range from 57 lbs. to 27 lbs., the two Italian ones, formerly mentioned, being respectively 57 lbs. and 53½ lbs. The best black stock was 45 lbs., and I at once decided to Italianize my whole apiary, and sent off for a dozen Ligurian queens, six of which duly arrived on the 20th. I found, on the 22nd, they were not a moment too soon, as in two cases princesses were reigning in the hives; and as they were, from too late hatching, not in a condition to reproduce their kind, not having been impregnated, nothing but destruction to the hives could have been the outcome. Unless the practical bee-keeper makes a minute examination of his hives, some such calamity as this may from time to time happen. Having satisfied myself of the fertility of the remaining queens, I weighed all hives, leaving nothing to chance. Although, no doubt, this has been an exceptionally bad season for bees, let us take courage and hope for better times to come.

NOVEMBER 25TH, 1879.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr. James Eggleton, jun., was elected an ordinary member.

SPECIMENS EXHIBITED.

Messrs. Thomas King and Peter Ewing exhibited a variety of mounted specimens of Fungi, which had been collected in the neighbourhood on the previous Saturday. This department of botany has of recent years been receiving more attention than formerly, and the number of species known and described has been

largely increased. Sir Wm. Hooker, in his "Flora Scotica," published in 1821, records about 200 species; while in the Rev. John Stevenson's "Mycologia Scotica," recently issued, over 2100 are enumerated. Our local botanists have taken up the study of the Fungi in earnest, with a view to the meeting of the Cryptogamic Society of Scotland in Glasgow during the ensuing autumn, when an exhibition of the lower forms of plant life will take place.

Professor Young exhibited a number of Tortoise remains from Rodriguez, on which he made some interesting remarks.

Mr. Robert Hill, corresponding member, showed remains of Fishes from Berbice, British Guiana; and the President gave a description of the various specimens, and announced that Mr. Hill had presented them to the Hunterian Museum.

Mr. John Kirsop exhibited a collection of mounted specimens of Ferns, Grasses, and other plants, from the interior of South Australia, sent by Mr. Alexander Murdoch; also Seaweeds from Kangaroo Island, sent by Mr. Duncan Brown, Port-Adelaide.

Mr. George A. Burns brought forward a number of bones of the Moa (*Dinornis gigantea*), which he had received from Mr. George Dennistoun, of Row, who had lived for many years in New Zealand. They were found by that gentleman on the banks of the Waitaki River, which divides the provinces of Otago and Canterbury, and were lying exposed in a deep gully on the Canterbury side, which had been cut into by very heavy rains. He says that these specimens are very small ones, and that when put together the largest of these remains stands about 15 feet high. It is generally supposed that the Moa has not been seen alive since 1850. They are represented by the natives to have been fat, stupid, indolent birds, which lived upon vegetable food. They belong to the order *Grallatores*, which includes the Ostrich, Cassowary, Emu, and Dodo; they are also called the *Brevipennes*, or short-winged, and were unable to fly, although they used their stumpy wings to assist them in running. Moas were very unwieldy birds, and the bones, especially those of the leg, are very massive and solid. The toe-bones almost rival those of an elephant, while the thighs are double those of an ostrich, and of such great strength that they could hit out behind with much force, and could kill a man or a dog with a single kick. Mr. Burns also showed a bundle of assegais from South Africa, which he thought might be interesting to those who had not seen these deadly weapons, of which so much had

been heard lately in connection with the Zulu war. They were picked up in the bush by Mr. Noble, clerk to the Assembly, and they had, no doubt, been used in warfare, as it was just after a battle between two native tribes.

Mr. Peter Cameron exhibited some new British Hymenoptera. He enumerated and described 15 species, all new to the British Fauna, and regarding a few of them he made some interesting remarks.

The President then spoke at some length on the composition of the heads of Crustacea, illustrating his remarks by a number of specimens.

DECEMBER 23RD, 1879.

Mr. John Young, F.G.S., Vice-President, in the chair.

Messrs. William Watson, George F. Bell, and William B. Robinson were elected ordinary members.

Mr. John M. Campbell exhibited a live specimen of the rare Smooth Snake (*Coronella laevis*), from Hampshire, and made the following remarks:—

The Smooth Snake (*Coronella laevis*, Boie; *C. austriaca*, Laurenti) is the rarest of all our British reptiles, and although so long ago as March, 1863, Mr. E. R. Alston exhibited a specimen before the Society, and made some remarks on the species, it may possibly be new to many of the present members. Mr. Alston then stated that the first recorded specimen taken in this country was captured by a Mr. Fenton, in Hampshire, in September, 1862, and was presented to the Zoological Gardens, London. It was there seen and identified by Dr. Günther, of the British Museum. But in the volume of Hardwicke's *Science Gossip* for 1872, a correspondent, while recording the capture of one in Dorsetshire, mentions that the first authenticated specimen was captured in June, 1854, where, he does not state. It has also been taken near Christchurch, and J. R. Wise, in a book entitled "The New Forest," gives Dorsetshire, the New Forest, and Kent, as localities for the Smooth Snake. The specimen I have brought here to-night was taken on a moor near Bournemouth, Hampshire, which is, as far as I know, the most productive locality for the species in this country, though there is good reason for believing that it has a wider range. Bell, in his "British Reptiles," second edition, 1849,

p. 60, states, under the heading *Coluber dumfriensis*, Sow.:—"Many years since a small Snake, having the characters of one of the *Colubridae*, was taken by Mr. J. W. Simmons, near Dumfries. It was published as a new species by Mr. Sowerby in his *British Miscellany*, and figured in the third plate of that work. It was there named *Coluber dumfriensis*. The specimen remained until within the last few years in the possession of Mr. Sowerby's family; but having come into my hands, it was unfortunately lost or mislaid, and I have never since been able to recover it. There is, I think, great reason to believe that it was a very young *Natrix torquata*, but differing certainly in many respects from the usual appearance and characters of that species. It was about three or four inches in length, "of a pale brown colour, with pairs of reddish brown stripes from side to side, over the back, somewhat zigzag, with intervening spots on the sides." The most remarkable peculiarity mentioned, however, is that the "scales are extremely simple, *not* carinated." The abdominal plates were one hundred and sixty-two; those under the tail about eighty. This is all the information at present possessed respecting the species, if it be indeed a species. Mr. Jenyns, in his excellent *Manual*, expresses the opinion which I have given above, that it is "probably an immature variety of the common species."

From the above description, I have strong reasons for believing the Snake referred to to have been a Smooth Snake (*C. laevis*), and if such was the case, it proves it to have a much wider range than generally supposed. In this species the scales are rhomboidal, perfectly smooth, and in long rows (Günther gives 21), the ventral plates 160 to 164, the anal plates bifid. Its colour is brown or greenish brown, with two parallel rows of black markings. Very probably it may often be mistaken for the Adder, but the entire absence of the dark zigzag line of black markings, which is a specific character of the Adder, would at once distinguish it from that species, while the yellow collar and the carinated scales of the Ringed Snake form a sufficient distinction in the case of that species.

I have not had sufficient opportunities of observing the habits of the Smooth Snake, but in the volume of the *Zoologist* for 1865, there are (pp. 9505 and 9734) two interesting papers by Drs. Opel and Blackmore, more especially on the habits of this species in confinement. Its food seems to be principally Lizards, but these

observers state that it also takes Slowworms, killing them by constriction, like the larger tropical snakes. It is said to be ovoviviparous; but one in the possession of Mr. Buckland gave birth to six live young ones. Mr. Alston is of the opinion that "the animal is oviparous, but has the power of retaining her eggs up to the hatching point when in adverse circumstances."

Mr. Campbell also showed specimens of the Bandurria (*Geronticus melanopis*, Gmelin) and eggs, from Patagonia and Chili, and gave some interesting notices of the habits of this bird from personal observation in South America.

Mr. James Eggleton exhibited a fine specimen of the Golden Eagle (*Aquila chrysaëtus*, Lin.), shot on the estate of Ballimore, Lochfyne, Argyllshire, on 28th October last.

Mr. Arthur Pratt brought forward a fine series of skins of birds from the Island of Borneo. The collection, which consisted of upwards of 70 specimens, embraced a variety of species, such as Kingfishers, Woodpeckers, Birds of Paradise, &c., and was much admired on account of the fine plumage of the specimens and the excellent state in which the skins had been preserved.

Mr. John Farquhar exhibited a specimen of *Aporrhais pelicani*, which he had found in the glacial clay-beds at Garvel Park, Cartdyke, and which had not formerly been recorded from that locality, although it has been obtained in several other post-glacial deposits.

PAPERS READ.

I.—*Ornithological Jottings from the neighbourhood of Loch Lomond.*
December, 1879. By Mr. JAMES LUMSDEN, F.Z.S., M.B.O.U.*

At the meeting in February, 1878, I had the pleasure of reading to this Society a rough list of the Birds of Loch Lomond and its neighbourhood. Since that time I have continued to keep notes from all parts of Dumbartonshire and Stirlingshire—of which counties Loch Lomond forms the connecting link—and the following jottings, referring only to the Loch Lomond district, although not of much value taken by themselves, may not be without interest as supplementary to the list already mentioned.

* Although this paper was read in December, 1879, it has been brought up to date of going to press, October, 1880.

During the winter of 1878-79 many species of small birds—and indeed some of the larger ones also—suffered most severely from the long-continued hard frost and snow, one result of this being a great reduction in the numbers of Blackbirds and Thrushes. Never do I remember seeing so few of those birds on the banks of Loch Lomond as during the past summer, and in some gardens gooseberries were allowed to hang on the bushes quite unprotected by nets, which have in most seasons to be used long before the fruit is ripe. Starlings also suffered, but are not mourned for, as their numbers had of late years increased to such an extent that they are now by many people included in the list of pests. Perhaps one cause of this is their most objectionable habit of building their nests in the chimneys of houses. For it is disagreeable to find, on the first cold day of early winter, when fires are resumed, that there is not a vent in the house that will *draw*, all being filled with Starlings' nests. Nor would any one who has not seen nests of these active little birds easily believe the large amount of materials—hay, straw, feathers, and other odds and ends—which a pair will stuff into a chimney.

Black Game and Partridges were also scarce this year, as in other parts of Scotland. The cold, late spring, however, must be blamed for this rather than the severe winter months.

ROUGH-LEGGED BUZZARD.

BUTEO LAGOPUS (Gmelin).

Since my former list, three specimens of this species have been got in the neighbourhood. One was taken in a trap set for Hooded Crows at Arden, 31st March, 1876, and is a fine bird in perfect plumage. One shot at Rowardennan, 20th November, 1876. One taken 17th February, 1880, within a few yards of the same place as the one caught at Arden in March, 1876. In this case also the trap was set for Crows. The bird was a male, and its stomach contained nothing but some digested vegetable matter.

GREAT GREY SHRIKE.

LANIUS EXCUBITOR, Linnaeus.

A bird of this species was shot at Rossdhu, Luss, in December, 1878. On being examined its stomach was found to contain the leg and feathers of a Robin. The bird is now in the collection of Mr. John Colquhoun, Edinburgh.

The Shrike is very rare in the Loch Lomond district, not more than four or five specimens having ever occurred.

Mr. William Colquhoun informs me that he once got one at Rosdhu in a snare set for small birds—the Shrike being caught when darting at a bird in the noose.

CAPERCAILLIE.

TETRAO UROGALLUS, Lin.

This species has, since 1876, taken a firm footing in the district, specimens having been obtained on one or two occasions. It may now be classed with the residents, as a pair bred in the Buchanan Woods (Stirlingshire) in 1878. It is worthy of remark that all the birds shot have been females.

RED GROUSE.

LAGOPUS SCOTICUS (Latham).

An albino of this species was shot by Mr. R. D. Mackenzie of Caldarran, on Dumbarton Moor, on the 14th of August, 1879. The bird was pure white, with the exception of one or two dark feathers on the back. It was a bird of the year, and all the rest of the covey were of the usual colour.*

WOOD SANDPIPER.

TOTANUS GLAREOLA (Lin.).

This species may now almost be considered as a regular autumn visitant, a second specimen having been obtained at Ross Priory on 4th October, 1878. Although this is only the second record of the Wood Sandpiper, yet there is every reason to believe that the bird is more common than is usually supposed, its likeness to many of the other Sandpipers causing it to escape notice.

RUFF.

MACHETES PUGNAX (Lin.).

I am informed by Sir George H. Leith Buchanan that a Ruff was shot by the Duke of Montrose, in September last (1879), on the shore of the Loch near the mouth of the Endrick, on the

* Four albinos were seen several times by Mr. Mackenzie on the same moor in the following season, August, 1880.

Stirlingshire side. This bird has been preserved, and is now at Buchanan Castle.

This is the first specimen of this species which has occurred within our district, and it is far from common in any part of the West.

WILD SWAN OR WHOOPER.

CYGNUS MUSICUS, *Bechstein*.

Eight adult Wild Swans and one young one frequented Loch End, Caldervan, for several weeks during February and March, 1880. Birds of this species were also seen on Loch Lomond about the same time.

Obs. Lieutenant-Colonel James Colquhoun informs me that he saw two Black Swans on Loch Lomond, in June or July, 1879.

LONG-TAILED DUCK.

HARELDA GLACIALIS (*Lin.*).

Many years ago a female of this lovely species was shot near Ross Priory, and is now in Sir George Leith Buchanan's collection there. With this exception it has never been recorded from our district.

The male bird now exhibited was shot two or three winters ago (I have been unable to get the exact date) by one of the Cameron gamekeepers. It was got at the lower end of the Loch, near Cameron House. Although not a rare bird on the sea coasts of Scotland, especially on the north and east, it is very seldom found on any of our fresh-water lochs.

SHIELDRAKE.

TADORNA VULPANSER, *Fleming*.

This is the only new species I have to add to the former list.

A young bird was shot in the summer of 1877 by Sir George Leith Buchanan. He thinks the bird must have been bred in the neighbourhood. Some time previous to his obtaining the specimen, he had observed an old bird and two young ones sailing about the Loch, which he thought belonged to this species, but he failed to get near enough to identify them with certainty.

If the species has bred on the banks or on one of the islands of the Loch, it is worthy of note, as it is unusual to find it nesting so far from the sea.

SCLAVONIAN GREBE OR HORNED GREBE.

PODICEPS CORNUTUS (Gmelin).

By the kindness of Mr. Clark, Alexandria, I am able to exhibit a specimen of this species shot on Loch Lomond about three years ago. A pair were obtained, and the one now exhibited is the male. In my list I put down this bird as having been obtained on the Loch, on the authority of a friend who knows birds well, but this is the first specimen I have ever seen or that I have any definite information about. I do not, however, doubt that the Horned Grebe is a more common species than is supposed in many places—the “Hell Diver,” as the Americans call it, being hard to catch.

II.—*Vegetable Parasites and Saprophytes.*

By Mr. ROBERT TURNER.

Of plants that depend on organic matter for their nutrition, Parasites are those that attach themselves to other living organisms and prey on their juices, Saprophytes those which obtain their nourishment from dead and decaying substances. Plants that are entirely destitute of chlorophyll belong, without exception, to one or other of these two groups; but there are many in which chlorophyll is both present and effective, that are, nevertheless, largely dependent for their nutrition on the absorption of organic matter.

In the fungi the extreme degree of dependence on other organisms is reached, this extensive order being wholly composed of parasites and saprophytes, which are not only destitute of chlorophyll but also of starch. Their mycelium is only capable of growth where it finds organic matter to absorb, which it can convert into its own substance. This is the case in regard to the so-called “Yeast Plant,” for instance, which multiplies indefinitely in a fermentable liquid at a moderate temperature, but which in a solution of pure sugar cannot grow, since that does not contain the nitrogenous materials which go to form protoplasm. Besides these materials the plant requires oxygen. When, as in the process of fermentation, it cannot obtain atmospheric oxygen, it is able to decompose the saccharine matter, absorbing the oxygen and setting alcohol and carbonic acid free. If, however, it be exposed in a fermentable liquid to the atmosphere, it will flourish and produce plenty of carbonic acid, consuming the oxygen of the air; but there

will be hardly any traces of alcohol in the liquid. On the other hand, if there is sufficient nitrogenous matter, the fermentation goes on, accompanied by the production of a more highly-developed form of the mycelium, consisting of elongated filaments known as the "Vinegar Plant." This organism, and of course the "Yeast Plant" as well, seem to be but imperfectly developed forms of several fungi which are usually regarded as specifically distinct.

This affords one of the few instances in which the lower fungi prove of any economic importance; but it is not difficult to find many of these plants that cause much mischief and devastation. One of them (*Peronospora infestans*) occasions the potato blight, and as illustrative of parasitic action in general, it is worthy of consideration, especially as so much is now known of its modes of reproduction. Its mycelium possesses the power of destroying the starch and other substances in the tissue of the potato, and of absorbing part of the products; but its adaptations for reproduction are especially noteworthy. Branches of the mycelium break from the interior of the leaf into the air usually through the stomata. These threads ramify, and at the tips of the branches bear two kinds of fruit—1st, simple spores or conidia; and 2nd, vesicles containing zoospores. A simple spore falling on a suitable *nidus* sends mycelial filaments through the stomata into the interior of the plant, and thus germinates. The vesicle, on the other hand, on the application of moisture, sets free a swarm of zoospores, varying in number from half-a-dozen to upwards of a dozen, each of which is furnished with two lash-like tails. These zoospores move rapidly about like animalcules for about half-an-hour after emerging from the vesicle, when they enter the stomata of the potato leaf (on which it is assumed that they are moving about), and there germinate. One square line of the surface of such a leaf is calculated to be capable of producing 3,270 acrospores, each yielding at least 6 zoospores, so that we have thus 19,620 reproductive bodies from that small space. When they cease to move, their lash-like tails disappear, and the mycelium proceeding from them commonly penetrates the cellular tissue in twelve hours at farthest. The fruit-bearing thread bursts out, usually through the stomata, and perfects its fruit in from fifteen to eighteen hours. Hence it is clear that countless myriads may be produced in a few days from a single germ. Dr. de Bary traced the development of the zoospores from the earliest stages, and found that the brown

spots on the potato haulm and leaf are the result of their action. If we consider that it is only when the zoospores act on the leaf that these brown spots are produced, it seems evident that the fungus is not the result of a diseased state of the potato, but really causes that disease. Both modes of reproduction—by conidia and by zoospores—are asexual, and both bodies are used up in the production of the mycelium, while its delicate filaments can but rarely survive the cold and wet of winter, and must usually perish with the leaves and haulm of the foster plant. In other species of *Peronospora* bodies called oospores had been known for many years as the products of the contact of two sexual, spore-like bodies—the antheridium, and oogonium; but it was not till 1875 that anything similar was discovered in *P. infestans*, the credit of this important accession to our knowledge being wholly due to Mr. Worthington Smith. The antheridium not only comes into contact with the oogonium, but fixes a small fecundating tube—a pollinodium—into its wall, discharging through it part of its protoplasm and producing fertilisation. The oogonium then matures into the oospore in the same way as the ovary of phanerogams becomes the perfect fruit. When this “resting spore” is mature, the mycelial threads disappear and it lies free among the cells of the tissue of the potato plant. These oospores are not delicate and unenduring like the conidia and zoospores, but become at length dense, dark bodies, covered with reticulated warts. The potato plant decays during winter, but they survive and are washed by the rains into the soil, where they rest for a variable period, when they germinate in the damp earth, either fixing themselves on potato plants, if these are near, or producing zoospores, which act similarly to those previously described, germinating in the same way. If potato plants are not available to which they can attach themselves, in process of time they perish. Farmers have often unwittingly done everything possible to facilitate the attachment of these germinating oospores to their host, the potato. Some of them, laudably desirous of utilizing everything, have the haulms, decaying tubers, and other refuse of their potato crop removed to their manure heaps, where they rot and become manure. But the little oospores do not rot. They lie with their vitality shut up in them till next spring, and when the farmer has his manure spread thick over his potato fields, he is sowing at the same time myriads of these little germs, which

will yet grow up in a mischievous crop. On the other hand, if he allows these decaying haulms to lie about his fields, the oospores will be washed into the soil and into ditches and drains, and moisture is especially favourable to the preservation and germination of the fungus. Destruction by fire seems to be the proper course to pursue with potato refuse, but it remains a question how much effect that might have after all on the disease.

The modes of reproduction in the fungi are very intricate and varied, but, so far as the question of their parasitism or saprophytism is concerned, it is unnecessary to enter further into details. It will be sufficient to indicate wherein these plants are especially adapted in their reproduction and growth for a parasitical or saprophytical way of life.

(1) *The minuteness of the spores renders them easily carried about in the atmosphere, &c.* The size of these spores varies considerably from a microscopic point of view; but all are exceedingly minute in the ordinary acceptation of the term. The spores of common "corn-smut" (*Ustilago segetum*) for instance, are so very minute that 49 of them would be contained in the $\frac{1}{100,000}$ th part of a square inch, or nearly 8,000,000 to the square inch. It would take millions of the spores of moulds to form a body the size of a pin-head.

(2) *The myriads of spores produced are an important element in ensuring extensive diffusion, so that they may find a suitable nidus.* To give some idea of the number of spores produced in an individual fungus, it has been calculated that in a specimen of *Boletus subtomentosus* five inches in diameter, there were produced no less than 5,000,000,000 spores.

(3) *The exceeding rapidity of their growth, which is largely dependent on their modes of nutrition on organic matter, is evidently of advantage in connection with their parasitism and saprophytism.* The Great Puffball will grow to the size of a child's head in a few hours, and Dr. Lindley computed that its cells multiply at the rate of 60,000,000 in a minute. Dr. Carpenter gives an instance of the rapid growth of Toadstools, as indicated by their expansive power in lifting some of the heaviest stones of a pavement completely out of their beds, one of these stones weighing 83 lbs., and the resistance offered by the mortar having also to be taken into consideration. The rapid development of *Peronospora infestans* has already been referred to.

(4) *The fact that fungi can usually flourish as well in darkness as in sunlight gives them a further advantage in regard to their nefarious habits.* The absence of light seems in many cases to be rather conducive to their development, as they are generally most abundant in dark cellars, hollow trees, under logs, or in the obscurity of woods, while some are subterranean. Not a few of them seem, however, to require light for particular processes in their growth and reproduction.

(5) *The varied modes of reproduction and the alternation of generations, so common in the lower forms, give them a further advantage in the struggle for life.* If *Peronospora infestans*, for example, were limited to the production of "resting spores," it is evident that the havoc it occasions would be much reduced; but by the ready production of conidia and zoospores it propagates its kind with great rapidity and success. The alternation of generations in which, for instance, the forms known as *Aecidium*, *Uredo*, *Puccinia*, and again *Aecidium*, are successively produced, seems to serve the same purpose.

There are, without doubt, other points in connection with the reproduction of fungi which may yet be found to be of importance in relation to their extensive diffusion and modes of nutrition; but considerable obscurity still rests on many of these processes. For instance, little of a satisfactory nature is known as to the function of the spermatogones and their spermatia, which are found in not a few of the Coniomycetes.

In proceeding to consider shortly the phanerogamic parasites and saprophytes, my remarks will be chiefly confined to the plants found in Britain. Probably all plants with viscid hairs or glutinous excretions retain and absorb the nitrogenous organic matter floating in the air, and in some cases living insects as well. That glandular hairs have the power of absorbing ammonia, both in solution and in the gaseous state, has been clearly proved by the experiments of Dr. Darwin. As there is an appreciable quantity of ammonia both in the atmosphere and in rain-water, and as many plants bear individually an immense number of glandular hairs, this mode of nutrition may not be so unimportant as we might at first be inclined to suppose. Darwin states that a plant of *Primula sinensis* was found to bear upwards of 2,500,000 of these glandular hairs. He is further of opinion that such plants obtain animal matter from the insects entangled by the viscid

secretions. The plants known as decidedly insectivorous are evidently closely related in respect of nutrition to this class, and so far as such plants are concerned, they are either rootless or are never found to possess large or highly-developed roots, and never grow in rich soils in which plentiful absorbable organic matter exists. Examples are afforded by our *Drosera*, *Pinguicula*, and *Utricularia*, and by the exotics *Dionaea muscipula* and *Aldrovanda*, all of which are either aquatic, or grow in swamps and marshes; by *Drosophyllum lusitanicum*, which is found on dry barren hillsides in Portugal and Morocco. It would thus seem that the adaptations for capturing insects are only or mainly developed in plants that have little chance of obtaining nitrogenous nutriment from the soils in which they grow. Probably most of the higher plants can live and flourish without absorbing any organic matter; but, however that may be, it is an undoubted fact that a very large proportion of them do usually derive a part of their nourishment from this source. This is markedly the case in many cultivated plants, which absorb organic manures largely, and are thereby stimulated to increased growth and development, and to greater activity in assimilating. In this latter respect these cultivated plants differ widely from typical saprophytes and parasites, which have come to depend wholly on supplies of organic matter, and have given up assimilating for themselves.

If we regard exclusively the amount of nutrition derived by vegetable parasites from foster plants, those which are, after attachment, wholly dependent on their hosts will be held to be completely parasitic, as *Lathraea*, *Cuscuta*, *Orobanche*; while those which supplement their drafts on their hosts by assimilating for themselves will only rank as sub-parasitic, as *Viscum*. If we regard, however, the mode of attachment to the foster plant, the class of complete parasites will include *Viscum*, which in one respect—that of germinating on its host—is more distinctively parasitic than any other British species, all the others germinating in the soil and subsequently attaching themselves. There is a group of plants, including *Euphrasia*, *Melampyrum*, and the like, which, like *Lathraea*, turn black when dried, and are usually regarded as partial parasites. These plants, however, not only assimilate for themselves, but their attachment to other plants is, at the most, a very superficial one. The glandular pubescence of many of them would, besides, seem to indicate the atmosphere as

another source available to them for the supply of nitrogenous nutrition.

The Mistletoe (*Viscum album*) is the only woody parasite indigenous in Britain. *Loranthus europaeus*, another representative of the same order, is found on the Continent, while many allied species are indigenous in the hotter parts of Asia and America; and all of them are parasitic. They possess no medullary sheath of spiral vessels, but the wood contains scalariform tubes. Their nearest allies are the *Santalaceae*, and to this order the British plant, *Thesium linophyllum*, which is recognised as a partial parasite, belongs. The seed of the Mistletoe clings to its host by means of a viscid pulp, and when the radicle sprouts it drives its way through the bark till it reaches the cambium layer, where it connects itself organically. This natural process is in fact similar to the artificial one of grafting, and no further development of root-structure occurs, the full grown plant appearing rootless, like a graft or branch on its host. The Mistletoe is found on a great variety of trees—usually in England, however, on the apple, poplar, or thorn, while its occurrence on the oak is very uncommon.

The order *Orobanchaceae* is represented in Britain by various species of *Orobanche*, and by *Lathraea squamaria*. These all germinate in the soil, and afterwards attach themselves to the roots of certain plants. The order is probably a parasitical branch of the *Scrophulariaceae*, in which there are many of the so-called partial parasites formerly referred to, while its exotic genus *Striga* is distinctly parasitic, and *Buchnera hydrabadensis* has, like *Orobanche*, scales instead of true leaves.

Twining or trailing herbs are, more or less, on the way towards becoming parasitic, and it is not therefore surprising that the *Convolvulaceae* present, as in *Cuscuta*, instances in which the twining habit has become connected with parasitism. All the species of *Cuscuta* are leafless; they germinate in the ground, and then coil round other plants, at the same time developing sucker-like bodies, known as haustoria, which in this instance penetrate the tissues of their hosts. These parasites subsequently nourish themselves entirely through the haustoria, their lower parts connected with the soil dying away. They have wire-like stems, with minute scales at the nodes, and tufts of small convolvulaceous flowers. In some parts of England they are very destructive in clover and flax fields.

Among the *Orchidaceae*, *Neottia nidus-avis* is a brownish, leafless saprophyte. Its true root is exceedingly minute, though what is popularly considered the root is a mass of succulent, thick root-fibres, from the extremities of which young plants are produced. It is found in the rich vegetable soils of dark, damp woods, and seems to nourish itself by rendering soluble the organic matter in the soil, absorbing it and converting it into its own substance. *Corallorhiza* and *Epipogium* in the same order, and *Monotropa* belonging to the *Pyrolaceae*, are plants of a similar character. All of them contain traces of chlorophyll, which is not to any extent, however, effective for assimilating. They possess, further, abundance of starch, the materials of which are evidently absorbed in a soluble form, and then converted into it in a manner similar to what goes on in the roots, bulbs, tubers, &c., of ordinary green plants. This general resemblance to organs in which stores of reserve material are laid up is further evidenced in the case of *Lathraea squamaria*. In the interior of the nucleus of quickly-growing cells in that plant, those protoplasmic bodies to which Nägeli gave the name of crystalloids are observed in great numbers. They are usually only found in cells where there are large quantities of reserve material (as potato tubers, oily seeds, &c.), and they seem especially adapted for a dormant condition, the case of *L. squamaria* being the only known instance of their existence in quickly-growing cells.

In phanerogamic parasites the embryo not uncommonly remains rudimentary. In *Cuscuta*, *Orobanche*, and *Lathraea*, for instance, the cotyledons are not discernible. In the Mistletoe, too, the nucleus of the ovule is naked, no coats being formed, and the seed frequently contains two or even three embryos. The parasitical habit thus seems to affect the embryo and its development.

To groups of organisms that cannot obtain their nutriment from inorganic sources, it is hopeless to turn for any insight into the primordial forms of life. The very fact of parasitism and saprophytism presupposes the existence of other organic life; and it would seem probable that the primordial protoplasm must either have been in the form of a chlorophyll body or one possessing similar powers of nutrition. Nevertheless, vegetable parasites existed at a very remote geological epoch. The great botanist, Robert Brown, long ago discovered the mycelia of a fossil fungus. Some years ago Mr. Carruthers, of the British Museum, recognised mycelial threads in the tissue of a fossil fern from the Eocene beds

of Herne Bay; and in 1877, while preparing a slide to show the vascular structure of the axis of *Lepidodendron*, he observed both the mycelium and oogonia of a fungus, which Mr. Worthington Smith subsequently described, naming it *Peronosporites antiquarius*. A *Mucor* had been previously described from the Coal Measures, and other fungi had occasionally been observed, though no definite descriptions had been given. According to Mr. Smith, the mycelium of this *Peronosporites* is clearly septate, and certain of the oogonia show the contained zoospores "with a clearness"—to use his own words—"not to be exceeded by any living specimen at the present time." The oogonium is exactly the same in size and character with that of our *Peronospora infestans*—the contained zoospores are of the same form and dimensions, while the average number of zoospores in each oogonium is the same. In this lowly organism we have probably a simple primordial fungus. *Peronospora* is very closely related to the algae, the *Saprolegnieae*—which unite the parasitic habit of moulds with the fructification of algae—being the connecting link. Now Sachs and others place the lower algae among the primeval plants from which fungi and other cellular cryptogams have branched, and the extreme antiquity of this closely-allied form—*Peronosporites*—lends much support to their views. Were algae once to branch out in this way, we can so far understand—if we accept the theory of evolution—how all the variety and complexity that characterise the fungi arose during the millions of years that have elapsed since, at the least, the time when this *Peronosporites* lived. The lowly cellular structure of these fungi would in itself probably indicate their appearance at an early period in geological time, but this important discovery has set the matter at rest.

Nor is this *Peronosporites* by any means the oldest known instance of vegetable parasitism, which has, besides, been observed in fossils of both the Silurian and Devonian systems. Professor P. M. Duncan describes an alga (*Palaeachlya*) found on Silurian corals, which agrees in shape and size with the form parasitic on corals of the present time, known as *Achlya*, resembling *Saprolegnia ferax* in its habit; and he further considers *Empusa*, *Saprolegnia*, and *Achlya* to be the same organisms living under different physical conditions. If such be the case, the wonderful persistence of form in this lowly organism is deserving of attention. As further testimony to the intimate relationship between the alga-

fruited *Saprolegnieae* and the lower fungi, our greatest English authority on this subject, Dr. Berkeley, has expressed his opinion that *Achlya* may be an aquatic form of *Botrytis bassiana*, the fungus that attacks the silkworm.

To sum up, it would appear that the fungi have been developed from the lower algae, while the phanerogamic parasites and saprophytes have branched out from various classes of ordinary green plants—*Cuscuta* from twining species of the *Convolvulaceae*; *Orobanche* from the *Scrophulariaceae*, from which in *Buchnera* and *Striga* it is only separated by its parietal placentas; and the *Loranthaceae* probably from the *Santalaceae*. The British saprophytic orchids belong to an order which in warmer climes possesses many epiphytic species, and this epiphytism may be regarded as somewhat allied to parasitism and saprophytism. *Monotropa* is connected, in its mode of nutrition, with *Pyrola* by an exotic species—*Pyrola aphylla*—which is devoid of effective chlorophyll and has scales in place of true leaves.

I trust I have succeeded in bringing before you a few salient points in connection with this subject; and I think we cannot help admitting that the adaptations of plant parasites for pilfering from their neighbours, and of saprophytes for investing dead matter with life in a new form, are as admirable as any others in nature, and that the same elaboration and finish have been given to all their organs as have been bestowed on other living beings.

The Chairman, in proposing a vote of thanks to Mr. Turner for the able manner in which he had treated this important subject, referred especially to the instances given in the paper of parasites on the *Lepidodendrons* of the Coal Measures, &c., and stated that there were records of the finding in many cases of parasitical algae on fossils of the Silurian period.

JANUARY 27TH, 1880.

Mr. W. J. Milligan, Vice-President, in the chair.

Messrs. William Holbrook and James Steel were elected ordinary members.

SPECIMENS EXHIBITED.

Mr. A. F. Fergus exhibited several specimens of Moss-cup, *Peziza coccinea*, and stated that he had been induced to bring this

fungus before the Society, as he thought it was not so well known to a number of botanists as it ought to be. It is one of the most beautiful of the British fungi, and nothing can be more lovely than its crimson cup embedded in moss. It is often figured on Christmas cards; but, excepting at Cove, on Loch Long, Mr. Fergus had never seen it in nature. The form is somewhat infundibular, but is often more or less flattened or spread out. It grows to about the size of 1 inch, sometimes reaching $1\frac{1}{2}$ inches. It grows in moist places, and there is a popular tradition that it is only to be found on the hazel or oak; and, so far in corroboration of this, Mr. Fergus said he had not found it on any other wood. If a transverse section be cut out of the rim and put under the microscope, it will be found to consist of three layers, externally a cuticle covered with hairs on its outer surface, in the middle a somewhat granular layer, and internally the pigmented layer, which also contains the spores, as usual, eight to a sac, each individual spore being about $\frac{1}{850}$ th part of an inch—*i.e.*, between 4 and 5 times the size of the red blood corpuscle of the human subject.

Mr. Fergus also showed an abnormal variety of the Dandelion, *Taraxacum officinale*, found at the Kyles of Bute in July, 1879, and growing in a cottage garden. The specimen, in its essential features, did not differ from the typical form, but in addition there was developed rather more than half-way up the stem what was to all appearance a true leaf; and in its axil was developed a stem, 2 inches long, bearing another floral capitulum—in fact, practically a branch. When the specimen was plucked, the hollow stem and usual lactiferous discharge were observed, and in digging up the root there was noticed on the stem a good-sized bud, probably the embryo of another similar development. As to the cause of this abnormality, Mr. Fergus did not feel justified in giving an opinion, probably it was caused by some division of the growing point taking place as it forced its way through the soil. As a matter of fact he had often observed the capitula of Dandelions split up into two, three, or even four divisions, each subdivision resembling to some extent the perfect capitulum, but he had never seen the development of a leaf almost like a bract with a floral axis in its axil.

Mr. James Eggleton exhibited a specimen of the Little Auk, *Mergulus alle* (Lin.), got last year in the neighbourhood of Loch Lomond, and a fine specimen of the female Capercaillie, *Tetrao*

urogallus (Lin.), obtained recently near Milngavie, and remarks on them were made by several of the members.

Mr. James Allan exhibited a collection of mosses from Bogota, New Grenada. The specimens were all named, and numbered 98 species, and 56 genera, many being indigenous in Britain.

PAPERS READ.

I.—*Meteorological Notes and Remarks on the State of Vegetation during 1879.* By Mr. DUNCAN M'LELLAN, Superintendent of Parks.

This year has been exceptionally unpropitious, both for the animal and vegetable kingdom, owing to the long and severe winter season. It is only upon the latter that I purpose to make a few remarks. The year was ushered in with frost, and snow 4 inches deep, which continued more or less during the first four months. Beginning with January, the thermometer, as registered at the Queen's Park, was below the freezing point on 28 mornings, and only on 10 days did it rise above 32°. 249° of frost were registered during the month, and only 102° of heat. There were 25 dry days. The average depth of snow was 6 inches, and it remained upon the ground for 26 days. The average temperature was 34°·24. In February the thermometer was below 32° on 19 mornings, and registered 98° of frost, and 120° of heat. The dry days were 17. Snow and sleet fell on 11 days. The average temperature was 32°·24. During March rain and sleet fell on 10 days, and snow on 5 days. The heaviest fall of the season took place on the 17th, when about 12 inches lay on the ground, but partially disappeared the following day. The thermometer fell below 32° on 12 mornings. The average temperature was 46°·32°. The dry days were 16. April was a very cold month, the prevailing winds being north by east. Snow fell on the 13th, and during the month there were 20 days on which we had no rain. The average temperature was 45°·34°. In the beginning of May the weather continued remarkably cold, 12° of frost being registered between the 5th and the 9th. The dry days numbered 22, and the rainfall was 1·34 inches. The average temperature was 54°·38°. June is to be noted as the wettest month of the year. Rain fell on 21 days, giving 5·91 inches, and there were heavy thunder-showers of rain and hail on the 8th, 11th, and 21st. July was also

a dripping month, there being 3·37 inches of rain, and only 15 dry days. The average temperature was 61·49°. During August we had 4·58 inches of rain, and 13 fine days. The maximum temperature was 64° and the minimum 49°. There was nothing special to note in temperature, &c., for September, October, and November. Fortunately these months proved the most favourable of the year, which enabled farmers to secure their crops, and promoted the maturing of wood and flower-buds upon trees and shrubs. December commenced with severe frost. The thermometer registered 20° on the 4th, but towards the close of the month the weather became dry and mild. On the 22nd there were in flower in the Parks Christmas Roses, Violas of sorts, the Daisy, the Buttercup, and *Poa annua*. The two last-mentioned were also observed in George Square. There were in all 22 dry days, and the average temperature was 36·29°.

The coldest day of the year was December 4th, when the thermometer registered 20° of frost; and the warmest day July 28th, on which we had 78° in the shade. The average temperature for the year was 48·37°, as compared with 53·39° in 1878. The total rainfall was 30·93 inches, as against 26·18 inches in the previous year.

In summing up with a few general remarks upon the state of vegetation during the past year, I may notice that, consequent upon the severe spring, crops of all kinds were from four to six weeks later than usual. The Christmas Rose, which should have been in flower in December, 1878, only bloomed at the Queen's Park on February 24th; the Snowdrop appeared on March 1st, and the Crocus on the 20th of same month. The Lilac flowered on June 7th, the Laburnum on June 11th, and the Hawthorn on June 16th. Summer, or bedding-out plants, were almost a complete failure, with the exception of Violas; but this remark does not apply to those in the carpet beds, which proved fairly successful. Trees and shrubs made weak and sickly growths, and neither the wood nor flower-buds have been thoroughly matured to withstand the severe winter which we are now experiencing.

Referring to the injury sustained by trees and shrubs during the winter and spring, 1878-79, I am glad to observe that they have not suffered materially in the neighbourhood of Glasgow. The covering of snow which remained upon the ground during the hardest frost afforded partial protection; nevertheless, at Kelvin-

grove Park, Bay Laurels were all killed, except *Laurus colchicum* and *rotundifolium*. Several *Rhododendron ponticum* suffered severely, while the hybrid varieties escaped. *Aucuba japonica* was not injured either in spring, or on the 4th December, when, in the neighbourhood of Edinburgh, they were frosted to the ground. The following plants were more or less affected by the frost at Queen's Park, viz.:—*Pernettya mucronata*, Bay and Portugal Laurels, *Ribes sanguineum*, *Cryptomeria elegans*, *Escallonia macrantha*, Double-flowering Whin, Spanish Broom, &c. A number of Japanese Coniferae, planted out, have been found to be perfectly

METEOROLOGICAL RECORD KEPT AT QUEEN'S PARK, GLASGOW,
FOR THE LAST THREE YEARS.

MONTH.	1879.				1878.				1877.			
	Rainfall.	Thermometer.		Dry Days.	Rainfall.	Thermometer.		Dry Days.	Rainfall.	Thermometer.		Dry Days.
		Average.				Average				Average.		
		Max.	Min.			Max.	Min.			Max.	Min.	
January,	1·00	34	24	25	4·65	41	31	14	9·39	41	31	4
February,	·94	36	29	17	1·41	44	35	17	4·45	48	33	5
March, .	2·75	40	32	16	1·85	49	32	21	2·33	45	30	12
April, .	1·49	45	34	21	2·25	53	38	19	2·26	47	34	18
May, . .	1·44	54	38	22	2·73	60	42	14	1·57	54	37	22
June, . .	5·91	60	45	9	2·30	68	45	18	2·86	68	47	14
July, . .	3·37	61	49	15	·39	71	48	27	3·07	64	49	4
August, .	4·58	64	49	13	2·53	67	50	13	6·20	63	48	9
September,	3·37	57	44	10	4·61	63	47	10	1·50	60	41	22
October, .	2·08	52	38	21	1·26	65	43	20	4·71	54	39	11
November,	1·52	44	33	24	1·30	41	30	23	5·22	52	40	2
December,	2·48	36	29	22	·90	33	28	29	4·47	44	33	8
	30·93	48	37	215	26·18	53	39	225	48·03	53	38	131

hardy. At Messrs. Austin & M'Aslan's Titwood Nursery, which is considerably lower than the Queen's Park, Portugal and Bay Laurels, Sweet Bays, *Acucuba japonica*, and Laurestinas were considerably cut up. From several newspaper reports it appears that, in the south and east of Scotland, during January, the thermometer, on several occasions, registered a few degrees below zero. Consequently *Cedrus deodara*, and many valuable Coniferae, were killed outright; and, in various instances, hares and rabbits, in a famished state, stripped the bark off every green twig within their reach. Even the Monkey Puzzle, *Araucaria imbricata*, did not escape their ravages. In the north and west apparently little damage has been occasioned by frost; but in not a few instances the snow, especially during March, deprived many a noble silver spruce and Scotch fir of its branches, which means slow death. The pecuniary loss sustained throughout Scotland from the effects of wind and weather upon trees is estimated at several hundred thousand pounds.

II.—*On Tubers, Bulbs, and Tap Roots, their Functions in the Vegetable Economy.* By MR. ALEXANDER S. WILSON, M.A., B.Sc.

Every part of an organism is so intimately related to the conditions under which it lives, that only by the study of such relationships are we enabled to disentangle those complex forces, by the balancing and counteracting of which the stability of any organic form is in nature determined. Formerly, naturalists were too much given to the habit of looking on vegetable structures (and animal ones too, for that matter) solely in their relation to man's wants and necessities. Thus the beauty and fragrance of flowers were conceived to be merely for human enjoyment; fruits were not regarded as means whereby the species of plants were to be disseminated and propagated, but as food for man and beast. Now, however, the truth of the doctrine that no animal or plant ever possesses any structure or habit solely for the benefit of another, is beginning to be recognized, and the further recognition of this truth is, we venture to think, destined to give rise to many interesting investigations.

In the case of no structures, perhaps, has their primary object been more lost sight of than in the case of tubers, bulbs, and tap-roots. From the high economic value possessed by many of these, they seem hitherto to have been considered only in the light of

their utility—such as their susceptibility of great succulent development under the influence of external stimuli. In the present paper it is proposed to inquire what services they perform to the plant possessing them—what in short is their *rôle* in the vegetable system, irrespective of the uses made of them by man. Most people doubtless believe that Potatoes and Carrots were made to be eaten; for the present we must proceed upon the assumption that they were not. The present paper is but an extension of a former subject; the considerations here brought forward having forced themselves on me while trying to solve some of the questions which I then mooted, but could not satisfactorily clear up.* Some of you will, I dare say, remember that in trying to account for the predilection shown by certain plants for the abodes of man, from the fact that the majority of this class of plants bore the impress of a desert flora, I was led to infer that this peculiarity was due to the indirect effects of man's operations on the soil and climate, tending to render these drier.

I pointed out, further, that plants of a succulent habit were characteristic of regions which were subject to frequent drought, and illustrated the superiority of this class of vegetation over grasses for resisting excessive aridity by a reference to Dr. Livingstone's account of the displacement of the grass by ice-plants or succulent-leaved *Mesembryanthemums* and *Crassulas* on the Kalahari Desert during a succession of severe droughts. From this consideration we were led to infer that the peculiar liking of the House-leek for thatched roofs might be due to its inability to withstand a damp climate, and to its finding on a roof the needful dryness and sun exposure. There were one or two well-marked instances, however, which I found difficult to trace satisfactorily to this class, but I ventured to suggest that they might be originally shore-plants. One of these was the Dock (*Rumex*). The tap-root of this plant, however, I have since come to regard as a true index of its history, unmistakably proving it to be a desert or shore-plant; so that the Dock undoubtedly agrees with those other plants that grow near human habitations in this respect—that it is highly qualified to withstand drought.

On the authority of Mr. Darwin, many succulent-leaved plants succumb to a damp climate; and this is probably due to the fact that they have on the surface of their leaves comparatively few

* *Trans. Glasgow Soc. Field Naturalists*, 1878.

stomata for the exhalation of watery vapour, which seem to be necessary to plants in damp situations. On the other hand, *Mesembryanthemum edule* has the additional contrivance of oblong tubers buried deep beneath the soil for complete protection from the scorching sun, which serve as reservoirs of sap and nutriment during those rainless periods which recur perpetually in even the most favoured parts of Africa. Dr. Livingstone, speaking of the region north of the Orange River, where the soil was light-coloured soft sand, nearly pure silica, with beds of ancient rivers containing much alluvial soil, baked hard by the burning sun, says:—"The quantity of grass which grows on this remarkable region is astonishing even to those who are familiar with India. It usually rises in tufts, with bare spaces between, or the intervals are occupied by creeping plants which, having their roots buried far beneath the soil, feel little the effects of the scorching sun. The number of those which have tuberous roots is very great; and their structure is intended to supply nutriment and moisture when, during the long droughts, they can be obtained nowhere else. Here we have an example of a plant not generally tuber-bearing, becoming so under circumstances where that appendage is necessary for preserving its life; and the same thing occurs in Angola to a species of grape-bearing vine, which is so furnished for the same purpose. The plant to which I at present refer is one of the Cucurbitaceae, which bears a small scarlet-coloured eatable cucumber. Another plant, named 'Leroshúa,' is a blessing to the inhabitants of the desert. We see a small plant with linear leaves and a stalk not thicker than a crow's quill; on digging down a foot or 18 inches beneath, we come to a tuber, often as large as the head of a young child; when the rind is removed we find a mass of cellular tissue filled with fluid much like that in a young turnip. Owing to the depth beneath the soil at which it is found, it is generally deliciously cool and refreshing. Another kind, named 'Mokuro,' is seen in other parts of the country where long-continued heat parches the soil. This plant is a herbaceous creeper, and deposits underground a number of tubers, some as large as a man's head, at spots in a circle a yard or more horizontally from the stem. The natives strike the ground on the circumference of the circle with stones, till, by hearing a difference of sound, they know the water-bearing tuber to be beneath. They then dig down a foot or so and

find it." So much does Dr. Livingstone seem to have been struck with this peculiar tuber-bearing character of the vegetation, that he suggests elsewhere to the Cape farmers the possibility of growing grapes in the more arid parts of Cape Colony by means of the Angola tuber-bearing variety of vine. Another African traveller, who devoted much attention to the botany of the regions through which he passed, has carefully recorded similar features observed by him in the vegetation of Central Africa, in the district around the river Gazelle (a tributary of the Nile). Dr. Schweinfurth, in his work on the "Heart of Africa," describes this land of Bongo, which lies between latitudes 6° and 8° N., where the soil is alluvial, as being decidedly less varied than even the most uniform districts of Germany, although subject to periodic rainy seasons. A characteristic feature of the region is its steppes, which are subject to annual conflagrations. There are, too, as he mentions, pasture lands, interrupted here and there with impenetrable thickets, while in the shade of certain trees are found the splendid bulbs of the *Haemanthus gloriosa* and *Chlorophytum*, together with ground orchids and the wonderful "Kosaria," which is a tuber-bearing plant. Upon the drier spots, where the clay soil happens to be mixed with sand, weeds and herbaceous plants are found, which recall the flora of the northern steppes. Many species of Cappariaceae, *e.g.*, *Gynandropsis*, were abundant—an order which, while resembling our own Cruciferae in the arrangement of its floral envelopes and pungent juices, appears to bear the same relation to other tropical vegetation that many of our common Cruciferae with with acrid juices bear to the flora of our temperate clime. Dr. Schweinfurth mentions also two leguminous plants cultivated at Bongo, which fructify below the soil—the speckled pea-shaped *Voandzeia* and the *Arachis*, or earth-nut, now dispersed everywhere over the tropics, but whose proper home is in Africa. Plants having similar hypocarpogean fruits are alluded to in the course of Livingstone's writings. Of the tuberous vegetables cultivated by African tribes, there are various kinds of yams (*Dioscorea alata* and *Helminia bulbifera*), by some tribes, whilst the Niain-Niain and Monbutto, who devote more attention to the growth of tubers than of cereals, prefer the sweet potato (*Batatas edulis*), the "Manioc" (Euphorbiaceae), the "Colocasia" (Aroideae), and other bulbs. All the yams in these parts are seen to exhibit the same form, which is reckoned the most perfect in this produc-

tion, lavished by bountiful nature on man with so little labour on his part. The tubers of Central Africa are very long, and at their lower extremity have a number of thick protuberances resembling in size and shape the foot of an elephant (one of them hence called *Testudinaria elephantipes*. Of these, specimens weighing from 50 to 80 lbs. were seen by Dr. Schweinfurth, and the substance of these tubers, according to him, was mealy, somewhat granular, and easily cooked, being of a looser texture than our tenderest potatoes, and decidedly preferable to them in flavour. The tubers of the "Nyitti," or *Helmia bulbifera*, are similar to those of the potato, but occur in the axils of leaves. In Bongo, Cucumbers, Gourds, and a plant with a succulent calyx (*Hebiscus esculentus*) are abundant, so that though the people cultivate but few vegetables, they find a variety of substitutes in these succulent-leaved and tuber-bearing plants which grow wild. It is a remarkable peculiarity of the flora of this region that all the species which are not essentially shrubby or arborescent strive for a perennial existence, and, as evidence of this, it may be observed that the roots and portions of the stem beneath the soil either develop into bulbs and tubers, or exhibit a determination to become woody. Annuals occupy a very insignificant place, and all vegetation seems to be provided with a means of withstanding the annual steppe-burning, and of preserving the germs of life until the next period of vitality recurs. When their corn provision is exhausted, or when there is a failure in the harvest, the Bongo find a welcome resource in these tubers. They subsist on them for days in succession, and find in them the staple of their nourishment, whenever they go upon their marches in the wilderness. Many of their bulbs and tubers are extremely bitter; and it is not until they have been thoroughly steeped in boiling water, or have had the pungent matter roasted out, that they can be eaten. Amongst these bitter bulbs are two belonging to the Cucurbitaceae which claim notice, which are abundant everywhere. "Impregnated with like bitterness are the rape-like roots of the *Asclepias*, the huge tubers of the *Entada walbergii* and *Pachyrrhizas*, as well as the various kinds of *Vernoniae* and *Mlemingiae*, which are dug up from a foot below the surface of the soil." Notable among these numerous tuber plants is the diminutive *Drimia*, which lifts its pretty red blossoms about a couple of inches above the rocky ground, and possesses a bulb which becomes edible after prolonged

boiling. "Whenever a halt is made upon the marches across the wilderness, the bearers, as soon as they are liberated from their burdens, set very vigorously to work and grub up all sorts of roots from the nearest thickets." "I can myself," continues the same traveller, "vouch for a fact, which might fairly be deemed incredible, that thirty Bongo, who accompanied me on my return to Sably at a time when I had scarcely enough to keep me from starvation, subsisted for six consecutive days entirely on these roots, and, although we were hurrying on forced marches, lost neither their strength nor their spirits. Their constitutions were radically sound, and they seemed formed to defy the treatment of their inhospitable home." "Incalculable in its effect," says the same observer, "must be the influence of the annual steppe-burning on the vegetation of Central Africa, this being favoured by the dryness of the seasons, the ground being covered with a blackened ash, from which the alkalies are washed into the soil by the first rain, while trees have not the same chance of attaining great size that they have in temperate regions where such fires do not occur."

In the steppes of Europe and Asia, where the soil generally consists of a coating of vegetable mould over clay, no plants with deep roots thrive; hence steppes are destitute of trees, and even bushes are rare, except in ravines. The grass is thin, but nourishing; while Hyacinths and other bulbs, together with Asparagus and Liquorice, grow abundantly. Bulbous Amaryllidaceae abound in the meadows of Eastern Siberia, and the vegetation bears a great analogy to that of North-west America—several genera and species being common to both. On the North American prairies, among other Compositae, occur Dahlias (*Helianthus corcopsis*), &c. Again, the Llanos of Venezuela and Guiana are covered with tall grass, mixed with Lilies and other bulbous flowers. In these regions fires are of frequent occurrence. The same is also the case in Chili, the home of the Potato. Here this plant has a tendency to become woody and bristly. It is a native of the sea strand, and is never found naturally more than 400 feet above it. In the wild state the tubers of the Potato are small, and, like those African tubers already referred to, bitter. Indeed, the most of the order Solanaceae, to which it belongs, possess bitter, poisonous principles. The fibrous character of the rootlets of the Potato, as well as the fact that it prospers best in dry, sandy soils, together with those crop failures in very wet seasons, unmistakably

prove its character. The same thing may be said of Turnips and Carrots, which grow wild on our shores, and attain their highest perfection in light, sandy soils. The Cabbage presents an interesting case. The wild equivalent is a shore plant, but under cultivation the leaves, rather than the root-stock, tend to become succulent. In the Kohl-rabi, however, there is a fleshy bulb (Sprengel). The Jerusalem Artichoke (*Helianthus tuberosus*) grows to greatest perfection where there is a dry, hot summer. Plants of our native flora possessing tuberous structures too, usually grow in dry situations—*e.g.*, *Ranunculus ficaria*—whose fasciculate roots, partly fibrous, partly tuberous, are adventitious, the plant being perennial. It is instructive to compare the roots of this plant with those of its near ally the Marsh Marigold (*Caltha palustris*), which, growing in streams, has no tubers. An enlarged or succulent rhizome is frequently found in plants growing in dry situations, thus *Spiraea filipendula*, with a short root-stock and fibres interruptedly tuberous, according to Hooker, grows in dry pastures, while *S. ulmaria*, frequenting meadows and watersides, is not so provided. In England, Bryony possesses tubers, and grows in such situations; the rootstock of various species of *Plantago*, growing on sandy and gravelly soils (*P. coronopus*), *Corydalis bulbosa*, together with some members of the orders Convolvulaceae, Compositae, Cruciferae, Leguminosae, and Umbelliferae (*Daucus*), exhibit a like tendency. There are, however, marked exceptions—*e.g.*, the Cow Parsnip, with many Orchids, Lilies, Iridaceae (*Iris*, *Gladiolus*, *Crocus*), and Amaryllidaceae (*Galanthus*), are found in moist, shady situations. While, therefore, there can be little doubt in the case of tap-roots and tubers that they are directly related to a light soil and arid climate, it is by no means so clear in the case of such bulbs as those of the Lily, Onion, Hyacinth, Crocus, and rhizomes like that of Solomon's Seal, that they are directly related to withstanding droughts. It is not impossible that some of these bulb-bearing plants may be at an advantage as regards capability of withstanding cold (protected under ground under snow), as opposed to annuals grown from seed germination. As a matter of fact many of our earliest flowers are of this class, Snowdrop, Lily of the Valley, Narcissus, and Crocus. This much, however, appears, that such plants are most characteristic of prairies and steppes—tracts subject at one period of the year to floods, and to another

for long periods of no rain and great heat, when fires are frequent, which will greatly impair the chances of re-sowing from seed. Hence, annuals will be at a disadvantage in such situations, and biennials and perennials will be much more favourably placed. Hence we find that the annuals are few, or, as Schweinfurth observes, plants strive to become perennial. It is a well-known fact that many plants which are in our climate annuals, become biennial or perennial in the tropics, and *vice versa*. Those having hypocarpogean or underground fruits will also be at an advantage in the case of fire, for their seeds and seed-vessels would not be exposed to the flames. Hence, too, the necessity of each plant being able to continue its existence by vegetative reproduction from a tuber or bulb instead of from seed!

This brings us to consider shortly the function of these structures in relation to growth. This is different in different cases. In biennials with tap-roots, the root serves as a depôt of nutriment, which is to be utilized in the second year during the flowering of the plant—*i.e.*, is ultimately destined to be transformed into seed. In the case of the Potato, on the other hand, from the eye of each tuber a new plant proceeds, which is nourished on the starch of the tubers, until, by its own leaves, it is enabled to produce new tubers and flowers. Bulbs, again, may be compared to resting buds, which in reality they are. These are more characteristic of Monocotyledons, and, probably, their nearest analogue is the cotyledons or albumen of the embryo, bearing in mind that in the former case we deal with vegetative repetition and in the latter with sexual reproduction. The amount of water contained in these structures is remarkable. Thus, Potatoes contain 75 or 76 per cent., Turnips, 91 per cent., Carrots, 86½ per cent., Beet Root, 83½ per cent., &c., under cultivation. These, of course, are unnatural, but they serve to indicate the capacity of the plants in the way of storing up moisture for future growth, and, consequently, of withstanding drought, which appears to be the office fulfilled by them to the plants provided with tubers, bulbs, or tap-roots.

III.—*On the Use of Coloration and Markings of Caterpillars, and on the Development of the Insect.* By Mr. PETER CAMERON.

Mr. Peter Cameron in his paper gave an account of some observations he had made on the use of coloration and markings

of caterpillars, and on the development of the insects. Referring to the brown marks on the larvæ of *Smerinthus*, he showed that they simulated the leaf fungi and the mite galls so common on food plants, and thus had an additional means of concealment besides the green colour, in imitation of that of the leaves. He then discussed the striking change in coloration which many larvæ of Tenthredinidæ underwent at the last moult and immediately before pupation. This change he showed, by referring to *Cladius viminalis*, *Nematis viminalis*, &c., was of a protecting nature, either in rendering the larva less or more conspicuous, according to the habits of the creature. *N. viminalis*, for example, living in galls, has no need for coloration; but before pupation, and when it leaves the galls, it becomes slate coloured, which assimilates it with the sand on the river-bank on which it lives, and up which it crawls to a place where it will not be so much exposed to inundation. *Cladius viminalis*, on the other hand, assumes a more gaudy coloration at the last moult, so that it may be more readily seen—the reason of this being that the larvae live several on a leaf, and thus they are conspicuous enough; but when they reach maturity they separate, in order to reach a safe resting-place—generally up trees. Thus a more gaudy coloration is of advantage to them during this transition period, as the orange colour renders them visible at a distance of several yards, and when seen they are avoided by insectivorous animals.

The second part of the paper was taken up with the subject of Parthenogenesis in the Tenthredinidæ. Mr. Cameron stated that this phenomenon exists under two phases—first, with species which have males and females, tolerably common, the parthenogetic brood in this case being always male; and second, with species having no known males—the result in this case being females. Details were given of the experiments of the author with various species, as well as of observations communicated to him by Mr. J. E. Fletcher on *Nematis palliatus* and *N. gallicola*, all proving the very general occurrence of Parthenogenesis in this family. In conclusion, the author stated that, from observations he had made on one or two maleless species, he was inclined to believe that the number of perfect insects which reached maturity bore a small proportion to the number of larvae—in other words, the larvae have less vitality than those of bi-sexual insects, and thus the species was enabled to flourish only by the great number of eggs it laid. Still the diffi-

culty of getting precise information on the comparative number of perfect insects produced from a like number of eggs of parthenogenetic and bi-sexual insects was so great that he only threw out the suggestion in order to direct inquiry to the subject.

FEBRUARY 24TH, 1880.

Mr. John A. Harvie Brown, F.Z.S., M.B.O.U., Vice-President, in the Chair.

SPECIMENS EXHIBITED.

Mr. William Stewart exhibited a fine series of mounted specimens of Native Ferns. The collection, which embraced nearly all the British species, with a number of interesting varieties, was much admired from the perfect way in which the specimens had been preserved and mounted. Mr. Stewart pointed out any peculiarities connected with them, and stated the localities where they had been gathered. Several of the members made remarks on the collection.

PAPERS READ.

I.—*Notes, chiefly Botanical, of a Visit to the Island of Coll.*

By Mr. THOMAS SCOTT.

Not long before the Greenock Fair Holidays last year, as I was casting about for a place where I could conveniently spend a day or two, and perhaps have an opportunity of adding some specimens to my herbarium, a Greenock friend, who has a good deal of business intercourse with the Island of Coll, offered to procure for me a free passage there and back. Knowing that it lies rather out of the usual line of migration of botanists, while at the same time it formed a sort of *Ultima Thule* to myself, I gladly accepted the offer, and thus it was that I came to spend my holidays in Coll. I trust you will accord me your forbearance while I note a few particulars of my observations, chiefly as to its flora.

The Island of Coll, which lies a few miles to the north-west of Mull, is about 14 miles long, by about an average breadth of $2\frac{1}{2}$ miles, and is comparatively low-lying, its highest elevation not reaching 300 feet. Though forming one of the Inner Hebrides, it is, from its position, exposed to the full fury of the Atlantic

gales, and, as a consequence, few trees have been able to obtain a foothold, and even these few owe their scraggy existence to their being sheltered by walls or other artificial protection. The phanerogamic flora of the island consists nearly altogether of dwarfed shrubs and herbaceous plants, such as—*Vaccinium Vitis-Idaea*, *Arctostaphylos Uva-ursi*, *Juniperus nana*, *Ranunculi*, orchids, grasses, etc. The hills, or knolls rather, also present a bare and rugged, uninviting appearance, so you will thus understand that to the inexperienced botanist, the island presents a very unpromising look when first sighted; but, as the sequel will show, appearances here, as elsewhere, are sometimes deceptive.

The rocks of which almost the whole of the island is composed are gneiss, nearly, if not all, metamorphic conditions of hornblende, &c., belonging, I believe, to the Upper Laurentian system. In section they present generally a series of light and dark bands, rather coarse-grained, which are so constantly varying in thickness and structure that no two specimens are exactly alike. Sometimes beds or veins of a different and, occasionally, more homogeneous structure occur, as serpentine, felspar, hornblende, and quartz. At Acha Mill there is an extensive ridge of almost pure quartz, which has such a tempting look that it was quarried, and an endeavour made to prepare it for monumental purposes, but, as might have been anticipated from its structure, the attempt failed, and so the ridge is still left to adorn the landscape. I noticed the veins of hornblende on the west coast, not very far from the school-house. The sea had not long left off the work of hewing down its rocky barrier, the wind was pleasantly refreshing as it came from the Atlantic, and the air was flooded with sunlight when I first saw them, and as they glittered in the noon-day sun one could easily imagine each crystal a gem, and the spot a veritable *El Dorado*! The rocky knolls, with which the north end of the island is covered, have that peculiar rounded and polished appearance said to be due to the abrading action of moving ice.

Somewhat extensive accumulations of blown sand occur, principally along the west coast, and in the hollows which have been scooped out by the wind great quantities of land and marine shells are found indiscriminately mixed up. The land shells consist mainly of *Helix nemoralis* and *Bulimus acutus*, and the marine shells, of *Patella* and *Littorina*. As the shells become decomposed, the calcareous matter gets mixed up with the sand, and being of a

binding nature, forms a coarse-grained calcareous sandstone—of which considerable quantities are carted to a lime-kiln, near Aranagour, and burned as lime for building and agricultural purposes.

As the surface of the island is broken up by numerous small lochs and peat-mosses, and by many small streams, and as there are numerous sheltered bays and inlets, it is evident that there is a great variety of soil and situation favourable to many different plants. So that the more one extends his researches the more is he surprised at the comparative richness and variety of the flora.

I will now proceed to enumerate a few of the more interesting species.

Thalictrum minus is plentiful along the sandy shore of the west coast. *Nymphaea alba* grows in a small loch not far from the overseer's new house, near Aranagour. *Papaver* (sp.?) I noticed in a corn-field near the Free Church. *Arabis hirsuta* was found in a meadow, not far from the school-house. *Geranium sanguineum*, in most beautiful profusion, was found growing on the banks of a stream, not very far from Major Stewart's house, and I felt fain to linger beside this lovely spot. *Geranium sanguineum* is one of our finest wild flowers, and is also one of those that are never so beautiful as when growing in the wild freedom of their native habitat. Long-leaved Sundew was very plentiful beside a small loch about a mile-and-a-half from Aranagour. I did not get it in flower, but from the lengthened petioles I have marked it *Drosera anglica*. *Veronica anagallis* was found completely filling the bed of a stream flowing west, not very far from the school-house, and I never saw finer plants; they were just beginning to flower, and at that time would be fully two feet in height. *Ajuga pyramidalis* I found in a few places, and it seemed to favour rocky situations. This plant seems to be very restricted in its distribution as far as the British Islands are concerned, being confined to the North of Scotland and West of Ireland. The number of counties set down for it in the London Catalogue is 9, while some of our commonest plants reach as high as 103.

The next I have to notice is one of the interesting insectivorous plants, *Utricularia* (sp.?), which was frequent in ditches having an outlet into the small loch already mentioned as situated behind the overseer's new house. The plants were very attenuated, and

whether this was owing to the great number of confervae which were attached to them I cannot say, but, one circumstance I noticed was, that a specimen brought home in a bottle continued to grow for a time, but latterly vanished, while some of the confervae, which could not be disengaged from the plant when collected, continued to grow with increasing vigour till the whole space was filled. When the water was examined about this time, a number of animalcules were seen disporting themselves, and appeared as if feeding on the algae; whether that was the case or not, the quantity of confervae began to show signs of diminution, and continued to do so till scarcely a fragment remained; but the animalcules increased in numbers and now have usurped the place formerly held by the two vegetable organisms. May we call this a practical example of evolution? I have not been able to make out the species, the plants not being in very good condition—could they have been specimens of *Utricularia minor*? Besides the above-named station, I also noticed some plants of the same genus in a pool by the side of the road between Aranagour and Acha, but they seemed to be different from the last-mentioned, having the utricles on separate branches, while the latter had them on the leaves. They seem therefore to partake more of the character of *Utricularia intermedia*, but, meanwhile, not having sufficient knowledge of the genus to enable me to determine their species without the aid of the flowers, I leave them without particularizing the species till I know more about them. *Anagallis tenella* was common by ditch sides, &c. *Alisma ranunculoides* was also of frequent occurrence. Another plant, somewhat rare in Scotland, which I found in the small loch behind the overseer's new house, was *Cladium mariscus*. Hooker says of this plant:—"found in Sutherland, Wigtown, Berwick, only, in Scotland," but its number (35), in the London Catalogue, would indicate a wider range in the other divisions of the British Islands. Its long-pointed, rigid, and saw-edged leaves, form a very good distinctive character. *Koeleria cristata* was common in many places.

The next plant to which I wish to draw your attention I was rather surprised to find on the island, though that might be accounted for because of my imperfect knowledge. I refer to *Sclerochloa loliacea*. Hooker speaks of its distribution "from Fife southwards, and in Ireland," thus indicating that, so far as Great Britain is concerned, it is decidedly an east country plant.

Besides, it is not mentioned in "Clydesdale Flora," and it is also absent from the list of "Casuals" in the "Fauna and Flora of the West of Scotland." I found it plentiful on the walls of the old castle of the MacLeans of Coll. We have thus an extreme westerly station for an east country plant—a point which those having some knowledge of the causes of the distribution of plants may be able to explain.

I will conclude my notes by referring to a few ferns, many of the commoner species of which were observed on the island. Some fine plants of *Asplenium marinum* were found on rocks a little to the south of Major Stewart's house, and this fern is likely to occur on other parts of the coast. *Osmunda regalis*—the Royal fern—was frequent on the side of the loch, behind the overseer's house, and also on a small island in a loch about midway between Aranagour and Acha. I heard also of its occurrence in other parts of Coll. *Botrychium lunaria* I found on some grassy banks a little west of the school-house. One very rare plant said to be found in Coll—but of whose existence there I did not learn till I came home, which caused me not a little regret—was *Eriocaulon septangulare*. There are only two counties given for it in the "London Catalogue," and in "Withering's British Flora" Coll and Skye are given as stations. However, it is perhaps best that something worth looking for is left, in case I should be able to renew my visit.

I have now gone over a few of the more interesting plants found during a two day's ramble over the Island of Coll, and there is no doubt, I think, that the list could be largely increased by a more extended search. I may add, that Major Stewart, the proprietor of the greater part of the island, and his overseer, were most obliging, both as to affording the fullest liberty to ramble over the island, or in giving what information they possessed regarding its history, &c. The old castle I have spoken of might alone form an interesting subject for a paper, but perhaps what I have said may induce some member with more leisure and ability to visit Coll, and to place before the Society a more thorough record of its natural history and antiquities than I have been able to do.

II.—Notes on *Spirialis retroversus* from Gairloch, Ross-shire.

By JOHN GRIEVE, M.A., M.D.

Mr. Duncan's yacht "Varina" anchored in Gairloch, Ross-shire, on the evening of July 16th, 1879. It was rather dull and grey,

with high clouds; the sea outside was calm and had been so for some days; the air from the north was keen, but within the loch it was much milder. Nothing special was noticed in the water that evening. Next morning, July 17th, the sea was swarming with Medusae. It was a gray, hazy morning; mild, with no sun, and quite calm. Large *Medusa aurita* were progressing in all directions; *Cydidippe pileus*, and *Alcynöes* were in immense numbers; with *Thaumantias* and *Sarzia* pretty abundant also.

We use a small towing-net, with a bottle attached, as a dipping-net to pick up passing Medusae, and also allow it to hang below the surface for the chance of any animal going into it. This morning it was put down between half-past seven and eight o'clock, and on drawing it up a number of little blackish creatures were observed swimming merrily in the bottle, like a lot of small water-beetles. When we got it on board, we saw at once that they were Pteropods. The net was soon below the surface again, and this was repeated with the same result again and again. In fact, the sea was swarming with these Pteropods, so much so that the surface, as they came up and touched it, was covered with little rings, like those produced by gently-falling rain-drops, or as if some incipient ebullition was taking place. They were quite visible to the naked eye (especially against the light-coloured paint of the side of the yacht), as they approached the surface, and then dropped down again—for they appeared to be perpetually rising and falling, swimming up and dropping down, but not swimming along the surface. If the net was allowed to hang down a little while, the bottle, when taken up, contained a deposit of Pteropods at the bottom, and a number of them swimming among the *Cydidippes*, which were nearly as plentiful. The species was *Spirialis retro-versus*, Fleming.

A few were transferred to a large bottle, where they had plenty of free room and oxygen, and they survived till next day. The others were speedily suffocated from their own numbers, perhaps assisted by the *Cydidippes* among them. A good many *Chetochilus septentrionalis* were among them, and a few *Zöeas* of the shore crab (*Carcinus moenas*) in the second or *megalopa* stage, in which the tail is still free. We examined the Pteropods repeatedly during the day—the little creatures swam rapidly to the surface, rising with a peculiar fluttering motion, perpendicularly or at an angle, and having reached it, they raised the wings, as it were, above their heads, and holding

them motionless, and slightly bent at the angle in the middle of the wing, dropped gently to the bottom, the stiff expanded wing acting as a parachute. They reminded us of the sea-gulls dropping down to pick up food thrown overboard. Some of them would stop half-way in their descent, and resume paddling or winging their way to the surface; again to drop quietly down to the bottom, along which they would flutter on their side, and then rise again, but as if with some difficulty to get under weigh at first; or they would remain at rest till we lifted the bottle, when they started anew. They rose by a succession of rapid strokes, using the wings simultaneously, and it was a pretty sight to see them dropping slowly down again. They were not observed to use the wings as feet to walk or crawl along the bottom, as Mr. Jeffreys says (*Mollusca*, vol. v., page 117) A. Agassiz did. They only fluttered along and came to rest, or got under way like a solan goose, and sped upward to the surface. Perhaps if a flat stone had been put into the bottle they would have got a better hold than on the smooth glass. It would have been interesting to have seen whether they moved about like Gasteropods, or were able to use their wing-feet, right and left, like more rational beings. They were such joyous, merry creatures when swimming that they looked particularly miserable and helpless as they lay at the bottom. No exertion, apparently, being required in the act of descending, it may be a state of rest, and all that is necessary in deep water. This habit of dropping down would soon have filled the towing-net bottle, if we had had patience to leave it down long enough in the water. As it was we got a layer of them as often as it was put down and brought up.

We went ashore after breakfast, towing the net after us to the quay, and found them all round about, and they were quite as numerous when the yacht left the loch at 10.40 a.m. to go round the north point of Skye. All day it continued dull and hazy, and almost sunless till five o'clock, the Skye mountain tops being quite invisible. At noon the sun peeped out for a little, about which time we stopped to have a dredge over a patch of shell sand marked on the chart near the north of Skye. While the dredge was down in 37 fathoms, the towing net was put over, but we had got beyond the Pteropods, and not one was visible—*Cydippes* and *Chetochilia* alone being found in the bottle. The dredge brought up little—a couple of urchins, *Echinus sphaera*, *Amphidotus roseus*, and a *Tritonia hombergi*. It also contained a large stone with a mass of *Flustra*

foliacea growing on it. The fine scent of this species has been noticed before. Dr. Johnston (Zoophytes, i. 343) says—"When recent it exhales a pleasant scent, which Pallas compares to that of the orange, Dr. Grant to that of violets, and which a friend tells me smells to him like a mixture of the odour of roses and geranium. On the contrary, Mr. Patterson tells me that the smell is strong, peculiar, and disagreeable. It probably varies, and is often not to be perceived at all." Dr. Landsborough (Zoophytes, p. 346) says, "It is like bergamot, or rather like *Verbena triphylla*." Our living specimen reminded us of the *Verbena*, and had a strong scent of lemon; when chewed it was somewhat pungent, and rather pleasant, with a strong taste of lemon.* A few days later, in Kilbrannan Sound, the dredge brought up a specimen of *Flustra truncata*. This species has not been credited with fragrance, but it is not devoid of taste, for on being chewed it was found to be intensely bitter and to have a persistent bitter taste like that of quinine. The difference between the two species in this respect is somewhat remarkable.

After Dr. Grieve's paper, Mr. David Robertson, F.L.S., F.G.S., said—We are much indebted to Dr. Grieve for his excellent paper. He has told us what he himself saw, and under what conditions, and how these molluscs behaved both in freedom and in confinement. This, in a great measure, is the object that our Natural History Societies should aim at—to search for and to supply new facts, or to clear up obscurely known ones. In this pursuit, over the broad field of nature, there is ample scope for all our energies. There are so many aspects in both living and dead matter, that we need not sigh the sigh of Alexander the Great, that there are no more worlds to conquer. Each fact, however small, may be a component part of a whole, which without it may be difficult or impossible to comprehend. Regarding this little mollusc, *Spirialis retroversus*, Dr. Jeffreys tells us that it is known to be of wide distribution everywhere along our coasts in drifted and dredged sand. Among other places, it has been met with in the North Atlantic from 170 to 500 fathoms, on the Scandinavian coasts, in the Mid Atlantic, in the Gulf of Naples, and Dr. Brady and I dredged it off Sunderland in 30 fathoms. It has been met with in the post-

* *Flustra foliacea* cast ashore at Bournemouth, December, 1879. we found to have the same scent and taste of lemon.

glacial deposits of Norway by M. Sars, where also the Rev. Mr. Crosskey and I found it. It has not often been taken alive in our seas. Prof. E. Forbes observed it on the north-west coast of Skye in 1850. The Rev. A. M. Norman, in 1861 and 1867, caught great numbers in Shetland, of different ages, from the fry to the adult, in the towing net as well as the hand net, close to the shore. Mr. A. Agassiz says that it can creep about by means of its wing-like appendages—a circumstance which Dr. Grieve says he did not observe, and further inquiry may perhaps ascertain whether it behaves similarly under similar circumstances, or differently under different conditions. Such questions as those raised by Dr. Grieve have again and again resulted in valuable additions to our knowledge.

III.—*Collected Notes on the Birds of Buchan.*

By MR. WILLIAM HORN.

The district of Buchan, which occupies the north-eastern corner of Aberdeenshire, was formerly supposed to consist of the thirteen parishes of Aberdour, Crimond, New Deer, Old Deer, Fraserburgh, Longside, Lonmay, Peterhead, Pitsligo, Rathen, St. Fergus, Slains, and Strichen, but now the name is applied indiscriminately to the whole country between the rivers Ythan and Deveron, including several small bits of Banffshire. Looking at this district from any but an ornithological or sporting point of view, it is the reverse of interesting. The scenery is poor in the extreme, and there is scarcely any wood except some young fir plantations surrounding some of the larger mansion houses, such as Philorth, Pitfour, Aden, and Brucklay. The country is gently undulating, and the only hill or rising ground of any importance is Mormond Hill, 810 feet above the sea, on the estate of Strichen, while the only rivers worthy of the name are:—the Ythan, flowing into the sea at Ellon, and forming the southern boundary of the district; the Ugie, which flows through the centre, and reaches the sea at Peterhead; and the Deveron, flowing into the Moray Firth at Banff, which forms the western boundary. As the country is very thickly populated, the holdings are small, and the fields—consisting for the most part of small patches of corn and turnip, interspersed here and there with small bits of moss—are admirably adapted for partridge shooting, and there is no other district in Scotland where

larger bags may be made, in a favourable season, than here. Only a few years ago the mosses covered a considerable extent of ground, but now they are being rapidly drained and turned into arable land. The only natural feature which excites the admiration of any chance visitor to Buchan is the coast line, which consists of lofty and rugged cliffs, worn into the most extraordinary and picturesque shapes by the combined action of wind and wave, with, here and there, a low-lying piece of ground, consisting of sand-hills covered with bent grass, and which offers a temporary resting-place to Woodcock and numerous other birds when they first land on the coast. There is no finer coast scenery in Scotland than the Bullers of Buchan, the rocks at Slains Castle, Pennon Rocks (352 feet above the sea), Troup Head (309 feet), Gamrie More (403 feet), &c. On these cliffs numerous species of sea-birds, such as the Razor-bill, Kittiwake, Guillemot, and Puffin, take up their abode. Several fresh-water lochs offer great attractions to almost every variety of wild-fowl, chiefly on account of their shallow and marshy character, and in the case of Strathbeg, where more rare wild-fowl have been obtained than anywhere else in Scotland, perhaps on account of its being the most easterly fresh-water loch in the country. The Loch of Strathbeg possesses no natural beauty, and is as dreary a spot as can well be imagined. It is about $3\frac{1}{2}$ miles long by $\frac{1}{2}$ mile broad at the widest part, and is situated about halfway between Peterhead and Fraserburgh, on the estate of Mr. Gordon of Cairness. In severe winters, when all the smaller lochs are covered with ice, wild-fowl flock here in countless numbers, while in spring it is the resort of numerous species of gulls, waders, and ducks, for breeding purposes. Along its banks, and among the rushes, which extend for a considerable distance into the lake, nestle many varieties of small birds.

Many species are increasing in number annually, while others are rapidly becoming extinct. Among the former may be noted:—the Missel Thrush; Great, Blue, and Coal Titmice; Bullfinch; Starling; Rook; Jackdaw; Tree Creeper; Wood Pigeon; Pheasant; and Lapwing; and we have not far to go to find a cause for this increase. It is without doubt the annually increasing acreage under wood. On the other hand, nearly all the raptorial birds, the Goldfinch, Rock Dove, Black Grouse, and Common Snipe are becoming scarcer. All kinds of Hawks are shot down and trapped by gamekeepers, without reference to species, or the damage done

by them, and it is only a marvel that so many varieties are still to be procured. The Rock Dove, which formerly was common in caverns on the cliffs of this rocky coast, has been driven away by being constantly fired at, and now but a few pairs breed in the district. The Black Grouse and Common Snipe, though still tolerably common, are not nearly so numerous as they once were, chiefly on account of the ground which is suitable for them becoming annually more contracted in its area, through agricultural improvements. I must not omit to mention that since the passing of the Wild-Fowl Preservation Act, Seagulls have increased to an enormous extent, and that during autumn and winter they are to be met with in very large flocks on the coast.

Altogether I have included in the following list 199 species, besides 19 others which have occurred just outside the district I have attempted to describe, and which may very possibly have occurred in Buchan. In making this list, I have made use of Mr. Gray's "Birds of the West of Scotland," and Mr. Edward's paper on the "Birds of Strathbeg," published in the *Naturalist*.* Mr. George Sim, of Aberdeen, has given me every assistance in his power; and I am also much indebted to Mr. T. Ferguson, of Alton, Kimmundy, and to Mr. Duncan, for many years gamekeeper at Brucklay Castle, as well as to Mr. Henderson, formerly keeper at Brucklay Castle, but now with Mrs. Gordon of Cluny, in South Uist.

The nomenclature is according to Sundevall's method, revised by Henry Thornton Wharton.

OSCINES.

OBS. Bluethroat.—*Cyanecula suecica* (Linnaeus). On the 16th May, 1872, a fine male specimen of this species flew on board a fisherman's boat off the coast of Aberdeenshire in company with a common Redstart, and was taken into Aberdeen, where it was examined by Mr. George Sim, who has it in his possession. This is the first recorded occurrence of the species in Scotland.†

Redstart.—*Ruticilla phoenicurus* (Lin.). Tolerably common, and breeds in the district.

Redbreast.—*Erithacus rubecula* (Lin.). Common.

* *Nat.*, vol. iv., p. 239-247 and 263-271.

† *Scottish Naturalist*, vol. i., p. 226.

Stonechat.—*Pratincola rubicola* (Lin.). Rare.

Whinchat.—*Pratincola rubetra* (Lin.). Very rare.

Wheatear.—*Saxicola aenanthe* (Lin.). Common.

Missel Thrush.—*Turdus viscivorus*, Lin. Rare, but increasing in numbers annually.

Song Thrush.—*Turdus musicus*, Lin. Common in all the wooded parts of the district.

Redwing.—*Turdus iliacus*, Lin. Common in autumn and winter. Has been observed to remain all summer in this neighbourhood.*

Fieldfare.—*Turdus pilaris*, Lin. An autumn and winter visitant like the last-named species.

Blackbird.—*Turdus merula*, Lin. Very common.

Ring Ouzel.—*Turdus torquatus*, Lin. Not common, but is sometimes seen on the moors at Aberdour and on Mormond Hill.

Dipper.—*Cinclus aquaticus*, Bechstein. Breeds on all the burns and rivers, and at the Loch of Strathbeg.

Wren.—*Troglodytes parvulus*, Koch. Very generally distributed.

Gold-crest.—*Regulus cristatus*, Koch. Rare.

Willow Wren.—*Phylloscopus trochilus* (Lin.). Common in summer.

Wood Wren.—*Phylloscopus sibilatrix* (Bechst.). A specimen was procured by Mr. W. Craibe Angus, at Fyvie Castle, in 1862, when he took the nest and eggs.† Two others were seen and one shot at Gourdas, Fyvie, in the beginning of May, 1872.‡

Whitethroat.—*Sylvia rufa* (Boddaert). Occasionally seen during the summer months.

Blackcap.—*Sylvia atricapilla* (Lin.). Mr. G. Sim, Gourdas, Fyvie, shot one on 27th April, 1872, which was the second specimen of this species seen in the locality.§

Reed Warbler.—*Acrocephalus streperus* (Vieillot). Breeds in suitable localities round the Loch of Strathbeg.|| Probably the Sedge Warbler, *Calamodius schoenobanus*, is meant here.

Great Titmouse.—*Parus major*, Lin. Numerous where there are large woods, and increasing every year.

* Yarrell's British Birds, 3rd edition, vol. i., p. 218.

† Gray's "Birds of West of Scotland," p. 97.

‡ Scot. Nat., vol. i., p. 226.

§ Scot. Nat., vol. i., p. 226.

|| Nat., vol. iv., pp. 239-247 and 263-271.

Blue Titmouse.—*Parus coeruleus*, Lin. Also common in the wooded parts of the district, and is seen in greater numbers every year.

Coal Titmouse.—*Parus ater*, Lin. Commoner than either of the two last-named species.

Long-tailed Titmouse.—*Acrechula caudata* (Lin.). Rare. I have seen it only in one place, near Aberdour, among some birch trees close to the Brucklay Castle keeper's house.

OBS. Great Gray Shrike.—*Lanius excubitor*, Lin. A specimen was caught in the rigging of a ship about sixty miles off the coast of Aberdeenshire, and it was brought into the harbour of Fraserburgh alive. This was on the 8th October, 1860.*

Red-backed Shrike.—*Lanius collurio*, Lin. Mentioned in a list of the birds of Peterhead prepared by Mr. Adam Arbuthnot, which is published in the New Statistical Account of Scotland, vol. xii., p. 351. The specimen is a male, and was obtained about the year 1833. It is still in the museum at Peterhead.

Waxwing.—*Ampelis garrulus*, Lin. Regular winter visitant. In severe winters tolerably common. One was killed in the garden at Kimmundy, near Peterhead, about the beginning of April, 1851.† Many others have been seen and killed at Brucklay, Loch of Strathbeg, &c.

Pied Flycatcher.—*Muscicapa atricapilla*, Lin. In May, 1849, one was killed in a plantation at Brucklay Castle.‡ Another was killed at Peterhead in May, 1872, on the authority of Mr. G. Sim, naturalist, Aberdeen.§ Mr. Henderson, gamekeeper to Mrs. Gordon of Cluny, tells me that two were killed, near Pitfour, by Mr. Grant, keeper to Col. Ferguson, of Pitfour, about the same time as the Brucklay one.

Spotted Flycatcher.—*Muscicapa grisola*, Lin. An occasional visitor.

Pied Wagtail.—*Motacilla lugubris*, Temminck. Common, and breeds at the Loch of Strathbeg.

Gray Wagtail.—*Motacilla sulphurea*, Bechst. Rare, but a few pairs are to be seen every year on or near the shore.

Yellow Wagtail.—*Motacilla raii* (Bonaparte). This graceful bird is to be found on the sandy hillocks covered with bent grass

* *Zoologist*, vol. xviii., p. 7235.

† *Nat.*, vol. i., p. 147.

‡ *Zool.*, vol. viii., p. 2651.

§ *Scot. Nat.*, vol. i., p. 226.

on the shore near St. Fergus, between Strathbeg and the sea, where it breeds.

Meadow Pipit.—*Anthus pratensis* (Lin.). Very common. Breeds among the bent grass on the seashore, and on the inland moors.

Rock Pipit.—*Anthus obscurus* (Latham). Very common along the coast.

Hedge Sparrow.—*Accentor modularis* (Lin.). Pretty numerous.

Bullfinch.—*Pyrrhula europaea*, Vieill. Increasing rapidly in numbers. In the woods at Brucklay Castle, consisting chiefly of spruce and birch, I have seen a good many lately.

Greenfinch.—*Ligurinus chloris* (Lin.). Very common.

Goldfinch.—*Carduelis elegans*, Stephens. Not so common as it used to be; still a few are to be seen occasionally.

Siskin.—*Carduelis spinus* (Lin.). Rare. This species is mentioned by Edwards as being a rare visitor in the neighbourhood of Strathbeg.*

Lesser Redpoll.—*Linota rufescens* (Vieill.). Breeds numerously in the higher parts of this district, but is rare near the coast, and is not known to breed there.† One flew against the lighthouse at Fraserburgh on 11th October, 1854. Mr. Thomas Ferguson, of Alton, Mintlaw, writes me that he found a specimen of this bird dead in the snow outside his window last winter (1879), and that he never saw it before in this part of Buchan.

Linnet.—*Linota cannabina* (Lin.). Breeds plentifully on the sandy mounds covered with bent grass along this coast.

Twite.—*Linota flavirostris* (Lin.). Rarer than the last-mentioned species. Breeds on the same ground. Localities on east coast scarcer than in the west.

Chaffinch.—*Fringilla coelebs*, Lin. Very common.

Brambling.—*Fringilla montifringilla*, Lin. Often seen in winter, especially in severe winters, in company with the Yellow and Snow Buntings.

House Sparrow.—*Passer domesticus* (Lin.). Common.

Crossbill.—*Loxia curvirostra*, Lin. Rare. Six specimens (3 males and 3 females) were killed at Craigston, near Turriff, by Mr. Pollock Urquhart's gamekeeper.‡ It is included in Mr. Adam Arbuthnot's list of the birds of Peterhead, and is mentioned in the

* *Nat.*, vol. iv., p. 263-271.

† *Nat.*, vol. iv., p. 225.

‡ *Nat.*, vol. iv., p. 42.

Old Stat. Acct. of Scotland as being obtained in the parish of Lonmay.*

OBS. White-winged Crossbill.—*Loxia leucoptera*, Gmelin. Mr. Thomas Edward has recorded that a large flock of this bird appeared near the town of Banff in 1859.†

Bunting.—*Emberiza miliaria*, Lin. To be seen in large flocks in severe winters.

Yellow Hammer.—*Emberiza citrinella*, Lin. Very common. Like the common Bunting, the Yellow Hammer is frequently seen in large flocks during winter, and is often accompanied by some Bramblings and Snow Buntings.

Black-headed Bunting.—*Emberiza melanocephala*, Scopoli. Rare, but has been killed several times at Brucklay Castle, Kinmundy, and in the neighbourhood of Strathbeg.

Snow Bunting.—*Plectrophanes nivalis* (Lin.). Pretty common along the coast and on the higher grounds during the winter months, sometimes appearing in large flocks.

Starling.—*Sturnus vulgaris*, Lin. There is nothing more remarkable in the ornithology of this district than the immense increase of this species within the last few years. But a few years ago it was scarcely to be seen, and now it is in countless flocks everywhere.‡

OBS. Rose-coloured Pastor.—*Pastor roseus* (Lin.). Mr. Angus was informed by Mr. John Wilson of Methlick that there was a nest of this species in a burrow in a sandbank near Methlick in the summer of 1840. The birds removed to another place about a mile off, but Mr. Wilson did not think they succeeded in rearing a brood.§

OBS. Nutcracker.—*Nucifraga caryocatactes* (Lin.). There is a specimen of this bird in the museum of Mr. Arbuthnot at Peterhead, but whether it was shot in the district or not I cannot say.||

Magpie.—*Pica rustica* (Scopoli). Rare.

Jackdaw.—*Corvus monedula*, Lin. Formerly an uncommon bird, but is increasing every year.

Rook.—*Corvus frugilegus*, Lin. Not very numerous. The

* New Stat. Acct., vol. xii., p. 351; Old Stat. Acct., vol. xvi.

† Gray's "Birds of West of Scotland," p. 156.

‡ New Stat. Acct., vol. xii., p. 706.

§ Gray's "Birds of West of Scotland," p. 161.

|| Yarrell, vol. ii., p. 132.

only rookeries I know of in Buchan are those of Aden, Philorth, Artamford, Lunderton, and Troup. Formerly there was a very large one at Pitfour, but being constantly persecuted there, the birds took refuge at Artamford on the Brucklay estates and Lunderton, in the parish of St. Fergus. The rookery at Troup is a very large one, and all the people in the neighbourhood are allowed one day's shooting there. Notwithstanding this, however, there is no falling off to be observed in the number of birds.

Raven.—*Corvus corax*, Lin. Rare. Has been seen by the keepers at Brucklay Castle. Many years ago the Raven was seen regularly about the higher parts of the district at Aberdour and Mormond Hill, and used to breed in the cliffs near Pennan and Troup Head.

Carriion Crow.—*Corvus corone*, Lin. Not common. A few are shot every year by the keepers in the district.

Hooded Crow.—*Corvus cornix*, Lin. Very plentiful on the coast. During the breeding season they rob the nests of the numerous Gulls and other sea-fowl frequenting the shore.

Tree Creeper.—*Certhia familiaris*, Lin. Very common among the young fir woods at Brucklay. A large flock of them was seen there on 1st October, 1879.

Swallow.—*Hirundo rustica*, Lin. Abundant. Breeds in large numbers near the Loch of Strathbeg, where they can get plenty of food. My friend, Rev. Walker Gregor, of Pitsligo, informs me that he has observed that they arrive here about the first Sunday in May.

Martin.—*Chelidon urbica* (Lin.). Common.

Sand Martin.—*Cotyle riparia* (Lin.). Also common. A sand-bank on the south side of Strathbeg is mentioned by Mr. Edward as a favourite nesting-place of this species.*

Sky Lark.—*Alauda arvensis*, Lin. Common.

Hoopoe.—*Upupa epops*, Lin. Several specimens of this very handsome bird have been killed in the Buchan district; a fine male at Crimonmogate between March and April, 1852,† and one at Turriff on 29th September 1868, which was sent to Mr. Sim for preservation,‡ while Mr. Edward says that this bird has been obtained on more than one occasion in the neighbourhood of Strath-

* *Nat.*, vol. iv., pp. 263-271.

† *Nat.*, vol. iv., p. 226.

‡ Gray's "Birds of West of Scotland," p. 199.

beg, and it is included by Mr. Arbuthnot among the birds of Peterhead.*

VOLUCRES.

Greater Spotted Woodpecker.—*Picus major*, Lin. Has been obtained on many occasions in Buchan. Mr. Edward, in a note to the *Zoologist*,† mentions its occurrence at Troup and Cullen, while it has been killed at Aberdour on the Brucklay estates, and is included in Mr. Arbuthnot's list of the birds of Peterhead. Mr. T. Ferguson, lately of Alton, Kinnmundy, tells me that he once saw a bird of this genus, but not near enough to determine the species.

Wryneck.—*Jynx torquilla*, Lin. This bird has been observed at the Braes of Gight.‡

Cuckoo.—*Cuculus canorus*, Lin. Common in spring and summer.

Roller.—*Coracias garrula*, Lin. A specimen of this species was killed at the Loch of Strathbeg many years ago.§

OBS. American Roller.—Two specimens of what was considered to be the "American Roller" were shot in the parish of Crimond some years ago.|| It is impossible now to identify these birds. I need hardly say that there is no "American Roller."

Nightjar.—*Caprimulgus europaeus*, Lin. I have shot this bird at Aberdour while grouse shooting. It is mentioned in the New Statistical Account among the birds of Peterhead.

Swift.—*Cypselus apus* (Lin.). Common in spring and summer.

Bee-eater.—*Merops apiaster*, Lin. A beautiful specimen of this rare bird was procured by the gardener at Kinnmundy, near Peterhead, and I am told by Mr. Thomas Ferguson that he had it in his hands and made a sketch of it. There is a note upon this occurrence of the Bee-eater in *Nat.*, vol. ii., p. 204. It is mentioned as having occurred on more than one occasion at Strathbeg by Mr. T. Edward.

Kingfisher.—*Alcedo ispida*, Lin. I learn from Mr. George Sim that the only instance he knows of the Kingfisher having occurred in the Buchan district is one shot at Lower Smiddyseat, Turriff, on August 5th, 1878.

* New Stat. Acct., vol. xii., p. 351. † *Zool.*, vol. xvii., p. 6670.

‡ Gray's "Birds of West of Scotland," p. 193.

§ *Zool.*, vol. vi., p. 2302.

|| New Stat. Acct., vol. xii., p. 706.

Ring Dove.—*Columba palumbus*, Lin. Very common, and getting more so every year, with the increase of woods.

Stock Dove.—*Columba oenas*, Lin. An occasional visitor. It is included in Mr. Arbuthnot's list of the birds of Peterhead.*

Rock Dove.—*Columba livia*, Brisson. Not so common as it used to be. Formerly it was plentifully distributed all along the rocky parts of the Aberdeenshire coast, but now the only place where a few pairs still breed is in the neighbourhood of Slains Castle, the seat of the Earl of Errol.

Turtle Dove.—*Turtur auritus*, Gray. Mr. J. Henderson, formerly gamekeeper at Brucklay Castle, tells me that when walking in a wood near the avenue there, without his gun, he twice put up a Turtle Dove, and from its being so unwilling to leave the place, he conjectured that it was a young bird, and that it had been hatched and reared in the wood. He adds that he is quite convinced it was a wild bird and not one escaped from confinement.

ACCIPITRES.

Barn Owl.—*Aluco flammeus* (Lin.). Rare.

Long-eared Owl.—*Asio otus* (Lin.). Tolerably common.

Short-eared Owl.—*Asio accipitrinus* (Pallas). A winter visitor, but by no means common.

Tawny Owl.—*Strix stridula*, Lin. The commonest of all this genus in the district.

Snowy Owl.—*Nyctea scandiaca* (Lin.). A specimen of this noble bird was picked up dead upon the Loch of Strathbeg about 1824.

OBS. Eagle Owl.—*Bubo ignavus*, Forster. Mr. W. C. Angus gives a very interesting account of a bird of this species being seen in the neighbourhood of Methlick.†

Sparrow Hawk.—*Accipiter nisus* (Lin.). Very common some years ago, but not so now.

Gos-Hawk.—*Astur palumbarius* (Lin.). Rare. Has been trapped and shot several times in the neighbourhood of Strathbeg.‡

Hen Harrier.—*Circus cyaneus* (Lin.). Rather rare. Mr. George Sim tells me that one was killed at Slains Castle on 16th

* New Stat. Acct., vol. xii., p. 351.

† Gray's "Birds of West of Scotland," p. 55.

‡ Nat., vol. iv., pp. 263-271.

October, 1865. It has also been killed at Brucklay and near Strathbeg.

Buzzard.—*Buteo vulgaris*, Leach. Has been seen at Brucklay Castle by Mr. J. Henderson, lately keeper there, and is pretty common along the coast. Many are trapped and shot by keepers every year.

Rough-legged Buzzard.—*Buteo lagopus* (Gm.). Usually rather a rare bird, but Mr. G. Sim tells me that during the last two seasons they have been more than usually abundant all along the east coast. Two specimens were killed at Troup Head in December, 1865; one at Aden in the same month; and another at Troup in 1867.

Peregrine Falcon.—*Falco peregrinus*, Tunstall. Has been seen at Brucklay frequently, and killed at Aberdour. Not an uncommon bird by any means, though rarer than it used to be.

Merlin.—*Falco aesalon*, Tun. Common.

Obs. Hobby.—*Falco subbuteo*, Lin. I have no doubt that this species has been obtained in the district, but I have only heard of one killed near the town of Banff—but whether on the east or west side of the Deveron I cannot say—and an immature specimen picked up at sea, off the coast of Aberdeenshire, and sold to Mr. George Sim.*

Obs. Red-footed Falcon.—*Falco vespertinus*, Lin. Mr. Sim informs me that a specimen of this rare British bird was killed on the Hill of Fiddes, near Foveran, at mouth of Ythan, 29th May, 1866.

Kestrel.—*Falco tinnunculus*, Lin. Common.

Golden Eagle.—*Aquila chrysaëtus* (Lin.). This noble bird was formerly comparatively common along the cliffs from Slains to Troup Head. “At one period a pair of Eagles regularly nested and brought forth their young in the rocks of Pennan, but according to the tradition of the country, when the late Earl of Aberdeen purchased the estate of Auchmedden from the Bairds, the former proprietors, the Eagles disappeared, in fulfilment of a prophecy by Thomas the Rhymer that there should be an Eagle in the crags while there was a Baird in Auchmedden. But the most remarkable circumstance, and what certainly appears incredible, is, that when Lord Haddo, eldest son of Lord Aberdeen, married

* Gray's “Birds of West of Scotland,” p. 30.

Miss Christian Baird of New Byth, the Eagles returned to the rocks, and remained until the estate passed into the hands of the Honourable Wm. Gordon, when they again fled, and have never been seen again in the country. These facts, marvellous as they may appear, are attested by a cloud of living witnesses.”*

Mr. G. Sim tells me that a specimen of the Golden Eagle was killed at Pitfour on the 26th November, 1869. An immature specimen was killed at Cairness about 1829.†

White-tailed Eagle.—*Haliaëtus albicilla* (Lin.). Included in Mr. Arbuthnot's list of birds of Peterhead.‡

Kite.—*Milvus iclinus* (Savigny). Formerly pretty plentiful along the coast line, but now exceedingly rare. One has been killed at Aberdour by Mr. Duncan, the Brucklay Castle keeper.

Honey Buzzard.—*Pernis apivorus* (Lin.). Mr. Hyatt shot a Honey Buzzard in the pleasure grounds of Crimonmogate, in September, 1864.§

Osprey.—*Pandion haliaëtus* (Lin.). There is a beautiful specimen of this bird in the collection at Brucklay Castle. Mr. Edward once saw one fishing in the Loch of Strathbeg.

GALLINAE.

Pallas' Sand-Grouse.—*Syrhaptes paradoxus* (Pall.). I am informed by Mr. G. Sim that two of this species were shot at New Deer, near Brucklay Castle, in 1863, and were sold by him to the Kelvingrove Museum, Glasgow.

Red Grouse.—*Lagopus scoticus* (Lath.). The country best suited for this bird is becoming more contracted in its area every year. Formerly there were numerous large pieces of moss scattered all over the district, but now these are few and far between. At Mormond Hill and at Aberdour, as well as a few other places, the Red Grouse is still very plentiful.

Black Grouse.—*Tetrao tetrix*, Lin. Not nearly so numerous as formerly. It is still to be found, however, on the hills of Mormond and Aberdour. Late in the season they go down in flocks to wherever there is a small bit of moss, and feed on the surrounding stooks. It is wonderful how far from a moor of any size they are sometimes to be found.

* New Stat. Acct., vol. xii., p. 261. † Nat., vol. iv., p. 263-271.

‡ New Stat. Acct., vol. xii., p. 351. § Zool., 2nd ser., vol. ii., p. 555.

Pheasant.—*Phasianus colchicus*, Lin. In the New Statistical Account it is mentioned that a few years before the publication of that work (1845), Pheasants were introduced into this quarter by Captain Ferguson of Pitfour, and that, being protected, they prospered and spread.*

Partridge.—*Perdix cinerea*, Charleton. Very common indeed. The whole district is admirably adapted for partridge shooting. Being a thickly populated country, the holdings are for the most part small and broken up into small patches of corn and turnips, which enables the sportsman to find his birds much more easily, and to mark them down with certainty when once raised.

Quail.—*Coturnix communis*, Bonnaterra. Not by any means a rare bird. I have shot one myself near Brucklay Castle, and I know a farm on the estate where there is a nest almost every season. Mention is made of this fact in a note to the *Zoologist* by Rev. Mr. Smith, of Monquhitter.†

GRALLATORES.

Heron.—*Ardea cinerea*, Lin. Common along the coast. Breeds at Brucklay, Pitfour, Hatton Castle, near Turriff, &c.

Purple Heron.—*Ardea purpurea*, Lin. On the authority of Rev. Jas. Smith, a specimen of this bird was killed in the parish of Monquhitter in the beginning of March, 1847.‡

Great White Heron.—*Herodias alba* (Lin.). A specimen of this noble bird was obtained at Strathbeg in 1854.§

OBS. Buff-backed Egret.—*Bubulcus ibis* (Lin.). Mr. Thomas Edward, in his list of the birds of Strathbeg, mentions that a bird supposed to be an Egret was observed on the west side of the loch in 1816.||

Bittern.—*Botaurus stellaris* (Lin.). Mentioned in New Statistical Account as occurring in the parish of Crimond,¶ while Mr. T. Edward states that one was shot by one of Mr. Gordon of Cairness' keepers in the autumn of 1824, and that others have been seen.**

OBS. Night Heron.—*Nycticorax grisea* (Lin.). A specimen in

* New Stat. Acct., vol. xii., p. 146.

† *Zool.*, vol. vi., p. 2302.

‡ *Zool.*, vol. vii., p. 2497.

§ *Nat.*, 1854, p. 243, and *Zool.*, 1860, p. 6847.

|| *Nat.*, vol. iv., pp. 239-247 and 263-271.

¶ New Stat. Acct., vol. xii., p. 705. ** *Nat.*, vol. iv., pp. 239-247.

immature plumage was shot on 6th January, 1866, at Menie, not far from the mouth of the Ythan.*

Spoonbill.—*Platalea leucorodia*, Lin. A very rare visitant, but has been seen once or twice at Strathbeg.†

White Stork.—*Ciconia alba*, Briss. Dr. Macgillivray mentions that this bird was killed in Aberdeenshire, on the authority of Rev. Jas. Smith, of Monquhitter.‡

Glossy Ibis.—*Falcinellus igneus* (Gm.). Seen once at Strathbeg;§ while Mr. G. Sim tells me that a male specimen, in beautiful plumage, was shot on the sand-flats at the mouth of the Ythan, at Newburgh, on 4th October, 1880.

Curlew.—*Numenius arquata* (Lin.). Very common in winter.

Whimbrel.—*Numenius phaeopus* (Lin.). Frequently seen during summer.

Esquimaux Curlew.—*Numenius borealis* (Först.). This great rarity was obtained on the estate of Slains Castle on 28th Sept., 1878, and was preserved by Mr. George Sim, of Aberdeen, to whom I am indebted for this note. Exhibited to Glasgow Natural History Society. (See *Proc.*, vol. iv., p. 12.)

Bar-tailed Godwit.—*Limosa lapponica* (Lin.). Common at the end of summer and autumn at Strathbeg, and on some parts of the coast.

Black-tailed Godwit.—*Limosa aegocephala* (Lin.). Twice obtained by Mr. Thomas Edward at Strathbeg.|| Not nearly so common as the Bar-tailed Godwit.

Greenshank.—*Totanus glottis* (Pall.). Rare. Has been obtained at Brucklay and Strathbeg.

Wood Sandpiper.—*Totanus glareola* (Lin.). Mr. Sim, of Aberdeen, tells me that a specimen of this species was obtained at the Loch of Strathbeg on the 18th May, 1868, and that it is still in his possession.

Redshank.—*Totanus calidris* (Lin.). Very numerous all along the coast of this part of Aberdeenshire. Breeds on the islands in the Loch of Strathbeg.

Green Sandpiper.—*Helodromas ochropus* (Lin.). Mentioned along with the Ruff and Avocet as rare visitors to the Loch of Strathbeg.¶

* "Gray's Birds of West of Scotland," p. 282.

† *Nat.*, vol. iv., pp. 239-247.

‡ "Gray's Birds of West of Scotland," p. 285.

§ *Nat.*, vol. iv., pp. 239-247.

|| *Nat.*, vol. iv., pp. 263-271.

¶ *Nat.*, vol. iv., pp. 239-247.

Ruff.—*Machetes pugnax* (Lin.). As above mentioned, a rare visitor to Strathbeg. There is a female specimen of this species in the collection at Brucklay Castle, which was killed at Aberdour. Rev. Jas. Smith, of Monquhitter, mentions one having been shot on a moss in that parish.*

Common Sandpiper.—*Actitis hypoleucos* (Lin.). Common along the banks of the Ythan, Ugie, and Deveron in summer.

Sanderling.—*Calidris arenaria* (Lin.). A regular winter visitor, and is occasionally seen during the summer months.

Little Stint.—*Tringa minuta*, Leisler. A regular winter visitor. Twice obtained by Mr. Thomas Edward at Strathbeg.†

Dunlin.—*Tringa alpina*, Lin. Common. Breeds, or, at all events, used to breed on the islands on the Loch of Strathbeg.‡ Formerly no one could land on the islands without the permission of the proprietor, but now anyone who can obtain a boat may go there, provided he does not take a gun. The eggs are, consequently, taken away and sold in Peterhead. Mr. W. C. Angus, in writing to Mr. Gray, says that a correspondent sent him eighteen specimens, the result of a right-and-left into a flock at Charlie's Pot near the mouth of the Ythan.§ Mr. J. A. Harvie-Brown tells me that this is no uncommon number to kill at one time, for he once killed sixty-four with a right-and-left at Grange-mouth.

Curlew Sandpiper.—*Tringa subarquata* (Güldenstädt). Once obtained at Strathbeg by Mr. Edward.||

Knot.—*Tringa canutus*, Lin. An annual winter visitor. About as common as the Sanderling.

Woodcock.—*Scolopax rusticola*, Lin. Very common in autumn along the sandy hillocks covered with bent grass at St. Fergus, on the Pitfour estates, and between the Loch of Strathbeg and the shore. In some seasons very large bags of Woodcock are to be got here, just after they have arrived in the country and before they have moved inland. They breed now in some of the dens above Aberdour and at Auchmedden.

Great Snipe.—*Gallinago major* (Gm.). Several specimens of this bird have been killed in the district of Buchan. One by Mr. Duncan at Aberdour, on the estate of Brucklay, and one at Strath-

* *Zool.*, vol. vi., p. 2302. † *Nat.*, vol. iv., pp. 263-271.

‡ *Nat.*, vol. iv., pp. 263-271. § "Gray's Birds of West of Scotland," p. 320.

|| *Nat.*, vol. iv., p. 239-247.

beg about 1839 or 1840.* This species is also included among the birds of Peterhead.†

Common Snipe.—*Gallinago gallinaria* (O. F. Müller). There are many peat-hags and marshy places still left in this district, though they are being gradually improved away, where the Snipe abounds both in summer and winter.

Jack Snipe.—*Limnocryptes gallinula* (Lin.). Common in autumn, and I am convinced sometimes stays all the year round here.

Red-necked Phalarope.—*Phalaropus hyperboreus* (Lin.). One was killed at Fraserburgh on 27th October, 1853, and a fine female specimen was killed by Mr. John Gatherer, of H.M. Customs, at the same place, near the lighthouse, on 11th October, 1854. Mr. Edward gives another instance of this rare bird being obtained near Fraserburgh on 26th September, 1855—it feeding with a flock of Dunlins and Ring Dotterels.‡

Gray Phalarope.—*Phalaropus fulicarius* (Lin.). Rare visitor. Mentioned in Mr. T. Edward's list of the birds of Strathbeg.§

Avocet.—*Recurvirostra avocetta*, Lin. Also a rare visitor. Has only been seen at Strathbeg, as far as I am aware.||

Turnstone.—*Streptilas interpres*, Lin. A regular winter visitor, and has been occasionally met with during summer.

Lapwing.—*Vanellus cristatus*, Meyer. Breeds in large numbers everywhere, and the eggs are eagerly sought after by people from Fraserburgh and Peterhead, who find a ready market for them there.

Gray Plover.—*Squaterola helvetica* (Lin.). A winter visitant, making its appearance at about the same time as the Knot, Sanderling, Turnstone, &c.

Golden Plover.—*Charadrius pluvialis*, Lin. Very common in winter, and occasionally seen on the higher grounds in summer.

Dotterel.—*Eudromias morinellus* (Lin.). Included in Mr. Arbuthnot's list of the birds of Peterhead.¶ Mr Edward also mentions it, and says that four of this species were killed on the links near the Loch of Strathbeg in 1852, two of which are in his own collection.**

* *Nat.*, vol. iv., pp. 239-247.

† *Nat.*, vol. v., p. 47.

‡ *Nat.*, vol. iv., pp. 239-249.

** *Nat.*, vol. iv., pp. 239-247.

† *New Stat. Acct.*, vol. xii., p. 351.

§ *Nat.*, vol. iv., pp. 239-247.

¶ *New Stat. Acct.*, vol. xii., p. 351.

Ringed Plover.—*Aegialitis hiaticula* (Lin.). Common along the sea-shore, and breeds on the sandy hillocks covered with bent grass.

Oyster Catcher.—*Haematopus ostralegus*, Lin. The Oyster Catcher, or Sea-pyet, as he is frequently called, is to be seen along the coast all the year round, and breeds there.

Obs. Little Bustard.—*Otis tetrax*, Lin. Mr. Sim informs me that one was killed near Old Meldrum on 13th Nov., 1873, and that he still has it in his possession.

Water Rail.—*Rallus aquaticus*, Lin. An occasional visitor. Has been obtained at Brucklay, Pitfour, Strathbeg, near Peterhead, &c.

Corn Crake.—*Crex pratensis*, Bechst. Common.

Spotted Crake.—*Porzana maruetta* (Leach). Twice obtained at Strathbeg,* while Mr. Sim tells me that one was shot at Newburgh, at the mouth of the Ythan, in Sept., 1875.

Moor-hen.—*Gallinula chloropus* (Lin.). Very common. Breeds plentifully all over the district.

Coot.—*Fulica atra*, Lin. Common. Breeds in same places as the Moor-hen.

NATATORES.

Obs. Black Tern.—*Hydrochelidon nigra* (Lin.). Mr. Sim writes me that a specimen of this species of Tern was killed at Newburgh in October, 1866.

Common Tern.—*Sterna fluviatilis*, Naumann. Both the Common and Little Tern (*Sterna minuta*, Lin.), breed on this coast. They lay their eggs on the sand. Mr. Arbuthnot includes both these species among the birds of Peterhead, and Mr. Edward mentions them among the birds of Strathbeg.

Arctic Tern.—*Sterna macrura*, Naum. Occasionally seen on the coast. Used to breed on the larger island on the Loch of Strathbeg.†

Roseate Tern.—*Sterna dougalli*, Montagu. One was shot at Strathbeg in 1849 by Mr. Thomas Edward.†

Sandwich Tern.—*Sterna cantiaea*, Gm. Rare. A pair were seen by Mr. Edward at Strathbeg in the summer of 1854, and

* *Nat.*, vol. iv., pp. 263-271.

† *Nat.*, vol. iv., pp. 263-271.

one was shot by him on the sands near Banff, 7th July, 1854, when feeding in company with the Arctic Tern.*

Little Tern.—*Sterna minuta*, Lin. Breeds on this coast. See note upon Common Tern.

Ivory Gull.—*Pagophila eburnea* (Phipps). Has been obtained upon several occasions. Rev. Jas. Smith, of Monquhitter, in a note to the *Zoologist*, mentions one killed by Mr. Thomas Edward on the rocks about four miles to the eastward of Banff, on 29th January, 1847,† another, which is preserved in the Banff Museum, was shot by the same gentleman near Gardenstown in the end of December, 1860.

Kittiwake.—*Rissa tridactyla* (Lin.). Common all along the coast. Inhabits the cliffs, such as Troup Head, Pennan Head, &c., in company with the Razor-bill, Guillemot, and Puffin.

Black-headed Gull.—*Chröicocephalus ridibundus* (Lin.). Common. Breed on the islands of Strathbeg.

Little Gull.—*Chröicocephalus minutus* (Pall.). There is a very perfect adult specimen of this bird in the Elgin Museum, which was killed near Fraserburgh on 28th June, 1854.‡

Iceland Gull.—*Larus leucopterus* (Faber). An occasional winter visitant.

Great Black-backed Gull.—*Larus marinus*, Lin. Pretty common. This bird used to breed on the larger island on the Loch of Strathbeg.§

Lesser Black-backed Gull.—*Larus fuscus*, Lin. A common species.

Herring Gull.—*Larus argentatus*, Gm. Common. Often seen feeding along the coast in company with Kittiwakes and Black-headed Gulls.

Glaucous Gull.—*Larus glaucus*, Lin. Always to be seen on this coast in winter.

Common Gull.—*Larus canus*, Lin. By no means so common on this coast as the Black-headed and Lesser Black-backed Gulls.

Great Skua.—*Stercorarius cataractes* (Lin.). To be seen every winter on this coast.

Richardson's Skua.—*Stercorarius crepidatus* (Gm.). A rare

* *Nat.*, vol. iv., pp. 226, 239-247, and 263-277.

† *Zool.*, vol. v., p. 1700, and vol. xix., p. 7387.

‡ Gray's "Birds of the West of Scotland," p. 474.

§ *Nat.*, vol. iv., pp. 263-271.

visitor. One was killed in the neighbourhood of Strathbeg on 15th June, 1850, and is now in Mr. Thomas Edward's collection.*

Buffon's Skua.—*Stercorarius parasiticus* (Lin.). Occasionally seen on the coast.

Razor-bill.—*Alca torda*, Lin. Common. Lives on the cliffs with the Kittiwake, Guillemot, and Puffin.

Common Guillemot.—*Alca troile* (Lin.). Pretty numerous all along the coast.

Ringed Guillemot.—*Uria lacrimans* (Gould). Not as numerous as the common Guillemot, I believe, although the late Rev. Jas. Smith, of Monquhitter, writing to the *Zoologist*, on 16th September, 1850, mentions one killed at Gamrie Rocks as the first obtained in the neighbourhood.

Black Guillemot.—*Uria grylle* (Lin.). The late Rev. Jas. Smith says of this species that it inhabits or did inhabit the caverns on the shore.† A specimen was killed at Fraserburgh, in 1851.‡

Little Auk.—*Mergulus alle* (Lin.). Frequently appears on the coast in large flocks during severe weather, and numbers are picked up dead along the shore. In 1846 they appeared in unusual numbers.§

Puffin.—*Fratercula arctica* (Lin.). Met with in considerable numbers along the cliffs, where it finds a home along with the Razor-bill, Kittiwake, etc.

Great Northern Diver.—*Colymbus glacialis*, Lin. An annual visitor to this coast, and is sometimes seen inland as well. The late Rev. Jas. Smith, of Monquhitter, writing to the *Zoologist*, on the 2nd October, 1848, mentions the fact of one being caught in the salmon nets on the coast.||

Black-throated Diver.—*Colymbus arcticus*, Lin. A regular visitor to the coast of Buchan.

Red-throated Diver.—*Colymbus septentrionalis*, Lath. Common.

Crested Grebe.—*Podiceps cristatus* (Lin.). An occasional visitor.

Red-necked Grebe.—*Podiceps rubricollis*, Lath. Has been seen at Strathbeg, but is not common. One was shot on an 'artificial loch in the parish of Monquhitter, in the spring of 1848.¶

Little Grebe.—*Podiceps minor* (Gm.). A few always to be met

* *Nat.*, vol. iv., p. 263-271.

† *Zool.*, vol. viii., p. 2913.

‡ *Nat.*, vol. i., p. 147.

§ *Zool.*, vol. v., p. 1642.

|| *Zool.*, vol. vi., p. 2294.

¶ *Zool.*, vol. vi., p. 2302.

with on inland sheets of water, where it breeds. I shot a male and female on the artificial loch at Brucklay Castle, in the beginning of October, 1879.

Gannet.—*Sula bassana* (Lin.). Tolerably common both along the coast and at Strathbeg. There is one small rocky bay near Abdour, which they frequent in winter in considerable numbers.

Great Cormorant.—*Phalacrocorax carbo* (Lin.). Pretty common on the coast, and is sometimes seen a considerable distance inland.

Stormy Petrel.—*Procellaria pelagica*, Lin. Specimens of this bird have often been obtained after severe gales from the sea, but have generally been picked up dead. One was killed some years ago on the moor at Abdour by Mr. Duncan, the keeper there. It is included in the lists of both Messrs. Arbuthnot and Edward.

Northern Fulmar.—*Fulmarus glacialis* (Lin.). Rather rare.

Dusky Shearwater.—*Puffinus obscurus*, Gm. Mentioned by Mr. Edward as a rare species at the Loch of Strathbeg.

OBS. Spur-winged Goose.—*Plectropterus gambensis* (Lin.). Mr. Gray says that the only Scottish specimen of this rare bird which he has seen recorded was shot in the neighbourhood of Banff in February, 1855, and was preserved by Mr. Thomas Edward.*

Bean Goose.—*Anser segetum* (Gm.). Some of this species are seen every year, and in very severe winters they often visit the Loch of Strathbeg in considerable numbers.

OBS. Pink-footed Goose.—*Anser brachyrhynchus*, Baillon. A somewhat small specimen of this genus was shot at Strathbeg in spring of 1843, and was supposed to be a Pink-footed Goose. I have no doubt that this species does visit Strathbeg frequently in winter, but they are so extremely wary that they can seldom be approached within shooting distance.

White-fronted Goose.—*Anser albifrons* (Gm.). Has been obtained on the Loch of Strathbeg.†

Brent Goose.—*Bernicla brenta* (Pallas). By far the commonest species of this genus frequenting Strathbeg and the coast. They are to be seen in large numbers in some of the rocky bays near Abdour.

Bernicle Goose.—*Bernicla leucopsis* (Bechst.). Specimens have been obtained at Strathbeg.‡

* Gray's "Birds of West of Scotland," p. 355.

† *Nat.*, vol. iv., pp. 239-247.

‡ *Nat.*, vol. iv., pp. 239-247.

OBS. Canada Goose.—*Bernicla canadensis* (Lin.). Mr. Edward mentions in the paper above quoted that a bird resembling this species was obtained at Strathbeg in 1879. When first observed it was surrounded and beset by a host of other wild-fowl, which were teasing it.

Red-breasted Goose.—*Bernicla ruficollis* (Pall.). Once seen at Strathbeg.*

Mute Swan.—*Cygnus olor* (Gm.). Common.

Whooper.—*Cygnus musicus*, Bechst. Swans are frequently seen and shot on the Loch of Strathbeg and the coast between Fraserburgh and Banff. In the New Stat. Acct. of Scotland, under the heading of Crimond Parish, it says that “many are shot on the Loch of Strathbeg, and that the skins often fetch as much as 10s. or 12s. for the sake of the down.”†

Polish Swan.—*Cygnus immutabilis*, Yarrell. Only two specimens of this bird are mentioned by Mr. Edward as having occurred at Strathbeg, one in 1814, and the other in 1826. On 16th April, 1860, a flock of thirty wild Swans visited the Loch of Strathbeg. The resident Swans (*Cygnus olor*), although not half so numerous, would not allow them to rest, but drove them off.

Egyptian Goose.—*Chenalopex aegyptiaca* (Gm.). One was seen in a pond attached to the manse at Crimond by the Rev. A. Boyd in the winter of 1854.‡

Sheldrake.—*Tadorna cornuta* (S. G. Gmelin). Rare. Sometimes obtained at Strathbeg. It is included among the birds of Peterhead.§

Widgeon.—*Mareca penelope* (Lin.). Common.

Garganey.—*Querquedula circia* (Lin.). Three were seen by Mr. Thomas Edward in the summer of 1850 on the Loch of Strathbeg.||

Teal.—*Nettion crecca* (Lin.). Very common all over the district.

Pintail.—*Dafila acuta* (Lin.). Rare, but is occasionally got at Strathbeg and other inland lochs. It was once seen on the Deveron by the Rev. Jas. Smith, of Monquhitter.¶ It is included in Mr. Arbuthnot's list of the birds of Peterhead. A pair of Pintails were seen by Mr. W. C. Angus on the Loch of Slains on

* Macgillivray's "History of British Birds," vol. iv., p. 636.

† New Stat. Acct., 1845, vol. xii., p. 705.

‡ Nat., vol. iv., pp. 239-247. § New Stat. Acct., vol. xii., p. 351.

|| Nat., vol. iv., pp. 239-247. ¶ Zool., vol. vi., p. 2292.

4th May, 1866, and a pair—probably the same birds—were shot by him as they flew up the Ythan, nearly opposite Waterside.* Mr. Angus has also examined an immature male in the collection of Mr. J. Wilson, of Methlick, which had been shot by that gentleman on the loch at Haddo House on March 10th, 1867.

Wild Duck.—*Anas boschas*, Lin. Very common.

Gadwall.—*Chaulelasmus streperus* (Lin.). A Gadwall was killed on the Deveron by Dr. Leslie in the winter of 1837-38.†

Shoveller.—*Spatula clypeata* (Lin.). Has been obtained on loch at Haddo House by Mr. J. Wilson,‡ and at Strathbeg by Mr. T. Edward.

Pochard.—*Fuligula ferina* (Lin.). Decidedly a rare bird in this neighbourhood. One was killed on a loch in Monquhitter parish some years ago.§ It is in the list of the birds of Peterhead, already so often quoted.||

Ferruginous Duck.—*Fuligula nyroca* (Güldenstädt). Occasionally met with at Strathbeg.

Tufted Duck.—*Fuligula cristata* (Leach). Has occurred several times in this district. One was shot on the coast not far from the mouth of the Deveron,¶ and one was seen on the Deveron by the late Rev. Jas. Smith, of Monquhitter.** Specimens have been procured several times at Strathbeg.

Scaup.—*Fuligula marila* (Lin.). The late Rev. Jas. Smith has observed flocks of ten or twelve Scaups in the estuary of the Deveron,†† and Mr. Edward says that this bird has been shot at Strathbeg.‡‡

Black Scoter.—*Oedemia nigra* (Lin.). Occasionally met with on the coast.

Velvet Scoter.—*Oedemia fusca* (Lin.). Commoner than the last-named species.

OBS. Surf Scoter.—*Oedemia perspicillata* (Lin.). One instance of this rare bird having occurred on the coast of Aberdeenshire is given in Harting's "Handbook of British Birds," but it does not state the precise locality.§§

* Gray's "Birds of West of Scotland," p. 368. † *Zool.*, vol. xviii., p. 6969.

‡ Gray's "Birds of West of Scotland," p. 366. § *Zool.*, vol. vi., p. 2302.

|| New Stat. Acct., vol. xii., p. 351.

¶ *Nat.*, vol. iv., p. 226.

** *Zool.*, vol. vi., p. 2292.

†† *Zool.*, vol. vi., p. 2292.

‡‡ *Nat.*, vol. iv., pp. 239-247.

§§ Harting's "Handbook of British Birds," p. 162.

Harlequin Duck.—*Cosmonetta histrionica* (Lin.). One specimen of this beautiful and rare bird was obtained at Strathbeg a good many years ago.*

Golden Eye.—*Clangula glaucion* (Lin.). A regular winter visitant.

Buffel-headed Duck.—*Clangula albeola* (Lin.). There is a male of this species in the Banff Museum, which was shot many years ago at Strathbeg. It was presented to the Museum by the late Rev. Jas. Smith, of Monquhitter. Another specimen of this species was shot at the Loch of Loriston in January, 1865.†

Long-tailed Duck.—*Harelda glacialis* (Lin.). Large flocks of this duck frequent the estuary of the Deveron in severe winters.‡

Eider Duck.—*Somateria mollissima* (Lin.). Is generally seen on the coast near Aberdour in severe winters, and is occasionally met with at Strathbeg.§ It is also included in the list of birds of Peterhead.||

OBS. Smew.—*Mergus albellus*, Lin. Mr. Thomas Edward has no doubt that, from the description of a bird killed at Strathbeg, it must have been a Smew. It was, unfortunately, destroyed by a dog.

Goosander.—*Mergus merganser*, Lin. Pretty common in severe winters, and a few are to be seen every year.

Red-breasted Merganser.—*Mergus serrator*, Lin. A regular visitor, but in small numbers. Several have been shot at Brucklay Castle and at Aberdour. They are frequently seen on the coast and at Strathbeg.

IV.—*Entomological Notes bearing on Evolution.*

By Mr. PETER CAMERON.

In continuation of his paper read at last meeting, Mr. Cameron made some additional observations on the coloration of caterpillars. He remarked that the pale hairs over the legs or over the entire body of those larvae which feed on the flat surface of the leaf, or rest during the day on bark or lichen, was to prevent a sharp shadow being thrown by the body, and so lead to the detection

* *Nat.*, 1854, p. 242.

† Gray's "Birds of West of Scotland," p. 396.

‡ *Zool.*, vol. vi., p. 2292.

§ *Nat.*, vol. iv., p. 239-247.

|| *New Stat. Acet.*, vol. xii., p. 351.

of the larvae. He showed, too, that greenish-coloured larvae, by acquiring bad odour and secretions, and by congregating together, made their presence known by the fetid atmosphere with which they surrounded themselves as effectually as if they were gaudily coloured.

MARCH 30TH, 1880.

Mr. John Young, F.G.S., Vice-President, in the chair.

SPECIMENS EXHIBITED.

Mr. Peter Cameron exhibited a large and fine collection of galls, chiefly Hymenopterous, remarking at some length on their varied character, and giving descriptive notes regarding the insects which emerge from them.

PAPERS READ.

I.—*Notes on a Carboniferous Species of Glauconome.*

By Mr. JOHN YOUNG, F.G.S., V.P.

The group of Carboniferous polyzoons at present arranged under the genus *Glauconome* seems to be more abundantly represented in the limestone strata of Western Scotland than in other localities where similar strata prevail. In the Society's *Proceedings*, vol. ii., p. 325, and vol. iii., p. 353, Dr. Young and I figure and describe what we believe to be eight new species, and I have now to bring under your notice another species or variety, which I am inclined to regard as new, and which I provisionally name *Glauconome recticarinata*. This form is moderately common in the shale that lies between the two beds of limestone so long worked in the parishes of Blantyre and East Kilbride for various industrial purposes, and from which so many interesting species of *Polyzoa* and other Carboniferous fossils have been obtained. The species of *Glauconome* under notice is found in bipinnate branching fronds, in fragments varying from one to two inches in length—nearly all the specimens being found with their celluliferous faces adhering to the stone. I have been fortunate, however, in lifting from the shale by the asphalte process a few well-preserved fronds, which show the character of the celluliferous face in a state of excellent preservation.

The following are the characters noted:—Main stems and pinnules strongly carinated; keel straight; cells oval, rather more than their length apart; one at the base of each pinnule and one in the space between; cells on main stems and pinnules alternate; pinnules rather more than a line in length, opposite, or slightly sub-alternate; keel and opening of cell mouths ornamented by a row of small close-set tubercules; other portions of the face strongly granulated between the cells; reverse face of stem flat or slightly rounded, and ornamented with from three to four rows of granulated striae.

In the number and form of the cells, and in the ornamentation of the stem, this species approaches very closely to our *Glaucanome flexicarinata*, of which I think it may be only a straight-keeled variety. The more especially do I think so, as I find that some specimens show a tendency to become slightly flexuous on portions of the stem. As the typical specimens, however, of each variety, should they be considered the same, present very distinct differences, I would suggest that the distinctive names of *G. flexicarinata* and *G. recticarinata* be retained for these respective forms, in order to mark the distinguishing characters of the keel in each species.

There remains one other important character to be noted in the form named *G. recticarinata*. Recently, while examining some fragments of the stem from the shales of Capelrig Quarry, East Kilbride, I found that the cell mouths in one well-preserved specimen were fringed with a series of delicate hair-like spines or denticles, some fourteen in number, which curved inwards over the opening of the cells, like that seen in some species of recent *Flustra*. In this character *G. recticarinata* somewhat resembles our *G. stellipora*, only in this species the cells are round, and the regular number of spines fringing the cells is eight, and there is a small secondary pore. In the specimen here noted, it appears that the preservation of the hair-like spines is due to their having been crushed down a little way into the hollow of the cell mouths, and thus saved from abrasion. I am inclined to think that the whole celluliferous surface of this species was closely beset with hair-like spines, and that what we now see in the row of tubercules on the keel, and those around the cell mouths, as well as the smaller granulations on other portions of the face, are all due to a series of spines which have been abraded or destroyed, either before

or during fossilization, and of which only the tubercles or bases of the spines now remain to tell of their former existence. We seem to have much yet to learn regarding the perfect condition of many of our Carboniferous Polyzoa, and it is only by the occasional discovery of specimens which have not lost their appendages, or other external characters by which their surfaces were adorned, that any light can be thrown upon the perfect condition of some of the forms.

I find that the existence of tubercles on the surface of the Polyzoa corresponds very much with the evidence now obtained from similar appearances on many species of our Carboniferous Brachiopoda, viz.—that these tubercles were in most cases the bases of spines, varying in length and diameter, which have been denuded away. Mr. Thomas Davidson, F.R.S., has been able to illustrate in his Monograph of the Carboniferous Brachiopoda, the more perfect condition of the spiny exterior of several species found in the strata of Western Scotland, and which formerly were only known by their tuberculated character. This being the case, we are encouraged to continue the examination of all our tuberculated polyzoa, in the hope that specimens will yet turn up which will help to throw light on the more perfect character of some of the other forms. It is also probable that the discovery of these new characters will necessitate a revision of the genera of polyzoa amongst which they are now placed.

II.—*On Fungi.* By MR. THOMAS KING.

In the course of his paper the author said that he wished to draw attention to this branch of botany, as hitherto it had not received much notice from the members of the Society. The subject is one not only of scientific but also of economic interest, many species being valuable articles of food, although quite neglected in this country. The study of the Fungi is at present of special interest for Glasgow naturalists, as the Cryptogamic Society of Scotland holds its annual conference in this city next September.

Mr. King, in elucidation of his introductory remarks, gave a history of the common mushroom, *Agaricus campestris*, from the germination of the spores to the production of spores again, and illustrated the paper by drawings and specimens.

III.—*On the Occurrence of the genus Pentremites (Say.) in the Carboniferous Limestone Series of the East of Scotland.* By Mr. R. ETHERIDGE, Jun., F.G.S., Pres. Roy. Physical Soc., Edinburgh. Plate V., figs. 7-12.

In the *Geological Magazine* for March, 1878,* I called attention to the probable occurrence of the genus *Pentremites* in Scottish carboniferous rocks—an opinion based on the finding of a small and separate ambulacrum by Mr. James Bennie, which clearly belonged to some member of the Blastoidea and distinct from the curious little *Astrocrinites Benniei* (mihi).

Shortly after this announcement, thanks to Mr. Bennie's persevering efforts, a few crushed specimens of a small *Pentremite* were actually found at Kidlaw in Haddingtonshire.

Unfortunately, as is often the case in specimens of great and unusual interest, these precious examples were either so fragmentary or greatly crushed, that I was afraid little beyond satisfactorily proving the identity of the genus could be made of them. However, further examination gave a more hopeful view of the case, and believing that so important a discovery should not remain unchronicled, I beg to offer the following description of the fossils.

My thanks are due to Prof. A. Geikie, LL.D., F.R.S., &c., for permission to make use of the specimens for descriptions, and to Mr. James Bennie for the cordial manner in which he endeavoured to obtain further and better material.

One of the two entire specimens is crushed from above downwards. On one side it exhibits traces of the ambulacra, and the position of the radial and oral plates, but beyond these points the matrix hides everything from view. On the other side the plates of the calyx have become crushed together, and all that is distinct is the ornamentation of the surface, which will be described further on.

The second and best specimen (Pl. V., fig. 7) has been crushed from side to side, but in such a manner as to leave the leading features of the fossil apparent, especially on one side. The supplementary basal plates first detected in the calyx of *Pentremites* by Mr. S. S. Lyon† are not visible at all, and the basals themselves are

* Vol. v., dec. 2, p. 118.

† D. D. Owen's Third Report Geol. Survey of Kentucky, 1856-57, p. 469.

a good deal crushed, and do not appear to have anything especially remarkable about them.

The radial plates, on the other hand, judging from one very well preserved piece, are peculiar and characteristic. The plate in question is narrowed below, along its line of junction with one of the basals, and expands rapidly upwards, the lateral margins parallel with one another (and those of contiguous plates placed in deep grooves), forming a broadly hexagonal figure, the fore part of which forms a re-entering angle or fork, for the reception of the ambulacrum. The bifurcation is wide, and extends for nearly three-fifths of the length of the plate, has elevated rim-like margins, and is bevelled inwards towards the ambulacrum. The apex of the bifurcation, into which fits the tip of the ambulacrum, is lip-like and projecting. The two foremost extremities of the fork are obliquely truncated, meeting against the interradial plates. From the apical projection of the fork to the base of the plate the surface is obtusely angulated in the middle line, having on each side an oblique radiating ridge, passing to the angles formed by the union of the parallel sides with the two shorter basal edges of the plate. The surface of this and the other radial plates is ornamented by a series of finely-executed lines parallel to the margins of the plate, and which make, in their more or less concentric course, five distinct angles, thus:—First, following the line of junction of the radials and interradials at the fore part of the plate on each side (2 angles); second, in crossing the two lateral radiating ridges (2 angles); and third, in crossing the central obtuse ridge (1 angle) = 5 angles.

The oral plates are small, obtusely lanceolate, and do not extend above the truncated summit of the calyx. They occupy the angles between the halves of every two radial plates.

The ambulacra are narrow, moderately elongated, and pointed, rather deeply inserted in the radial forks, and each divided by a well marked, deep, median ambulacral groove, giving off distinct branches right and left. Beyond this the component plates of the ambulacra are not discernible. The central hiatus, the four spiracles, and the fifth compound aperture (commonly called the ovarian apertures) are quite obliterated, and the summit presents no further features of interest.

So far as the limited material at my disposal, and the state of preservation of the same, will allow of an opinion being formed, this

Pentremite does not appear to be nearly allied to any hitherto recognised British form, and is probably an undescribed species.

Similarly formed radial plates occur in *P. obesus* (Lyon)* with ornamentation of a like character, but certain other features of the calyx do not correspond

Locality and Horizon.—Kidlaw Quarry, near Gifford, Haddingtonshire, from shale above the No. 2 limestone, Lower Carb. limestone group. Collection of the Geological Survey of Scotland. Collected by Mr. James Bennie.

In pursuance of this subject, it may not be out of place to give an illustration of the ambulacra originally found by Mr. Bennie, and which in all probability is one of those of the above species.

In form elongately petaloid, tapering towards the outer extremity, traversed by a median flexuous ambulacral furrow (Pl. V., fig. 8). The component plates are not distinguishable, being apparently all anchylosed together, but the sides of the lancet plate bounding the ambulacral furrow are on each side crenulated. The groove in the ambulacral furrow gives off short alternate, equidistant, lateral branches on each side, which communicate with depressions in the pore plates close against their crenulated margins, which in no way perforated the plates, and are, therefore, of the nature of sockets,* and not pores. From the true pores (Pl. V., figs. 9b-12b) along the external margins of the pore plates run in other and somewhat longer grooves, which terminate in similar but larger sockets to those just described, and set alternately with them (Pl. V., fig. 8b).

The under surface of the ambulacrum is flattened (Pl. V., figs. 9, 11, and 12), the lateral portions showing the divisions of the plates running from the pores (Pl. V., figs. 11 and 12). The central part, which is marked by four longitudinal ridges (Fig. 9c), represents the lancet plate of the larger *Pentremites*. In cross section the respective parts just described are clearly distinguishable: the central furrow, the arched pore plates on each side terminating laterally in flange-like projecting margins, and the flat base.

The small slits or nicks in the margins of the ambulacra (Pl. V., figs. 9b-12b) probably represent the pores as previously described, but no separation into pore plates and supplementary pore plates is visible, the whole being apparently anchylosed together, and the sutures obliterated.

* D. D. Owen's Third Kentucky Report, Atlas, t. 11, f. 1b.

Of the four ridges visible on the reverse (Pl. V., fig. 9) the two lateral ones appear to represent the boundaries of the pore plates. The two inner probably form a portion of the lancet plate, but, at times, in place of these four ridges, the two lateral ones only are marked; at others, the central ones are alone visible, and represented by a groove (Pl. V., fig. 11*f*), or open gutter, extending the whole length of the ambulacrum. This may answer to the lancet canal of Mr. Roë and other writers.

EXPLANATION OF PLATE V. (figs. 7-12).

FIG. 7.—*Pentremites*, sp.—The best example yet found, showing portions of the basal plates; portions of two of the radial plates; an entire radial or forked plate; and one of the ambulacra. Kidlaw, near Gifford, Haddingtonshire, from the Lower Carboniferous limestone group.

FIG. 8.—Front view of the best preserved ambulacrum—with the ambulacral furrow; the pores leading to the inner depressions or sockets (*b*); the outer sockets at the terminations of the branch ambulacral grooves (*c*).

FIG. 9.—Reverse of an ambulacrum, presumed to be that of the foregoing species. Pores at the edges of the pore plates (*b*); divisions of the plates (*a*); the four ridges (*e*).

FIG. 10.—Side-view of another similar specimen, showing the pores at the sides of the pore plates (*b*), and the outer depressions or sockets in the same pieces (*c*).

FIGS. 11 and 12.—Views of the reverse, in which the grooves or gutters in the lancet plates (?) are visible (*f*).

Figs. 9-12 are taken from specimens obtained at Carlops Quarry, Carlops, Peeblesshire, from the shale above the Carlops limestone, Lower Carboniferous limestone group.

N.B.—The natural size of the specimens is shown by the indicators. The originals of Plate V., figs. 7-12, are in the collection of the Geological Survey of Scotland.

IV.—*Notes on Carboniferous Brachiopoda.* By Mr. ROBERT ETHERIDGE, Jun., F.G.S., Pres. Royal Phys. Soc., Edinburgh. Plates V. (figs. 1 to 6) and VI.

1. On the colour markings in *Lingula mytiloides* (Sowerby), Plate V., fig. 3.—The remains of colour bands have been noticed in a few Carboniferous shells by De Koninck, Davidson, Young,

De Ryckholt, and others, but, so far as I am aware, those of *Lingula mytiloides* (Sow.) have not been described. Mr. John Young appears to have noticed* the remains of colour in more forms than perhaps any other author. In a paper entitled "On the occurrence of shells showing Colour Marking in the Carboniferous limestone strata of the West of Scotland," he cites the following genera as so preserved, viz.:—*Orthoceras*, *Naticopsis*, *Aviculopecten*, *Myalina*, *Mactra*, *Terebratula*, and *Lingula*, but unfortunately no species are mentioned. My friend Mr. James Bennie has been fortunate enough, during his duties in connection with the Geological Survey of Scotland, to meet with specimens of *Lingula mytiloides* in the Bo'ness coal-field retaining traces of colour bands. From these it appears that in this species the markings in question are arranged in longitudinal, more or less wavy, and sometimes irregular thin bands of a colour darker than the general surface of the shell. The number of these bands varies, the smallest I have observed being two, and, so far as my memory serves me, the largest four. In some cases the lines become broken, when the colour assumes more the condition which may be described under the term "flashes of colour."

Locality and Horizon.—Chance Pit, Kinneil, Bo'ness coal-field, in shale forming the roof of the "Smithy" coal, associated with *Lingula squamiformis*, Phill. (*Mr. James Bennie*).

2. On the occurrence of *Syringothyris cuspidata* (Martin) in Scottish Carboniferous strata.—*Syringothyris (Spirifera) cuspidata* (Martin) has not been met with hitherto, according to the most authentic catalogues of fossils, in the Carboniferous strata of Scotland. During explorations carried on in Roxburghshire in 1878, Mr. A. Macconochie met with this species in moderate abundance in the shales of the Cement-stone group of that county. Mr. Thomas Davidson, F.R.S., to whom examples were submitted, considered them to be a variety of *S. cuspidata*, with a moderately-developed area.

Locality and Horizon.—Staneshill burn and Thorlieshope burn, Liddel Water, near New Castleton; Cement-stone group of the Lower Carboniferous series (*Mr. A. Macconochie*).

3. Note on *Spiriferina Etheridgei* (Davidson), Pl. VI., fig. 1.—This interesting little shell was described by myself in 1876†, but

* Proc. Nat. Hist. Soc., Glasgow, 1868, Vol. i., pt. 1, p. 185.

† Quart. Jour. Geol. Soc., Vol. xxxii, p. 463.

without assigning to it any specific name, only one specimen being known to me. Since then additional material has been obtained, and Mr. Davidson has done me the honour, in the lately published Supplement to his "Monograph of British Carboniferous Brachiopoda," to connect my name with it. The additional specimens have been obtained chiefly by Mr. Bennie in the East of Scotland; but some time ago I was shown examples collected in the West by Mr. John Smith of Kilwinning. Those gathered by Mr. Bennie prove that in some an additional rib occurs on each side of the fold of the dorsal valve, and that in fact the ribs are mere rounded undulations of the surface of the valves, rather than true ribs in the sense in which the term is usually applied in the Brachiopoda. The surface of the type specimen was smooth, but in one or two there are traces of papillae, as in other forms of *Spiriferina*.

Locality and Horizon.—Bruntsfield Colliery, near Penicuik, in shale above the No. 2 Limestone of the Lower Carboniferous Limestone group (*Mr J. Bennie*).

4. Notes on *Chonetes polita* (M'Coy), Pl. VI., figs. 2 and 3.—In the *Geological Magazine* for March, 1878, I briefly referred to the occasional ornamentation of this shell with faint radiating ribs, a peculiarity not mentioned in the original description by Professor M'Coy, nor in Mr. T. Davidson's later remarks. Some examples of *C. polita* appear to be quite smooth, others, on the contrary, have unquestionable traces of close rounded faint and direct radiating striae, covering the whole of the ventral valve, and usually more apparent from the visceral region forwards, leaving the latter more or less smooth.

Locality and Horizon.—Catcraig Quarry, near Dunbar, in shale above the Catcraig limestone; Ladedda Quarry, near Ceres, Fife, in shale above the limestone; both horizons in the Lower Carboniferous limestone group (*Mr. J. Bennie*).

5. On the punctate structure of the shell in *Orthotetes crenistria* (Phill.), Pl. VI., figs. 6-8.—Some time ago very fine examples of *Orthotetes crenistria*, var. *senilis* (Phill.), were forwarded to me by Mr. R. L. Jack, F.G.S., from the Permo-Carboniferous beds of Northern Queensland for description, and certain of them for presentation to the Geological collection of the British Museum. The Queensland specimens have, in common with British examples, the semi-conical ventral valve, with step-like interruptions pro-

duced by two or three very large and irregular concentric undulations, the elevated but not incurved beak, and the wide area, with its convex deltidium. Similarly the dorsal valves of these specimens exhibit the straight hinge line, and evenly convex surface. The situation of the valves likewise appears to be identical, and there also appears to be the same concentric lamination of the area and deltidium as seen in some British specimens. The most interesting point, however, is the structure of the shell itself. This is seen to be distinctly punctate, and when the surface is at all worn the punctae are everywhere visible, more especially on the area. I believe this feature in *Orthotetes* (= *Streptorhynchus*) has not been generally recognised, for in the generic description given by the best authorities the shell is said to be impunctate. Professor William King, however, has not omitted to notice this peculiarity in a Permian species, *O. pelargonatus* (Schlothheim). On mentioning the existence of these perforations to Mr. T. Davidson, he informed me that he had recently seen the same structure in some British *Orthotetes*. The punctae on the exterior of the shells appear as small rugosities scattered at random over the surface of the ribs or striae and intervening valleys, but when the surface is to any extent worn, their perforate character at once becomes apparent.

Locality and Horizon.—Havilah-Byerwin Road, one mile south of Rosella Creek Crossing, Bowen River coal-field, N. Queensland; a marine band intercalated in the "fresh-water" or upper series of the Permo-Carboniferous formation (*Mr. R. L. Jack, F.G.S.*).

6. On a small, distorted, and probably young form of *Chonetes*, from the Carboniferous beds of the East of Scotland, Pl. V., figs. 1 and 2; Pl. VI., figs. 4 and 5.—Only one valve of this shell is known to me—the ventral. When the normal form is preserved the shell is convex, markedly so in the middle line, giving rise to a rather prominent fold of greater or less dimensions. The specimens undergo curious contortions of outline, due perhaps, to a certain extent, to accidental crushing; in some there is a pinching up of the mesial fold or visceral region, in others a puckering in of one of the lateral margins, giving to the valve that irregular appearance assumed by Mollusca which live in crevices and cracks of rocks. One individual is of a very peculiar form—much elongated laterally, and correspondingly narrowed across the valve from the dorsal to the front margin, and somewhat obliquely twisted. The hinge

line is as wide as the valve, and is bordered by a row of hinge spines, rather strong for the relative size of the shells. The alar expansions are small and the angles rounded. When not distorted the valve acuminate or narrows towards the front, and the form is, speaking in a general way, roughly triangular. The beak is much incurved, overhanging the umbonal region of the shell. There is a small, although well-marked and distinct area (Pl. V., fig. 2), which appears to be longitudinally striated, and perforated by a small foramen or deltidial aperture, elongately triangular in shape. The surface is covered with coarse, strong, radiating ribs, which are simple, as a rule, but occasionally bifurcate, and are separated from one another by valleys about their own thickness in width. The ribs vary from sixteen to eighteen in number. The internal characters cannot be distinguished, except that the radiating ribs are as plainly visible as on the exterior. It is difficult to express an opinion as to the specific identity of these little fossils. The question arises, Is the irregular form an accidental peculiarity, or a specific character? If the former, which it probably is, we are dealing with an abnormal variety of *Chonetes Buchiana* (De Koninck). My friend, Mr. T. Davidson, was kind enough to examine the whole of the specimens, and wrote me as follows:—"I have seen young shells of *Chonetes Laguessiana*, or even *C. Buchiana*, very like your specimens. When *C. Laguessiana* is very young the ribs are simple, and it is only when the shell gets older that the ribs appear to become more numerous by interpolation. . . . I would have put them down for young specimens of *C. Laguessiana*. It is always very difficult to determine young shells of closely-allied species, for they rarely show the characters of the adult." If these specimens are to be regarded as the young of either of the above species, I think the decision must rest in favour of *C. Buchiana*, to which they appear to bear a closer resemblance than to *C. Laguessiana*.

Locality and Horizon.—Skateraw Quarry, near Dunbar, in shale over the Skateraw limestone; Kidlaw Quarry, near Gifford, Haddingtonshire; East Salton old Quarry, ditto, in shale above the No. 2 limestone; Inverteil Quarry, near Kirkcaldy, in shale over the main or No. 1 limestone; Cowdens Quarry, near Dunfermline, a shale over the Linn limestone; all horizons in the Lower Carboniferous limestone group (*Mr. J. Bennie*).

7. On a small specimen of *Orthis* perforated by a Crinoid stem,

Pl. V., figs. 4-6.—The shell in question possesses to a great extent the characters of *Orthis Michelini* (Léveillé), having the outline of this species, and the surface of both valves entirely covered with small, straight, short spines. The valves are in apposition, but have been pressed quite flat, or nearly so.

The chief point of interest lies in the presence of a Crinoid stem, which has passed through one corner of both valves, projecting beyond. It is difficult to determine the manner in which this has been accomplished. Had accident forced the encrinite stem through the valves, we should have expected to find the shell fractured to a greater or less extent—but this is certainly not the case—and a disarrangement of the surface. On the other hand, we cannot suppose there is, in this case, an attempt at attachment such as we now know took place in some Brachiopoda, otherwise the stem of the Crinoid would have been united to the *Orthis* either by some portion of the hinge, or the general surface of one of the valves.

Presuming this to be only an accidental occurrence, it is worthy of illustration as showing one of the many facts which have to be taken into account in dealing with the peculiarities of supposed adherent Brachiopods.

Locality and Horizon.—Skateraw Quarry, near Dunbar, in shale above the Skateraw limestone (*Mr. J. Bennie*).

EXPLANATION OF PLATE V. (figs. 1 to 7).

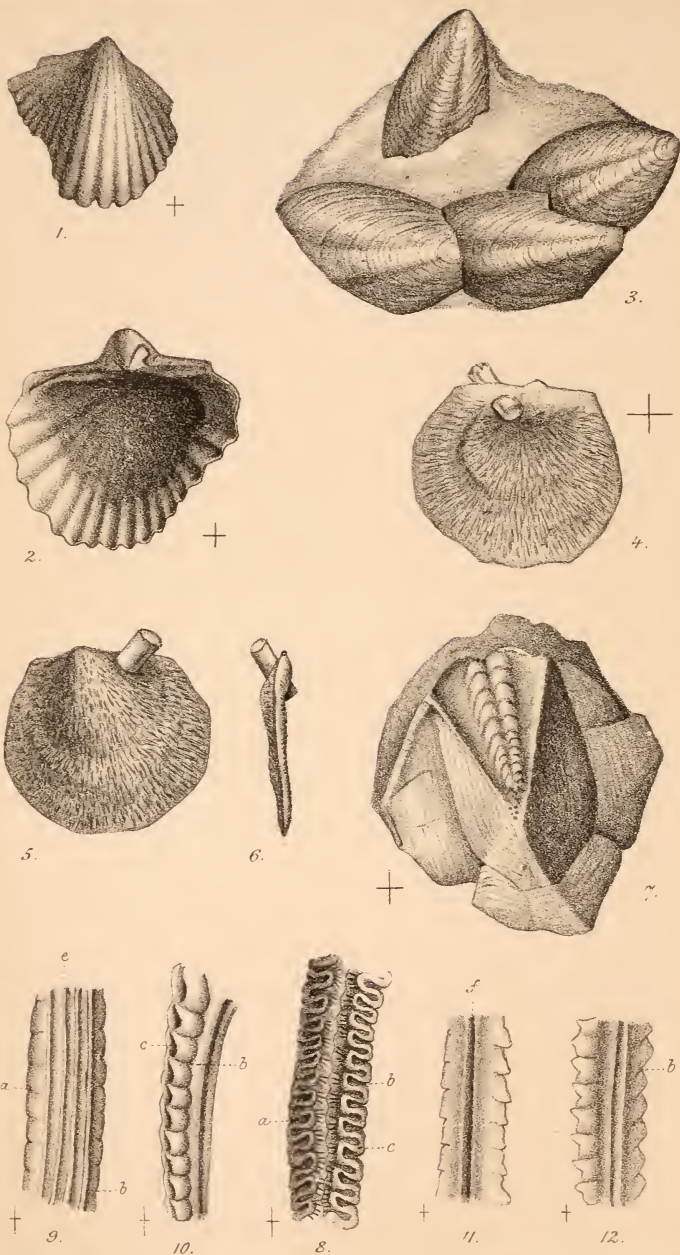
FIG. 1.—*Chonetes*, sp.—Another example of the shell represented in Plate VI., figs. 4 and 5, exhibiting one of the forms of distortion. Kidlaw Quarry, near Gifford, Haddingtonshire.

FIG. 2.—Interior of another specimen, with the area preserved. Skateraw Quarry, near Dunbar; Lower Carb. limestone group.

FIG. 3.—*Lingula mytiloides* (Sow.)—A group of four individuals, with the remains of radiating colour bands. Roof-shale of "Smithy" coal, Chance Pit, Bo'ness coal-field.

FIGS. 4-6.—Three views of a small *Orthis* (near *O. Michelini*, Lév.), perforated by a small Crinoid stem. Skateraw Quarry, near Dunbar.

N.B.—The natural size of the fossils is shown by the indicators. The originals of Plate V., figs. 1-6, and Plate VI., figs. 1-5, are in the collection of the Geological Society of Scotland. Those of Plate VI., figs. 6-8, are in the British Museum.



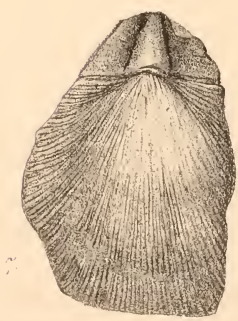
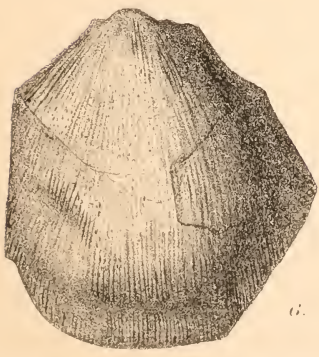
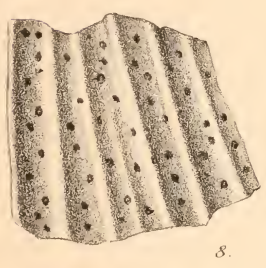
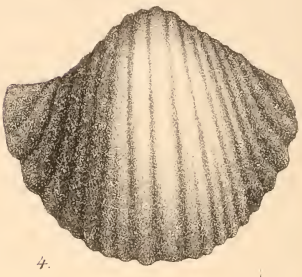


PLATE VI.

FIG. 1.—*Spiriferina Etheridgei* (Davidson).—The dorsal valve of an example in which the roughened papillose surface is preserved. Brunston Colliery, near Penicuik, in shale above the No. 2 Limestone.

FIG. 2.—*Chonetes polita* (M'Coy).—As usually described and figured; a well grown example. Catcraig Quarry, near Dunbar; Lower Carb. limestone group.

FIG. 3.—The same, with the indistinct striae of the surface preserved. Same locality.

FIG. 4.—*Chonetes*, sp.—A view of the ventral valve, showing the probable normal form. Kidlaw Quarry, near Gifford, Haddingtonshire; Lower Carb. limestone group.

FIG. 5.—Interior of the same specimen, showing the beak and portions of the area.

FIG. 6.—*Orthotetes crenistria*, var. *senilis* (Phill.)—View of the ventral valve, nat. size. Bowen River coal-field, N. Queensland.

FIG. 7.—View of a portion of the dorsal valve, and area of the same, nat. size.

FIG. 8.—Portion of the surface of the same, highly magnified, showing the perforations of the shell substance.

April 27th, 1880.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Mr. Thomas King exhibited a growing specimen of the common Primrose (*Primula vulgaris*), in which the points of the calyx had been metamorphosed into true leaves.

Mr. Peter Ewing showed specimens of *Petasites alba* from the neighbourhood of Barrhead. This plant, which differs not only in the colour of its flower but in other respects from the common Butterbur, is not indigenous, but may be considered as an escape from shrubberies, although found in many different localities.

Mr. John M. Campbell exhibited :—

1. A specimen of the Collared Peccary (*Dicotyles tajacu*, Lin.). He said the Peccaries, of which there are two distinct species, are natives of the forest region of South America. They are by nature

shy and timid creatures, but when attacked or menaced by an enemy exhibit a courage not to be despised, and often their two great enemies, man and the jaguar, have good reason to remember their dental arrangements. They are remarkable as being the only representatives of the porcine group indigenous to America, the number of hogs which here and there wander in a wild state having been, like the horse, introduced in early times by man. In general appearance the Collared Peccary resembles the common pig, but differs in its dentition and some other points of structure.

The species of which this is an example was included by Linnaeus in his genus *Sus*, from which it was separated by Cuvier, who included it in his genus *Dicotyles*, which the late Dr. Gray restricted to the allied species *D. labiatus*, the White-lipped Peccary. The Collared Peccary is the smaller of the two, being about three feet in length, and has a strip of yellowish white passing down each shoulder and meeting on the throat, its general colour being a grizzly black, the hairs being alternately ringed with grey, yellowish, and black. The tail is very short—in fact, a mere tubercle. Above the loins there is a glandular apparatus, which contains a secretion of a disgusting odour. Its flesh is said to be good, and is eaten by the natives, who hunt it with dogs. In its habits it resembles the hog, and is sometimes domesticated, but, unlike its congener, does not breed so readily in confinement. It has been bred in the Zoological Gardens in London, and a hybrid between the species and a male *D. labiatus* was born in the Gardens in 1864.

The individual now exhibited—a female—was brought alive to this country, and after its death was presented to the Kelvingrove Museum. In a letter, which I received a few days ago, its former owner says, “When it left Surinam it had its mate shipped with it, but, unfortunately, the male died on the voyage. When it came here in the month of May last it was rather low in condition, but soon picked up. It was very tame, and fond of being caressed or scratched, followed those that looked after it; but it was not often allowed to walk about in the yard, as it sometimes attacked the fowls, and sometimes succeeded, which made the dairy-woman declare ‘it had a blood-thirsty nature.’ After it had been a month with me, I had a Berkshire young boar placed beside it, but it never got in season, although in general they seemed very friendly. At first it ate the food before allowing the

Berkshire to taste, but as the latter got stronger than it, this was reversed, and it had to be fed separately. It knew strangers readily, and did not care for them being near it, and, if they offered to touch it, raised its bristles and snorted, and, if they persisted, it ejected a most offensive matter. After the severe frost it began to fall off in condition, though it took its food, and never seemed to be ill till a few hours before it died."

2. The Kiwi (*Apteryx australis*, Shaw), and its egg. Early in 1869 Mr. Gray, at that time Secretary of this Society, exhibited a specimen of *A. oweni*, and made some remarks on the species; and in November, 1878, Mr. Harvie-Brown exhibited another of the same species with its egg. Although the specimen I have brought here to-night is the species which was first described and figured, it is still sufficiently rare to be of interest to the members.

The Kiwi (*A. australis*) was first brought to this country from the South Coast of New Zealand by Captain Barclay, of the ship *Providence*, about 1812, and by him presented to Dr. Shaw, who described and figured it in the 24th volume of the *Naturalists' Miscellany*, under the name of the "Ferruginous-grey Apteryx." The notices of subsequent writers are mostly all derived from this description, although many doubted its existence. After Dr. Shaw's death his specimen was bought at the sale of his effects by Lord Stanley, who, to settle all doubts as to the genuineness of the species, sent it to the Zoological Society, and at one of the meetings it was submitted to a careful examination, and all doubts set at rest.

Since that time specimens have from time to time come to this country, and no less than four, or probably five, species have been described. Like the Dodo, Dinornis, and other wingless birds, the Kiwis are doomed to become an extinct race, and only their comparatively smaller size and nocturnal habits have till now preserved them from extinction. They are much esteemed by the natives for food, and are hunted at night by torch-light, their skins being dressed for robes, which are highly valued. The food of the Kiwi consists of worms, grubs, and insects, which their long and slender beaks and powerful claws are well fitted to obtain. The whole length of the Kiwi, as described by Dr. Shaw, is about 32 inches. In this specimen the length is about 24 inches, of which the beak, measuring from the eye, is 5 inches. The feet are large and powerful, with long sharp claws. The feathers, brownish with

blackish margins, are soft and broad at the base, and taper rapidly to the points, which are harder and more wiry, making the surface appear harsh to the touch. The head and neck is lighter in colour. Round the base of the bill are a number of long bristle-like feathers. Dr. Shaw states that at the base of the upper mandible the "aperture of the nostrils is covered by a valve-like membrane that would render it impervious. A bristle introduced into the nostril under this passes up the whole length of the beak." In this dried specimen the nostril is not so apparent, but at each side of the point of the beak is a small opening, down which a fine wire or bristle can be easily passed. The egg, which I also exhibit, belongs to this individual, and is, like those of the other species, of a large size in comparison to the bird, measuring 5 inches in length by 3 inches in width.

On 9th June, 1859, a Mantell's Apteryx (*A. mantelli*), which had been living in the Zoological Gardens, London, from 1851, deposited an egg which weighed $14\frac{1}{2}$ oz., the contents weighing $13\frac{1}{2}$ oz. The shell was smooth and of a dirty-white colour; the form an elongated oval, slightly tapering towards the small end, 4.75 inches in long, and 2.9 inches in short diameter. The weight of the living bird was ascertained to be 60 oz., so that the egg was nearly equal to one-fourth of the weight of the bird. As many absurd stories have been told regarding the reproduction of the Apteryx, I may be permitted to read the following short note on the incubation of the bird, whose egg I have already referred to—read to the Zoological Society on 28th May, 1868, by Mr. A. D. Bartlett, Superintendent of the Society's Gardens.

"In 1851 Lieut.-Governor Eyre presented to the Society an Apteryx. This bird proved to be a female of *Apteryx mantelli*. In the year 1859 she laid her first egg, and has continued to lay one or two eggs every year since that time. In 1865 a male bird was presented by Mr. Henry Slade. During the last year these birds showed symptoms of a desire to pair. This was known by the loud calling of the male, which was answered by the female in a much lower and shorter note. They were particularly noisy during the night, but altogether silent in the daytime. On the 2nd of January the first egg was laid, and for a day or more the female remained on the egg; but as soon as she quitted the nest the male bird took to it, and remained constantly sitting. On the 7th of February the second egg was laid, the female leaving the

nest as soon as the egg was deposited. The two birds now occupied the two opposite corners of the room in which they were kept, the male on the two eggs in the nest under the straw, the female concealed in her corner, also under a bundle of straw placed against the wall. During the time of incubation they ceased to call at night—in fact were perfectly silent, and kept apart. I found the eggs in a hollow formed on the ground in the earth and straw, and placed lengthwise side by side. The male bird lay across them, his narrow body appearing not sufficiently broad to cover them in any other way. The ends of the eggs could be seen projecting from the side of the bird. The male continued to sit in the most persevering manner until the 25th of April, at which time he was much exhausted and left the nest. On examining the eggs I found no traces of young birds.

“Notwithstanding the failure of reproducing the Apteryx, I think sufficient has been witnessed to show that this bird’s mode of reproduction does not differ essentially from that of the allied Struthious birds—in all cases of which that have come under my observation the male bird only sits. I have witnessed the breeding of the Mooruk, the Cassowary, the Emu, and the Rhea; and the mode of procedure of the Apteryx fully justifies me in believing the habits of this bird to be in no way materially different from those of its allies.”

3. Alpine Newt (*Triton alpestris*, Laur.). This Newt, although not a native of this country, might at first be readily mistaken for our common Warty Newt, but a glance at the ventral aspect of this species is sufficient to show that it differs from our largest Newt. *T. alpestris* is of a blackish lead colour above, marked with brown, sides and lower part of the tail spotted with black, with which colour the toes are also ringed. All the lower parts are of a bright orange colour, without spots. The tail is compressed, with the edges acute. It is common in Switzerland, and is found in Belgium, Austria, Italy, Galicia, France, and other parts of the south of Europe. The individuals exhibited are from the neighbourhood of Paris. In habits it does not differ from the common Newts with which all are familiar.

Mr. Peter Cameron exhibited specimens of *Microgaster sericeus*, a parasite on *Thera juniperata*, from Milngavie. When it leaves the caterpillar on which it has fed, this insect in its turn spins a cocoon attached to the spines, where it is attacked by other ichneu-

mons. He also exhibited two species bred from the galls of *Lasiop-tera juniperina*—viz., *Torymus juniperi* (Lin.)—a species new to Britain, and an undescribed species of *Lygocerus*, which it was proposed to name *L. juniperi*. Mr. Cameron also showed a gall of *Aphilothrix clementinae*, a species new to Britain, from Cadder.

PAPERS READ.

I.—*On the Skuas, particularly with reference to the recent occurrence of the Pomatorhine Skua (Stercorarius pomatorhinus), on the Coasts of Scotland in unusual numbers.* By Mr. J. J. DALGLEISH, M.B.O. U.

Dr. Elliott Coues, the eminent American ornithologist, in his “Birds of the North-west,” published in 1874, divides the sub-family of the Laridae known as the Stercorariinae or Skuas, into two sub-genera, *Buphagus* (Moehring, 1752), for the heavy short-tailed Great Skua and its antarctic representatives, and *Stercorarius* for the three longer tailed species. Our latest and best recognised British authority, however, on the Laridae (Mr. Howard Saunders), following more strictly the British Association rules for nomenclature, rejects the former as being anterior to the 12th edition of Linnaeus’ *Systema Naturae* (1766), and recognises one genus only, that of *Stercorarius*. Of this he enumerates six species as follows:—

<i>S. catarrhactes.</i>	<i>S. pomatorhinus.</i>
<i>S. antarcticus.</i>	<i>S. crepidatus.</i>
<i>S. chilensis.</i>	<i>S. parasiticus.</i>

Of these, *S. antarcticus* and *S. chilensis* are confined to the southern hemisphere. The former, which is widely distributed in the Atlantic, to the south of latitude 29° south, was found breeding at Kerguelen’s Island, in 1874, by Dr. Kidder, the naturalist attached to the American expedition sent to observe the transit of Venus. He records that its habits partake of those of a buzzard, feeding as it does nearly upon flesh, and that when shooting parties were out, they had some difficulty in securing the ducks, etc., which they shot, from being carried off. *S. chilensis* is seemingly confined to the Pacific Coast of South America, and the Straits of Magellan, probably breeding on the islands and shores of the latter.

The remaining four species are better known to British ornithologists; *S. catarrhactes*, the Common or Great Skua, and *S. crepidatus*, Richardson's Skua, being still found breeding, although, especially the former, in greatly decreasing numbers, on some of our Scottish islands; and the other two, *S. parasiticus*, Buffon's Skua, and *S. pomatorhinus*, the Pomatorhine Skua, being found as regular stragglers to our shores. I shall, therefore, confine my remarks on the present occasion more particularly to the last mentioned species, whose recent appearance on our coasts forms the subject of the present paper. I may, however, draw the attention of those interested in the distribution of the genus to an exhaustive monograph on the subject by Mr. Howard Saunders, in the *Proceedings* of the Zoological Society of London for the year 1876, p. 320, and to which I am indebted for valuable assistance on the present occasion.

Stercorarius pomatorhinus, the Pomatorhine Skua (sometimes spelt Pomarine, but as Mr. Sclater has shown in the *Ibis* for 1867, the former is more classical, being derived from $\pi\omega\mu\alpha$, operculum, and $\rho\upsilon\varsigma$, nasus), is a native of the arctic seas, where it has been observed as far north as lat. 82° N. It is found on the coasts of Spitzbergen, Novaya Zemlya, and along the northern coasts of Russia and Siberia. Middendorf found it breeding in the "barrens" of the latter. Newton also records it as breeding in Greenland. Besides these, Mr. Saunders considers there must be many other breeding places, for it is numerous in the north, and on our own shores it is not very uncommon in the autumn. It extends in winter all along the western coasts of Europe and Africa, ascending the Mediterranean as far as Sicily and Malta.* It has been obtained on the Burmese coast and at Cape York, North Australia. It occurs on the North American shore of the Atlantic as far south as New York, and has been seen at the Prybilov islands on the west coast of that continent, while an adult specimen was obtained off the Japanese coast in May, 1875, by the Challenger Expedition (Saunders, *P.Z.S.*, 1877, p. 794). It is only in small numbers that it usually visits our shores, but it is quite well known in the Frith of Forth and other places along the eastern coasts of Great Britain. Although, like the other species, it is more frequently

* I observed in the spring of the present year, 1880, several specimens, both adult and young, in the Museum of Marseilles, all of which were obtained in that neighbourhood.

seen on the east than the west coast of the island, Mr. R. Warren informs me that it is a regular visitor every autumn to the west coast of Ireland, where he resides. Nowhere, however, can it be called plentiful, and the late great flight is thus the more remarkable and worthy of notice. They seem as usual to have struck the east coast, where the first recorded specimen of the year was observed on the first of October, 1879, at Portobello, on the Frith of Forth. Within a few days thereafter they appeared simultaneously in large numbers at various points, such as Berwick, Dunbar, North Berwick, Portobello, Queensferry, Kincardine, and elsewhere on the east coast of Scotland; also, at Lochmaddy, in the Hebrides, and in the river and estuary of the Clyde. Large numbers also were seen, and many obtained, at various points on the east and south coasts of England, as recorded in the *Field* newspaper, *Zoologist*, and elsewhere.* Confining the present observations, however, to Scotland, I shall give, as far as I have been able to ascertain, an approximate list of those which were obtained or observed at various points, chiefly on or near the coast, giving the dates of capture where I have found it possible to obtain them.

Beginning in the north, and coming down the east coast, I find recorded as follows:—

Caithness: Wick: One, early in October.

Sutherland: Brora: Two seen flying south, by Mr. T. E. Buckley, on 13th October, when grouse-shooting at Kintradwell.

Banff: The Rev. G. Gordon of Birnie records a Skua having been found dead by one of the Duke of Richmond's keepers at Glenfiddich, in the south of the county; but this may not have been *S. pomatorhinus*.

Forfar and Fife: Frith of Tay: None are again recorded until reaching this estuary, where they seem to have appeared in considerable numbers, in company with Richardson's Skua. The Rev. J. E. Somerville, of Broughty Ferry, writes that a friend of his, who knows the birds well, saw more Pomatorhine Skuas in one day last autumn than he had ever seen previously during all his life, though a keen observer. They were seen flying above the Tay Bridge, and numbers were to be found sitting on the Abertay

* For full papers on these occurrences on the English coasts *vide* Stevenson, *Trans. Norfolk and Norwich Nat. Soc.*, 1880, p. 99; also, Dr. C. Brown, *Proc. Berwick Nat. Club*, 1879, pp. 54 and 169, and various writers in the *Zoologist*, 1880, pp. 18-23, 90-97, 108-109.

sands, on the Fife shore. The following are recorded as having been obtained in this district:—

Oct. 17.—Two were shot by Mr. P. Henderson, naturalist, Dundee.

Oct. 23.—One shot, and sent to Messrs. Hope, Edinburgh, for preservation.

Oct. 26.—Seven were shot, adult and young, and taken to Mr. Henderson for preservation.

East Lothian: 1. Dunbar: Many hundreds were observed in the neighbourhood of this place, numbers of them sitting on the pier, apparently much exhausted; and Mr. R. Gray states that he has examined upwards of 40 specimens which were obtained here during the early part of October. 2. Aberlady: Two, a male and female, were shot here, on 23rd October. 3. North Berwick: Dr. J. L. Crombie writes that large flights of Skuas were seen here during the month of October, the first being on the 14th of that month. Many of them were in fine plumage, with the tail feathers complete. I find the following recorded as obtained here, all of which were sent to Messrs. Small, Edinburgh, for preservation—

Oct. 16.—Five.

„ 20.—Six.

„ 24.—Two, both males.

„ 27.—Six.

„ 31.—Five.

Two of these birds were of the uniform and very dark plumage afterwards referred to. 4. Prestonpans: Five were obtained in October, two of which were preserved by Mr. Hay, naturalist, there.

Midlothian: 1. Portobello: Several were seen here, and the following recorded as obtained—

Oct. 1.—One, a male, preserved by Messrs. Small.

„ 14.—Four, one male, and three females, all preserved by Messrs. Hope, Edinburgh.

Nov. 3.—One found dead by Mr. Caldwell.

2. Leith: One, a male, was shot here on 23rd October.

Westlothian: Queensferry: The following were shot:—

Oct. 14.—One, a male, very fine specimen.

„ 24.—One, a female.

Stirling and Perth : Kincardine on Forth : A flock of about twenty were observed here, for some days, about the beginning of October. They were very tame. One was shot, and preserved by Mr. M'Culloch, of Glasgow: this bird had remained some days after the others left, having been probably previously wounded. Several Skuas of other species were also observed here about the same time.

Berwickshire : Berwick : Great numbers were observed here, and upwards of thirty were shot at Spittal point, immediately across the border. One was also shot at Newton, in the county, as recorded by Dr. Traquair in *Proc. R. Phys. Soc., Edin.*, 1879-80.

On the West Coast of Scotland I have only notices from one or two districts.

Inverness, insular : North Uist Island : One was shot here, about 26th October, by Mr. Macdonald, factor to Sir J. W. P. Campbell Orde.

Bute : Mr. A. M'Cunn, shipbuilder, Greenock, obtained five, and saw other three, in Kilchattan Bay, in this island, in October.

Renfrew, Argyll, and Dumbarton : Considerable numbers appeared in the course of the autumn in the Clyde estuary. Mr. Clunie, naturalist, Greenock, passed about 14 through his hands, which had been killed at various points between Cardross, on the Clyde, and Dunoon. Numbers were seen in Gourock Bay, Dr. Leitch of that place having observed upwards of 20. These were in two flocks, one of eight and the other of twelve. They were accompanied by some common Skuas, which, however, kept a little apart from them. One of the Pomatorhine species was captured in a somewhat curious manner; the person who fired at it having missed, it rose and flew a couple of yards only, and then allowed itself to be taken by hand, having apparently been paralysed by fear. A few were observed even as late as 14th February.

Dumfries : This is the only other western county from which I have any information, one having been shot, early in October, in Hensol meadow, near the town of Dumfries.

Keeping, as usual, principally to the east coast, it is worthy of remark that fewer than usual were observed in Ireland, none having been seen by Mr. R. Warren on the north-west of that island during last season, where, as above observed, it is a usual autumn visitant. Doubtless this fact, as well as its appearance in so great numbers, is to be attributed to the same cause—namely,

the prevalence in October of severe and continued gales from the north-west, coupled with the occurrence, as noted by Mr. Stevenson, of large shoals of herrings and sprats at that period on the east coast.

Their line of flight seems to indicate that migration takes place across the narrow neck of land between the Friths of Forth and Clyde, and, indeed, this is borne out by observations, at various times, of other species. The central counties of Scotland appear to form no barrier to the annual autumn migration of birds, which, striking our east coast, at localities north of the Frith of Forth, frequently find their way across to the Frith of Clyde.

It may be remarked as a curious fact, that the central tail feathers, which form one of the most characteristic features of the species, were, in the case of nearly all the specimens obtained in Scotland, much abraded and worn—a circumstance which seems difficult of explanation. This seems to have been previously observed by French naturalists, one of whom, M. Hardy, of Dieppe, affirms that the Pomatorhine Skua assumes in winter a plumage more or less resembling that of the young, that they then lose the central rectrices, which, if the moult is delayed, become a source of irritation to the bird, and in that case it breaks them over to obtain relief. Messrs. Degland and Gerbe, on the other hand, attribute the frequent occurrence of the feathers in a broken state, at this season, to abrasion by the ice before leaving their breeding haunts, or to the action of the gales, which drive the birds on the coast. Such great flights as the one under notice have, according to the last-mentioned authors, occasionally occurred on the northern coasts of France—notably in the month of October, 1834, when a great storm prevailed for several days in succession.

Before concluding this brief and imperfect record, one more fact in connection with the recent Skua flight may be mentioned, viz., the detection, for the first time, of several cases of melanism among the specimens, which were obtained, both in England and Scotland, two of which in the latter were shot at North Berwick on 31st October. This form, although known to occur in the allied species *S. crepidatus*, had not been previously well authenticated in that now under review. A notice of this, from the pen of Mr. Howard Saunders, appeared in the *Field* of January 17th, 1880.*

* Reprinted in the *Zoologist*, 1880, pp. 90-97.

I may here add that since the reading of this paper, it has been stated in the *Field* of October 16th, 1880, by Mr. E. T. Booth of Brighton, into whose possession one of these dark-coloured birds fell, that it lived in confinement for upwards of five months, or until early in April last, when it had to be destroyed owing to swellings on its feet which caused it great apparent pain; and he further states the curious fact that by that time it had quite assumed a different plumage, the dark colour of the throat, breast, and under parts having changed to almost white, and light-coloured feathers were also showing themselves round the neck.

During the late autumn (1880) only one specimen, so far as I can learn, was obtained in Scotland, and that, so early as August 10, at North Berwick. Mr. T. H. Nelson, in the *Zoologist* (1880, p. 511), however, records the occurrence of a flight of several hundreds at Redcar, in Yorkshire, on 28th October, during the prevalence of a heavy gale from the north-east. They were flying in a westerly and north-westerly direction, but from the severity of the storm, no specimens were obtained, shooting being impossible. They were principally mature birds of the white-breasted variety, only three or four dark-plumaged specimens being amongst them.

Attention has been called by several writers in the *Field* during last autumn to the fact of the Pomatorline Skua carrying its tail shut up like a fan when flying straight forward, swimming, or standing on the ground, so much so, that only one single feather was to be seen; and Mr. T. H. Nelson remarks further in the same journal that he had observed, in several instances, when he "had shot a Skua, others came to the dead or wounded bird, and in their twistings and turnings while swooping round, continually opened and shut their tails much in the way which Terns do when fishing over a shoal of Sprats."

II.—*Barra Head and its Bird-Life.* By Mr. GEORGE MACLACHLAN, formerly Lighthouse-keeper there; with Notes by Mr. JOHN A. HARVIE-BROWN, F.R.S.E.

INTRODUCTION.

Barra or Barray, according to one reading, means—the *island of the point or extremity*, from *bar*, a head or point, and *ay* or *i*, an island [*v.* Robertson's "Gaelic Topography," p. 211, and "New Stat. Acct.," vol. xiv., p. 198], and this appears to be the one usually accepted. But other authors, as early as the days of Martin,

assigned the name as in honour of a tutelar saint, St. Barr, which has been contradicted, and again reasserted since that time, by different writers, some stating that no such saint existed or appeared in the Roman calendar, but others referring to "St. Barr, Bishop of Cork, in the 6th century, whose commemoration day, as Martin correctly states, is the 25th September." Those who uphold the latter derivation in conjunction with the Norse termination *ay* (*oe* of the Northmen), would appear to have at least an equal share of the argument.

Although not admitted in the Roman calendar, many names of saints, Irish, Scottish, and English, to which that honour has not been accorded, are to be found in native calendars, and the more prominent of these are now generally embodied in the calendars published in this country, which are often prefixed to books of Catholic devotion.

If the first derivation be accepted, it admirably describes the geographical position of the island; if the second be taken, we find much to support it in what is stated:—that the 25th September was kept as the commemoration day of the tutelar saint by the natives, and that the practice is only now dying out, while it is still further supported by the fact that churches on the islands are also called after the saint, *e.g.*, Killbar. In "The Story of Greltir the Strong," translated from the Icelandic by Magnusson (1869), "Barra" is several times mentioned, and, in the index, the name is bracketed "(Barrey) one of the Hebrides," an evident recognition of the Norse origin of the name.

Barra is also called Bernera or Berneray. This name Mr. James Macpherson* considers "has a suspiciously foreign appearance, but Gaelic writers appear to have assimilated it, and write it, Bearnairidh. *Bearn* means a gap or notch, and *airidh* (as they spell it) hill-pasturage, or a level green among hills," which describes the features of the interior of Barra Island, north of Castle Bay, though scarcely of the island upon which the lighthouse is erected.

The following observations on the Bird-life of Barra Head are principally based upon the results of a long acquaintance with the locality and the species mentioned, and of intelligent and careful

* I am obliged to Mr. Jas. Macpherson, of Edinburgh, for assisting me in the above notes on the derivation of the name, as well as for much kind help in similar directions elsewhere.

examination into their habits and economy, by one who is not only a good cragsman, but is also a good observer. Mr. George Maclachlan spent over four years as lighthouse-keeper on Barra Head. He left it in 1870, owing to bad health, and Captain H. W. Feilden and myself met him on board the s.s. "Dunvegan Castle," on his way to consult Dr. Sir Robert Christison, in Edinburgh. This was on the 25th May, 1870, when we were on our way to Barra Head. I am glad to say that Mr. Maclachlan's health is now quite restored, and he is lighthouse-keeper at another of the Scottish stations. I am indebted to him for a careful return from one of the north coast lighthouses in connection with the Migration of Birds in 1879.*

Such notes as Mr. Maclachlan's are particularly valuable, being the result of observations made at the same locality in four consecutive breeding seasons by one well able to observe correctly, and few of our naturalists have had as good opportunities of becoming intimately acquainted with any single rock-bird station, or have spent so much time, day after day, all through four seasons, in watching the habits of the residents. Mr. Maclachlan's notes cannot be looked upon as written for writing's sake, but as the real outcome of patient and correct observation, *in the field, and in one of nature's grandest observatories.*

I have supplemented them under the several species spoken of by a few additional observations made by Capt. H. W. Feilden and myself during our visit to Barra Head, of two nights and a day, in the end of May, 1870; and I have also alluded to the remarks of other observers on the rock-birds of this nursery.

Scattered notices of Barra Head occur in the works of our earlier authors. Martin only shortly refers to it; Macgillivray gives a good description of it in his "British Birds" [vol. v., p. 351];† Captain Elves describes it faithfully [Ibis, 1869]; and Mr. Theo. Walker goes somewhat minutely into a description of it ["Zoologist," May 1870, p. 2117]. Incidental accounts occur throughout the literature connected with the Hebrides and Highlands and Islands of Scotland, but a list of these would occupy too much space. Muir's "Barra Head," however, may be instanced as one giving illustrations of the scenery.

* V. "Zoologist," May, 1880.

† This is evidently rewritten and somewhat compressed from his earlier "Account," in 1830 [*Edin. Journ. of Nat. and Geog. Science*, vol. ii., p. 331].

When Captain Feilden and I visited Barra Head in 1870, we were not greatly impressed by the numbers of sea-fowl. Our first and last impression was that Barra Head, as a breeding station, has been lauded far beyond its merits, and we have, since that time, as well as prior to it, satisfied ourselves that there are many rock-bird stations holding a larger population of birds than Barra Head. The birds are much scattered upon small ledges all over the face of the cliffs, leaving great spaces quite untenanted and untenanted, owing to the irregular nature of the rock-strata. Very different is the cliff of Mingalay, with its regular and parallel ledges closely packed with birds; but of Mingalay we may take another occasion to speak more fully.

Perhaps the finest view of the rock-birds' haunts on Barra is from the old ruinous keep behind the lighthouse, where a deep gully in the rock runs inland about 100 yards, almost to the base of the lighthouse itself. From the southern side of this gully the whole face of the opposite cliff is seen. There, in 1869, the Peregrine Falcon had its eyrie, and Mr. Theo. Walker, with the assistance of Mr. Maclachlan, procured the young. Captain Elwes, in his able paper on "The Bird Stations of the Outer Hebrides," [Ibis, 1869, p. 26], gives a somewhat full account of Barra Head, referring also to the previous accounts by Macgillivray ["British Birds," vol. v., p. 351*]. Capt. Elwes, amongst other matter, describes the method adopted by cragsmen on Barra for killing the birds as they fly past, by an upward stroke of a long pole "resting, end downwards, across the thigh." A similar method is adopted at Ailsa Craig, as noted by Mr. R. Gray ["Birds of West of Scotland," p. 436].

GUILLEMOT. *Alca troile* (Lin.).

"The Guillemot, Razorbill, and Puffin keep their time to a day in arriving at their place of hatching, which is upon the 5th of April. If the weather is stormy they remain upon the water awaiting the first favourable opportunity of landing. They all land at the same time, and make a great noise, quarrelling and

* Rewritten, as before mentioned, from his own earlier notes, in 1830.

† For the purpose of distinguishing them, Mr. Maclachlan's notes are placed within quotation marks, " ", while the additional remarks are distinguished by square brackets, [].



“ fighting for the places on which they were successful in bringing
“ out their young formerly. There is every proof that they return
“ to the same ledge of rock year after year. I observed one
“ female Guillemot browner in colour than hundreds of her
“ fellows, who hatched her egg along with other six of the same
“ species on a small cliff where no person could get to them, but
“ where they could easily be seen from a ledge above. This brown
“ bird hatched her egg not only on the same rock, but on the
“ same place of that rock for three years in succession. At
“ another place I saw a Guillemot which had lost a claw. She
“ had hatched three years in succession on the same place, and
“ when I left in 1870 she was back at the old spot.”

[The regularity in the time of arrival of sea-birds at their breeding stations has been constantly remarked upon by authors, from Martin downwards in chronological sequence, and various references will be found under the different localities in the works treating of them. For the dates of arrival of the various species and of their departure from St. Kilda, see Martin's "St. Kilda," and for the same in more convenient form—and tabulated—see Seton's "St. Kilda," 1879, page 171. The accuracy of Mr. Maclachlan's observations cannot but prove useful to others who may wish to study rock-birds in their haunts, and the time devoted by him to his study of them is sufficient guarantee for their truthfulness. Few professed naturalists can boast of having lived amongst them for four years.

Varieties amongst sea-birds are not so frequently met with as among land-birds. Still, albinos and other varieties occur not uncommonly. From the Faroe Islands we possess in our collection a fine series of the Puffin—from the typical black-and-white to the albino—speckled, brown-winged, and others, being intermediate. The Guillemot and Razorbill also are occasionally obtained of a light brown colour on the back, and also albino and other varieties. Mr. Maclachlan expresses the opinion that the dun varieties are the direct produce of the same stock, or, in other words, that the colour is hereditary; and I think this is fully borne out by our experience of varieties in other species. Mr. Maclachlan thinks that there may be one dun-coloured bird in, perhaps, 400.

The variety called the Bridled Guillemot is abundant at Barra Head, and in 1870 Captain Feilden and myself were at considerable pains to arrive at an estimate of their numbers in proportion to

the *unbridled* examples. After minutely observing and counting the occupants of a number of ledges, we came to the conclusion that there were five common Guillemots to every bridled bird. The particulars of our observations on this point will be found in our *Journal* for that year.* We also satisfied ourselves of the identity of the two forms, finding a bridled and an unbridled bird most unmistakably paired on several occasions. Captain Elwes, when seated in the cliff-face, by counting the birds flying past, arrived at the conclusion that the bridled birds were in the proportion of one to ten or twelve [Ibis, 1869, p. 27]. Mr. Walker could only make out one in twenty [Zool., 1870, p. 2168]; whereas Mr. Maclachlan, in a subsequent note to me, states his opinion that "fully half of the Guillemots are bridled birds." J. A. H.-B.]

"They only hatch one egg in the season. No nest is formed, and the egg is laid upon the bare rock. But if by any means that egg is lost, she will lay another in seven or eight days. Should a female bird be killed early in the season, from six to ten ova are usually found in the ovary. If the first egg be taken away, the bird will not lay the second on the same place that season. I have sprinkled a lot of birds with red paint, by dipping a piece of heather into the paint, and shaking it over them. I have then gone down and taken their eggs. Other birds came there next day, and I found my marked birds, or the greater part of them, on the place which the others left. Another time I sprinkled some on one side of a point of rock with red, and those on the other side with blue paint, and found that the birds exactly changed places. Both companies were much wilder in their new abodes.

"Usually they sit until a person is within a few yards of them. In fact, when they are 'sitting hard' they will hardly leave the eggs. I have often walked among them when the young birds were coming out, and had to be careful that I did not tramp upon them. The parent birds make a low cooing sound, keeping the head moving up and down; every time they put down the head they touch the egg, placing it well in front of their feet. They know their own eggs perfectly well. I have several times gone on to a ledge and changed their eggs, and watched the birds return, and shift their eggs to their own respective positions

* See also Mr. R. Gray's "Birds of West of Scotland," p. 426.

“ again. I have never known an instance of the male bird hatching out an egg if the female has been shot. The egg is invariably left to rot, or is carried off by crows or gulls. But if the female is killed after the egg is hatched, the male bird will bring up the young one. The male always assists in feeding the young whilst the female is alive, but I never observed him feed the female while sitting. I do not think he feeds her, for she is absent a while every day. The rock is so hot that the eggs are never cold.

“ The young birds do not fly down to the water from the cliffs they are hatched upon. One of the old birds takes hold of a wing, at the shoulder, and flies to the water with the young bird. They do not alight upon the water immediately when they come to it, but fly for a few yards along the surface, and alight, after recovering their balance, which is lost by the change in the direction of their flight. The young one swims round the parent bird for about ten minutes, and the old one then takes it by the back of the neck and dives with it for a few seconds. She repeats this lesson several times, stopping longer under the water each time. Then she dives and takes up some food for the poor little one. Within an hour it is diving and following her, but is seen on the surface long before the old bird appears. The young are not fully fledged when taken to the water. The old birds take from 21 to 24 days to hatch the eggs, and the young are about the same length of time before they are fit to go down to the water. The young are often driven on shore in coarse weather and killed. On a fine day upwards of 100 may be seen taken down from the cliffs in the above manner. I have never seen them taking the young birds down on their backs, although the natives of Berneray have told me that they did so.”

“ In 1869 I selected four ledges and marked on each ledge twelve young birds on the web of the foot with a pair of scissors, in the same way as many mark the domestic goose, in order to ascertain if they came back to the same ledges on which they were hatched. But I was in bad health when the birds came in 1870, and I was not able to go down amongst them. I wrote to a native to try and pick out the marked ones, and to tell me where they were found, and what mark they had on the foot. He did not reply, and so my experiment was lost.

“ I have omitted to mention that, when the rock-birds come

“on the 5th of April, they only stay two days, and then disappear as suddenly as they came. Some of them return in the first week of May, and they gather together up to the 20th. They are about a week on the rock before they lay. I got thirteen eggs on the 12th May, 1867, which is unusually early. By the 1st June, they have all laid.”

[In the same year mentioned by Mr. Maclachlan as an unusually early breeding season at Barra, viz., 1867, Mr. Robert Gray tells us, on the authority of Mr. Alexander Carmichael, that “great numbers died on the ledges in the breeding season.” Mr. Gray goes on to say, “Incubation had been delayed till the middle of August, on account of the severity of the weather, which seems to have caused the mortality.” After the late and severe winter and spring of 1878-79, I did not find that the incubation of rock-birds was delayed, all my inquiries going to prove that such was not the case, and that they were in no way affected by the late summer. J. A. H.-B.]

“I have never attempted to count the number of these birds, as it seems not possible to do so. Captain Elwes stayed with me ten days or so, and, with the assistance of his servant, he used to try to come to some sort of calculation, but had to give it up. Suppose those on the rocks could be nearly counted, it was hard to say how many were flying in circles, and fishing at sea.”

[It seems to me that a tolerably fair estimate might be arrived at, if, for a few days, all which could be seen on the rocks were counted every day for a week at the height of the season, and the average doubled to include the birds away at sea fishing. This plan of course could only be applied at certain stations, as the nature of the ledge-formations of the cliffs of some other localities would, from their irregularity, render such an attempt almost vain. J. A. H.-B.]

RAZORBILL. *Alca torda*, Lin.

“There is little to be said regarding the Razorbill, as its habits are much the same as those of the Guillemot, only that the Razorbill hatches on the ledges highest up from the water, and it is a smarter bird on the wing.”

PUFFIN. *Fratercula arctica*, Lin.

“Of Puffins there is a goodly number. They frequent the grassy slopes and burrow into holes. They lay two white eggs,

“ with faint dark spots scarcely discernible. They feed the young
“ until they are nearly fledged, and the young follow their parents
“ as near to the water as they can, and generally have only one
“ range of cliff to fly over into the sea.

“ The information given in Chambers’ ‘Information for the
“ People,’ that the Puffin perches itself on the rocks overhanging
“ the sea, and pounces down on the fish that chance to come that
“ way, is erroneous, and quite foreign to the habits of the bird.
“ It neither perches itself on overhanging cliffs, nor does it
“ pounce on its prey in that manner. It will go fifty miles for its
“ food. I often saw them and other rock-birds leave the island
“ in large flocks, going straight for Skerryvore lighthouse, about
“ the time in the morning when we were extinguishing the lights.

“ I have been told by several old men, that when there were
“ no merchants’ shops in Barra and Uist, sixty years ago, the
“ natives made their markets in Tobermory. They took fish and
“ fat sheep, home-made cloth, or anything they had to dispose of,
“ as well as boxes of birds’ eggs, and sold or exchanged them for
“ other necessities.

“ When fog came on, as is often the case in summer, their only
“ compass was the direction of the birds’ flight, by which they were
“ sure to be piloted to Barra Head, or Mingalay. I have been
“ told also that when the saithe fishing did not do well with the
“ Islay fishermen they would leave, and go to fish at the Mull of
“ Kintyre. These fishermen told me that the birds came there
“ every morning and left about 4 p.m. This is possible, but I
“ think it likely that the birds they saw came from the coast of
“ Ireland.

“ The Puffins come home with from 16 to 20 herring-soil, about
“ an inch in length, in their bills. The only hold they take
“ is between the mouth and the eye of each fish. It astonishes
“ me how they can kill fish and keep hold of those they already
“ have.”

[The Puffin lays only one egg, but at Barra Head, as well as upon other stations, I have frequently found two eggs in the same nesting-hole, side by side. These however, are laid by two different birds. The slightly spotted eggs of the Puffin are typical, but a few occur with quite bold and large distinct true colour markings. We possess such specimens from Faroe, Shiant Isles, and other British localities.

It may prove interesting to compare these remarks of Mr. MacLachlan with somewhat similar observations made by myself at the Shiant Islands in 1879,* and those by some of the lighthouse keepers on the west coast of Scotland, such as Stoir Head, Cape Wrath, Butt of Lewis, and Island Glass.† In course of time by doing so we may hope to arrive at interesting conclusions regarding the directions of their flights at feeding time, and on migration. Martin also alludes to the fact of birds serving instead of a compass whilst on his passage to St. Kilda. The Puffins of the Shiant Islands fly away for many miles south-westward to their feeding grounds in the Minch and Sound of Harris. Rock-birds are seen also passing Stoir Head lighthouse in large numbers in June, flying in a south-westerly direction. J. A. H.-B.]

KITTIWAKE. *Rissa tridactyla* (Lin.).

“The habits of the Gulls are so well known that I have nothing to remark regarding them. The Kittiwake is the most plentiful. I have seen their nests so close together that I lifted 38 eggs without moving my feet. They lay three eggs—the same number as the Black-backed and Herring Gulls.”

[As Mr. W. Macgillivray informs us [“Account of the Outer Hebrides,” Edin. Journ. of Natural and Geographical Science, vol. ii., p. 328], the Kittiwake in Barray is called *Seathag*, but elsewhere in the Hebrides, *Ruideag*.—J. A. H.-B.]

BLACK GUILLEMOT. *Uria grylle* (Lin.).

“The Black Marrot is a scarce bird at Barra Head. A few hatch in the fissures of the rocks on the low end of the island. They hatch two eggs in a dry fissure of the rock which is accessible by the sea. The young follow the parents to the water without assistance.”

[The nesting crevices are not always accessible by the sea, but, as far as I have been able to observe, the young can easily gain access to the water from the crevices without assistance by the old birds. Males of the Black Guillemot assist in the duties of incubation, as I have already shown elsewhere, the hatching spot on the breasts of male birds taken upon the eggs, and the sex

* V. “*Trans. Norfolk and Norwich Nat. Soc.*,” vol. iii., p. 47-60, “The Shiant Islands and their Bird-Life,” by J. A. Harvie-Brown.

† V. “*Report on Migration of 1879*” [Zool., May, 1880, p. 40].

proved by dissection, distinctly showing this to be the case. Further, birds not yet having completely lost their immature or their winter plumage have been found sitting on eggs, on islands off the west coast of Sutherlandshire.—J. A. H.-B.]

HOODED CROW. *Corvus cornix*, Lin.

“The late Duncan Sinclair told me that one day as he was taking eggs from the birds, he observed a solitary bird on a small cliff by itself—a Guillemot. He saw a Crow alight near the bird, always eyeing the egg. The Guillemot defended it for a while, till at last the Crow pounced in upon her. A struggle ensued, and both took a firm grip of each other. The Guillemot got the Crow off the ledge, and fled to the sea with him, and diving beneath the surface, reappeared and returned to her ledge, leaving the black enemy to perish.

PEREGRINE FALCON. *Falco peregrinus*, Tunstall.

“There is a pair of fine Falcons that hatch near the lighthouse every year. It appears that these birds are much prized Peregrines. I saw in Martin’s Book on the Western Isles that the brood of this pair was all that was asked from the natives as yearly rent for the whole island.”

[Martin says [Western Islands, p. 100], “He holds his lands in vassalage of Sir Donald Macdonald of Slate, to whom he pays £40 per annum and a Hawk, if required.” J. A. H.-B.]

“There are no Falcons on Mingalay, nor others upon Berneray, except the pair which breed near the lighthouse. I have seen a visitor sometimes, but it was soon beat off by the hereditary occupants.”

[Captain Feilden and I saw one at the back of Mingalay, but pretty far out at sea. This was probably one of the pair above spoken of. J. A. H.-B.]

BERNICLE GOOSE. *Bernicla leucopsis* (Bechstein).

“A great many Bernicle Geese frequent the island of Berneray in winter, but not many Greylag Geese.”

PURPLE SANDPIPER. *Tringa striata*, Lin.

[In 1870, on the day we left Barra Head, Captain Feilden and I observed specimens of the Purple Sandpiper, and Captain F. shot

two on the shore which were in company. We also saw two the previous day, 26th May, nearly a mile from this place, and up on the hill-side. When shot they were trimming each other's feathers, and had every appearance of being paired birds, though upon dissection they proved to be both females, with ovaries much distended, but no appearance of eggs ready for extrusion. Shortly afterwards, just before landing on Mingalay, Captain F. shot two more, also females, though observed in pretty close proximity, and seeming like paired birds. These four birds were in full summer plumage. It seemed probable to us at the time that they had already laid their eggs, and, leaving the duty of incubation partly, or wholly, to the males, had descended to the shore to feed and bathe. If breeding on these islands, they are certainly scarce, as these four female birds were all we observed on Barra Head and Mingalay. Mr. MacLachlan, in a subsequent communication, says—"I know the Purple Sandpiper. There are two pairs on Berneray, which hatched on the hill-side. I had the eggs." Positive evidence of their breeding is still required, however. J. A. H.-B.]

III.—*Second Report on Scottish Ornithology—October 1st, 1879, to September 30th, 1880.** Compiled by Mr. JOHN A. HARVIE-BROWN, F.R.S.E., &c.

The present Report on Ornithology in Scotland for 1879-80 is not so long nor so minute as the last one. Had the First Report been circulated earlier, however, I believe many additional facts would have been forthcoming to swell this one, as some of my correspondents would probably have had more to communicate, if they had been guided by it.

* This is a continuation of the First Report, *antea*, p. 123. As printing was delayed, it was thought advisable to bring it up to 30th Sept., 1880.

The following general report on Shetland for 1878-79 reached me too late for insertion in the First Report:—"In Shetland the contrast between the two seasons—1878 and 1879—as to the birds of all species was so marked that it was at once acknowledged by every inhabitant, when asked an opinion. Comparatively speaking, in August, 1879, the marshes were destitute of Snipe, and the dry hills of the Plover (*Charadrius pluvialis*, Lin.)," Rev. Geo. Gordon, *in lit.*, 30th July, 1880.

Since my First Report was issued, a very full and able Report "On the Effects of the Winter of 1878-79 on Animal and Vegetable Life on the Borders," has appeared from the able pen of Mr. James Hardy [*vide Proc. Berw. Nat. Club*, 1879-80, pp. 122-157].

As my last Report said would be the case, the immigration of birds upon our coasts in the autumn of 1879 has received special attention, and a report founded upon the schedules returned from the various lighthouses upon the Scottish coasts, and east coast of England, has been prepared by Mr. John Cordeaux and myself, and has appeared *in extenso* in the May number of the *Zoologist*. It should be read by those who are interested in the results of our first year's observations in conjunction with this Report. I may mention, however, that an unusual scarcity of wading birds upon the estuaries of the east coast has been very generally commented upon by my correspondents, and the returned reports of the Lighthouse-keepers fully bear out this scarcity of immigrants—both Waders and other birds—on our Scottish coasts, whilst unusual abundance has been observed upon the English east coast, south of the Humber, passing the lightships or crowding the shores. The prevalence of N.W. winds at the time of migration is probably the first cause in this scarcity, assisted to no inconsiderable extent by the disastrous loss of bird-life in the severe winter of 1878-79; and also the late spring, which retarded the vernal migration in 1879. Two other somewhat unusual phenomena were, the irruption of Skua-gulls upon our coasts,* and the large numbers of Whimbrels on the east coast, where these birds are usually very scarce.

JOURNAL OF THE WINTER OF 1879-80.

On October 4th, 1879, my friend, Mr. W. Horn, saw a little snow in Aberdeenshire. On 14th October he and I walked over from Glen Queich to Remony, on Loch Tay, through a snow-storm. This snow lay all the 15th and 16th on the higher Perthshire hills. On the 15th there was $\frac{1}{4}$ inch of ice on the small pools on the

* Mr. J. J. Dalgleish has, since the above was first written, communicated to this Society a paper "On the Skuas, particularly with reference to the recent occurrence of the Pomatorhine Skua (*Stercorarius pomatorhinus*) on the coasts of Scotland in unusual numbers," read 27th April, 1880 [*antea*, p. 274]: and Mr. H. Stevenson has contributed a paper "On the abundance of Pomatorhine and smaller Skuas on the Norfolk Coast, in October and November, 1879" (*Trans. Norfolk and Norwich Nat. Soc.*, vol. iii., part I, p. 99), both of which should be read carefully by those specially interested. References to numerous other notices of the occurrences of Skuas on our coasts will be found in these papers, as well as to the more complete treatment of the subject by Mr. Howard Saunders (*P.Z.S.*, 1876, p. 320). (*Field*, Jan. 17th, 1880, and *Zoologist*, March, 1880.)

moor above Easter Shian; and about this date there was curling in Peeblesshire. From the latter end of October till the middle of December was fine in Islay, and, indeed, in most parts. In Islay, in December there was stormy weather, which culminated in the storm of the 28th. Since then the weather remained fine up to end of January.

Nov. 1st.—Up to this time the weather continued generally fine, with an occasional wet day, and crops were well garnered. Local falls of snow whitened the hills in parts of the west coast—Ardnamurchan, Morven, &c.; and frosts occurred at nights about this time, but did not continue.

Nov. 11th and 12th.—A strong gale from the N.W. affected the N.W. and W. coasts, and part of the east coast. Very large hailstones fell in Ardnamurchan on the 11th.*

This cleared off to frost on the 13th and 14th, on which day there was fully $\frac{1}{4}$ inch of ice on still water on Larbert Pond, Stirlingshire, and $\frac{3}{4}$ inch of ice upon the puddles on the road. Frost continued all day, and there was curling in places on the 14th. On the 15th, however, the frost lifted, and was followed on the 17th by heavy rain and gale of wind, succeeded by milder weather until the 27th, when keen frost set in at night, and lasted till the morning of the 9th December. During this time the frost was more intense than any we had in the previous winter. The Clyde was covered with ice from side to side on the 3rd December, and on the morning of the 2nd the thermometer registered 11° of frost. Labour was suspended in neighbourhood of Jedburgh by 8 inches of snow, and sledges were in use, instead of tramway cars, in Aberdeen. Hard frost in central Scotland, without snow. Snow general over N. and S. of Scotland.

This was the same date that ushered in the severe winter of 1878-79 with a snow-storm [see First Report, *supra*, p. 130].

Dense fogs on Clyde, Glasgow, and other parts of central Scotland. Navigation in the Clyde an “utter impossibility.” Fog in the Gareloch. The weather in the Channel Islands intensely cold. Thermometer in central Scotland registered from 19° to 22° of frost. The following is an extract from report issued by

* For account of this gale see daily papers of Thursday, November 13th, 1879, *Scotsman*, &c.—trees torn up, shipping damaged, &c., &c.—on which day I crossed over from Glenborrodale, in Ardnamurchan, to Tobermory, in Mull, and was glad to get on solid ground again at the latter locality.

Meteorological Office at 6 p.m., on the 3rd December:—"The weather over the United Kingdom to-day may be divided into two distinct portions—namely, fine, quiet, and very cold weather prevailing over all the northern, eastern, and central districts, with light variable breezes and local fogs; and, on the other hand, the less cold weather of our south-west coasts, where the wind has been strong from the eastward, blowing even a gale at the mouth of the Channel, and the weather less foggy, though more cloudy, than in the east. The conditions first named have prevailed in the area of relatively high pressure lying between some slight depression—systems which were found over the North Sea this morning—and a much larger depression which has been advancing in an easterly direction over the Bay of Biscay. To-day it is this latter depression which is likely to produce the most decided effects on our weather, for as it moves eastwards the easterly wind seems likely to increase in force over our southern and eastern districts, accompanied by showers of snow and soft hail; while in Scotland the weather will be fair and very cold. There are at present no signs of any permanent change from the cold weather."

By the 6th December, 15 inches of snow had fallen in the Jedburgh district, and Dr. F. Douglas, of Woodside, Kelso, registered 11° *below zero*, and 13° *below zero*, with two different thermometers by Adie and Lennie, Edinburgh. Somewhat nearer the river, -14° was registered, and at Springwood Park, close to the river, -16° was registered, while at Ormiston, four miles from Kelso and close to the river, no less than -18° was registered. The following record was kept carefully by Mr. Boyd of Ormiston's gardener, who was up all night attending to a valuable orchid house:—

3rd December, at 7 p.m.,	minus 10° .
" " 10 p.m.,	" 12° .
" " Midnight,	" 14° .
4th December, at 3 a.m.,	" 16° .
" " 5 a.m.,	" 18° .

Weather very calm and clear; wind, if any, S.W.; *barom.* $29^{\circ} \cdot 80$. I am indebted to Dr. F. Douglas for the above data.

The Tay and Tweed and tributaries are frozen over to a considerable thickness. Gartmorn Dam and other ponds near Alloa are frozen over. Frost and snow general over Scotland. The

weather on the Continent equally severe, or more so. But up to the 4th December labour had not been suspended in Berwickshire, and no snow lay there, being near the sea.

Writing on 8th December, a correspondent in S. Uist reports that, since the 29th November, the ground there has been covered with snow about 1 inch deep on the low ground. "Now, all the fresh-water lochs are frozen over. Weather beautiful and bright. Ice strong enough to bear the weight of a man; and ducks all at sea."

On the 9th December a rapid thaw took place, with S.W. wind, and cleared off a great deal of the snow in some districts; but keen frost— 10° to 13° —set in again on 10th, and continued. A good deal of loose ice came down the Forth, but inland the thaw did not carry away much ice from the rivers, and none from the ponds. The Forth bore traffic across its surface opposite Cambuskenneth Abbey three days previous to the thaw. This was interrupted by the thaw, but resumed again the following day. Frost up to 13th, when thaw, with S.W. wind, carried away a good deal of ice from the rivers, rising to half a gale of wind on the night of the 14th December, during which day the thaw continued.

Winter continued, however, on the Continent with unabated rigour, and, even in Spain, the Castile Canal was reported as frozen over on the 13th December. The following from the papers of 26th December shows the state of the winter in France, &c.:—

"The thermometer on Tuesday night went down to 2° F. in Paris and to 1° below zero at Charleville. Numbers of persons have been walking across the Seine, and on Tuesday night a torchlight party crossed it, but the ice is much too uneven for skating. The Western Railway Company has stopped running a number of its passenger trains owing to the effects of the cold on its staff, and the increase in goods traffic consequent on the difficulties of other means of transport. The canals round Lille have by great efforts been cleared of ice. Wolves have appeared near Charleville, Laval, Bar-le-Duc, and Amiens. At Mayence the ice is so thick that blacksmiths, publicans, &c., are beginning to do business on it."

And this may be compared with the following from the *Times* of about the same date:—

"The singular phenomenon has been frequently observed in the

mountainous parts of Switzerland, Baden, Bavaria, and elsewhere on the Continent in the course of the current winter, that it has been generally warmer in the elevated districts, on the hills and mountains, than in the plains and valleys. A Berne paper prints a correspondence from Flerden, in the Grisons, dated the 28th ult., in which the writer says:—‘For a month past we have had only two days of cloudy weather; otherwise it has been always a cloudless sky, with the most beautiful prospect. I have been able to write at the open window, as the sun shines from 8 a.m. till 5 p.m. into my room. At 9 a.m. we have had the thermometer standing at 15° Réaumur (66° Fahrenheit), and at one o’clock 17° Réaumur (or 70° Fahrenheit). It is only in the night that the mercury sinks a little under freezing point.’ Similar reports come from the Black Forest. At Triberg, 2268 feet above sea level, it is stated that the inhabitants have enjoyed the most beautiful winter known there for a generation past.”

The thaw continued general over Scotland till the 22nd December, with alternating frosts, but ice did not clear off the stagnant pools till 24th December. As high as 11° of frost were frequently registered in central Scotland during the night. During this time much fog prevailed, and dark gloomy weather.

Gales of wind succeeded from S.W., accompanied by dark gloomy weather and much rain, culminating in the terrific hurricane of the 28th December, between 7 and 8 p.m., which resulted in the appalling accident to the Tay Bridge, besides much other damage throughout the country. The force of the wind reached that of a hurricane—force from 9, 10, to 11 being registered—and reaching a velocity in some places of 96 miles an hour, and even 110 miles an hour, or nearly double the speed of an express train.*

Great was the destruction to trees all over the track of the storm. On Athole estates, 80,000 trees, said to be worth £30,000, were blown down† [*v. Journal of Forestry*, vol. iii., p. 826]. Viewed from the railway at Blair-Athole, the hill-sides appear to be half

* For a full, interesting, and scientific account of this great gale see the *Journal of the Scottish Meteorological Society*, New Series, vol. v., nos. xlix.-lxiii., pp. 355-360.

† For a general account of destruction to forests in Scotland, see *Journal of Forestry*, vol. iii., p. 670, *et seq.*, and of the effects at Blair-Drummond, *op. cit.*, p. 103.

denuded of trees. On Lanrick Castle grounds, near Doune, 4561 trees, mostly, however, of small size, were blown down.

At Dunipace, a very large beech succumbed, and almost the entire flat roof of the house was stripped of the lead—some 18 cwt. One piece of $3\frac{1}{2}$ cwt. was carried outwards from the house 32 feet, and the remainder was wrapped round the north chimney like a huge Ulster coat or Highland cloak—one great mass lying over the top and projecting like a hood [*op. cit.*, p. 730].

On the 30th December snow fell in considerable quantities in various parts of Scotland.

In the gale of 28th December many sea-birds are reported to have perished among the Hebrides, and southwards, towards the Mull of Kintyre, scores of dead ones having been seen floating. At Dougalston, Stirlingshire, 89 trees, mostly spruce, were blown down in an area about 70 by 20 yards.

The following letter from Professor Grant appeared in the *Glasgow Herald* on December 30th :—

“(To the Editor of the *Glasgow Herald*.)

“The Observatory, December 29, 1879.

“SIR,—The storm with which Scotland was visited on Sunday, the 28th inst., and which, alas! will be hereafter associated with an event that may be justly said to have brought sorrow to every hearth of our country, was one of the most violent that has occurred for many years. Nothing approaching to it has passed over Glasgow since the memorable storm of January 24, 1868. The system of self-recording instruments which has been established here, in connection with the Meteorological Office in London, enables us to obtain a complete pictorial representation of the various meteorological circumstances which occur from the commencement to the final termination of every storm which passes over the Observatory. It may, therefore, not be uninteresting to place before the readers of the *Herald* some of the results which have been obtained in connection with the late storm.

The aspect of things on Saturday, which was the day preceding the storm, was ominous of a change for the worse in the state of the weather. The barometer continued to fall steadily during the day, resulting finally in torrents of rain, which fell without intermission during the whole night. On Sunday morning, however, the heavens wore a more favourable aspect. The barometer was

found to be rising, the minimum depression having occurred at 1 a.m.; the wind also, which blew with considerable force during the night, had almost entirely died away. Soon, however, the atmosphere assumed more gloomy indications. At 10 a.m. the barometer again began to fall, and continued to do so till 5 p.m. At the same time the wind, which was blowing from the south-west, began to veer towards the south, and thence to south-east. A little before 3 p.m. the wind suddenly returned to the south, and commenced to blow violently and with increasing intensity. At 3 p.m. the hourly velocity of the wind was 24 miles, at 3.30 it was 42 miles, at 4 it was 42 miles, and 4.20 it was 60 miles. At 6 p.m. the velocity was also 60 miles, but at 7.10 it reached 72 miles, and again at 8 p.m. there occurred a gust which brought the velocity up to 72 miles. This was the highest velocity attained, so far as could be indicated by our measures. I do not entertain the least doubt, however, but there occurred from time to time sudden gusts of wind which attained a velocity of 90 miles an hour. This is equivalent to a pressure of 40 lbs. on the square foot. On the occasion of the great storm of January, 1868, the maximum pressure, as indicated by Osler's anemometer, amounted to 42 lbs. on the square foot. The conclusion at which I have arrived is that the storm of last Sunday was somewhat less intense than the great storm of 1868, but that it almost equalled it in this respect.

"I subjoin some of the numerical results obtained from the records of the anemograph, the barograph, and thermograph:—

ANEMOGRAPH.

Time.	Hourly Velocity.	Direction.	Time.	Hourly Velocity.	Direction.
Dec. 28. 11.0 A.M.	15 M.	S.S.W.	Dec. 28. 4.30 P.M.	48 M.	S.
Noon	17	S.	4.40	42	S.
1.0 P.M.	16	S.	4.50	36	S.
2.0	20	S.S.E.	5.0	42	S.S.W.
3.0	24	S.	5.10	48	S.S.W.
3.10	24	S.S.E.	5.20	48	S.S.W.
3.20	36	S.S.E.	5.30	54	S.S.W.
3.30	42	S.S.E.	5.40	30	S.S.W.
3.40	30	S.S.E.	5.50	60	S.S.W.
3.50	42	S.S.E.	6.0	60	S.W.
4.0	42	S.	6.10	60	S.W.
4.10	36	S.	6.20	66	S.W.
4.20	60	S.	6.30	48	S.W.

ANEMOGRAPH—*Continued.*

Time.	Hourly Velocity.	Direction.	Time.	Hourly Velocity.	Direction.
Dec. 28. 6.40 P.M.	60 M.	S.W.	Dec. 28. 8.50 P.M.	48 M.	W.S.W.
6.50	66	S.W.	9.0	42	W.
7.0	60	W.S.W.	9.10	48	W.
7.10	72	W.S.W.	9.20	42	W.
7.20	54	W.S.W.	9.30	48	W.
7.30	54	W.S.W.	9.40	30	W.
7.40	66	W.S.W.	9.50	30	W.
7.50	48	W.S.W.	10.0	38	W.
8.0	72	W.S.W.	11.0	31	W.S.W.
8.10	24	W.S.W.	Midnight	28	W.S.W.
8.20	60	W.S.W.	1.0 A.M.	24	S.W.
8.30	48	W.S.W.	2.0	23	S.W.
8.40	54	W.S.W.	3.0	24	S.W.

BAROGRAPH.

	Time.	Height. Inches.
December 28	Noon	29.426
"	12.30 P.M.	29.398
"	1.0	29.384
"	1.30	29.350
"	2.0	29.285
"	2.30	29.220
"	3.0	29.150
"	3.30	29.078
"	4.0	29.030
"	4.30	28.990
"	5.0	28.957
"	5.30	28.958
"	6.0	28.960
"	6.30	28.965
"	7.0	28.980
"	7.30	28.999
"	8.0	29.035
"	8.30	29.064
"	9.0	29.103
"	9.30	29.150
"	10.0	29.190
"	10.30	29.206
"	11.0	29.226
"	11.30	29.259
"	Midnight	29.276
"	0.30 A.M.	29.296

THERMOGRAPH.

Dry Bulb.	Wet Bulb.
44.8	42.8
44.7	42.5
44.4	42.1
43.8	42.3
45.9	42.8
44.5	43.3
44.6	43.9
48.3	47.4
49.3	42.8
50.7	49.3
52.9	50.9
52.8	50.5
51.9	48.9
50.8	45.0
47.9	43.0
46.7	42.3
44.8	42.3
45.4	42.0
45.1	41.7
44.0	41.2
43.8	41.0
43.3	40.8
43.9	40.9
43.0	40.3
43.9	40.5
41.9	39.7

"I am, &c.,

"R. GRANT."

Numerous are the reports on the continued general scarcity of birds from many parts of the country, partly the effect of the severe winter of 1878-79, but also partly owing to a much smaller migration for the reasons above given—viz., the deflection caused by the prevalence of N.W. winds in October and November, 1879. Mr. J. Crawford, writing from Tongue in January, 1880, says:—"Bird-life in this quarter is on a diminished scale this year. The severity of last winter, and especially during the spring months of 1879, must have destroyed many of our feathered tribes. No doubt many left the district and have not returned, but there has been great mortality. Blackbirds, Thrushes, Titmice, Yellow Hammers, and Linnets are all much less numerous, &c.;" and many similar reports have reached me from both east and west coasts.

And that this scarcity has continued in many localities, even up to the last days of summer of 1880, is equally certain, as the following notes supplied to me by Mr. Robt. Warren, of Ballina, Ireland, will clearly show. His letter is dated 25th July, 1880:—

"I am sorry to say that no Golden-crested Wrens have visited this place yet, but the Thrushes and Blackbirds are perceptibly increasing, *but only from the broods of the survivors*—there having been no addition to their numbers by any migrants that I can make out up to this time. Still, Thrushes are very scarce, but the Blackbirds are just beginning to make an impression on our red currants, and on a neighbour's strawberries. They were not touched last year. Our Robins and Wrens are also increasing fast, especially the latter. As one of your correspondents remarks,* the Robins died from cold, as well as from starvation, for several that we fed quite regularly disappeared before the end of the frost. The Wood Pigeons of this neighbourhood were kept alive by a large field of rape, upon which they fed when the ground was covered by frozen snow. Whenever we have the ground covered by snow and hard frost, the Blackbirds, Thrushes, Skylarks, and Starlings always take to the sea-shore, feeding amongst the sea-weed; but, strange to say, the northern birds, Redwings and Fieldfares, are the first to die off, then the Starlings, and the latter seem to suffer most from cold of any of our birds of similar size and strength."

Light frosts at nights succeeded from about the 10th January, varying in different parts of Scotland, with gloomy, hazy, or misty weather during the day. On 12th and 13th, 9° frost registered

* *Vide* First Report, *antea*, p. 152.

at Dunipace. Keen frost set in on the 16th January, and continued till the 26th. 16° of frost registered during the nights of 17th and 18th at Dunipace. Frost continued till evening of 26th January, succeeded by slow thaw till evening of 28th, when high S.W. wind and rapid thaw set in.

Lovely weather succeeded, and February was very fine throughout Scotland; but March "came in like a lion," with gales from S.S.W., and snow and rain.

Birds appeared on the increase, Chaffinches, Thrushes, and Blackbirds singing plentifully in Stirlingshire, and Tits having distinctly increased in numbers.

The gales at the beginning of March were succeeded by fine genial spring weather, and birds apparently daily increasing in number.

Occasional snow showers up to 15th March in certain parts, but the weather noted as generally fine and spring-like.

The close of March was fine but cold, with east winds and night frosts, the ground being white with hoar-frost on several mornings, notably that of 18th March. All April was bright but cold, with east winds; and beautiful weather succeeded in May, but still with occasional night frosts. On the 10th May a refreshing rain fell after long-continued drought, but lasted only a short quarter of an hour. On the whole, birds appear to have recovered greatly in numbers, appearing almost as plentiful as formerly, but in many localities this cannot be said yet to be the case. Thus, at Garrel Glen, Kilsyth, a weaver informed Mr. J. B. Murdoch that there is still a very noticeable difference. The nests this year are very much fewer than before the winter of 1878-79.

Some of the migratory species appear to be unusually abundant, especially the Leaf Warblers, and of these notably the common Willow Warbler. I have various accounts confirmatory of this, besides my own observations in Stirlingshire and elsewhere. From Islay Mr. Chisholm reports great scarcity, or almost total absence of Finches and Yellow Hammers in February, but Sparrows as abundant; Fieldfare and Redwing scarce; Chough not to be seen.* In former years the Ring Ouzel came in considerable numbers at

* In the *Courant*, however, it is recorded that Mr. Roderick Colquhoun sent to Mr. Small, birdstuffer, Edinburgh, a fine specimen of the Cornish Chough, which he shot on the 11th May, at Ballinaby, Islay. This shows that, if they were completely absent in February, they had returned by May.

the same time as the Woodcock, but none have been seen this season. The Lapwing takes up its winter abode regularly in Islay, or has done so for several years past.

May continued dry and sunny, but with cold east winds until the 22nd, when we had a change, and some rain fell with S.W. wind on the 23rd. Grass and vegetation were beginning to suffer by this time, and rivers were reduced to mere silver threads.

In Aberdeenshire heavy rain fell, raising slightly the river Don, between the 6th and 10th June, and freshening the corn-fields. Great drought continued, however, generally in Scotland, and east winds still prevailed. Occasional and severe night frosts occurred through May, and even in June, doing considerable damage to budded fruit-trees, &c.

July was more moist, yet little rain fell to swell the rivers in central Scotland, and rains which did occur were very local. Sufficient fell, however, to give an impetus to growth of turnips and other crops. In Perthshire much thundery weather and heavy rains between the 5th and 13th July, and levels of lochs raised two feet. East winds still prevailed, often cold and with mist in the mornings. Heat great on some days towards the end of the month, and weather thundery, with heavy falls of rain and local flooding of rivers; other days cold, with fresh breezes.

August was excessively hot, and many will remember the scorching heat of the opening days of the grouse shooting.

Little rain fell, and rivers remained unflooded till September, when the weather shortly changed, and became colder, with more frequent rains; but dry fine weather again succeeded and continued to far into October, in the central districts of Scotland—the east wind being, indeed, most marked through the whole autumn, and, as subsequent statistics show, having a powerful effect upon the Migration of 1880.*

MAMMALS.

RABBIT AND HARE.

LEPORIDAE.

Rabbits are scarcer in Islay, and generally in Scotland. Hares also scarce in Islay and elsewhere. One or two more such winters

* See forthcoming "Report on the Migration of Birds in 1880," being now prepared for the British Association by Mr. Cordeaux and myself.

as that of 1878-79 would do away with the necessity of any Hares and Rabbits Bill legislation.

RED DEER AND ROE.*

CERVIDAE.

Are generally reported in a forward condition. Roes' heads, sent to Mr. Snowie in beginning of August, had the horns clear of velvet (Inverness-shire) fully a month before last year. Red Deer are stated by Mr. Horatio Ross to be quite three weeks in advance of any former year in his experience [*Scotsman*, 6, viii., 80]. Stags generally reported to have finely developed heads.

BAT.

VESPERTILIONIDAE.

Vespertilio daubentoni, Leisler, occurred in large numbers in the Stewartry, as I am informed by Mr. Robt. Service, who forwarded a specimen for identification.† During July and August large numbers were seen hawking for Trichoptera over the waters of Lake Arthur, near Maxwelltown. From 8.30 p.m. till about 3.30 a.m., numbers were seen and easily recognised by their large size and swift gliding flight. Mr. R. Gray informs me that *V. nattereri*, supposed to be new to Scotland, was this year discovered "in dozens in the hole of a tree," and is "in plenty near Dalkeith."

The Common Bat, *V. pipistrellus*, Geoffroy, is said to have all but disappeared from the county of Elgin. Capt. Dunbar Brander writes me that formerly he might have seen a dozen or so in a week; now, perhaps one in the same time. He thinks that the disappearance of old houses, roofed with slabs of freestone, may have something to do with the scarcity of the Bat. They cannot so easily get in under the thin slates now used.

BIRDS.

WHITE TAILED EAGLE.

HALIAETUS ALBICILLA (Lin.).

Mr. Dewar, Remony, writes, "Every winter for this long time back, when we get a strong east wind in Nov., Eagles and Rough-legged Buzzards appear. In Nov. this year I saw four Eagles

* There is abundant room for a special annual report upon the deer-forests, if any one would take it up.

† Identified by Mr. E. R. Alston.

together—all White-tailed—and three Rough-legged Buzzards along with them.”

PEREGRINE FALCON.

FALCO PEREGRINUS, *Tunstall.*

On 1st Oct., 1879, a very fine Peregrine Falcon was brought to Dr. Crombie, having been shot that day near North Berwick.

RED-LEGGED FALCON.

FALCO VESPERTINUS, *Lin.*

One was killed in Fife on the 20th Sept., 1880, and sent for preservation to Mr. Robt. Small, naturalist, Edinburgh. It afterwards came into the possession of the Industrial Museum, Edinburgh, and was exhibited by Dr. Traquair at a meeting of the Royal Phys. Soc., in Dec., 1880.

HOBBY.

FALCO SUBBUTEO, *Lin.*

There appears to have been an immigration of the Hobby to the Island of Lewis. Mr. H. Greenwood of Carn House, Stornoway, writes me that he “first noticed the Hobby in Sept., 1879, having killed one flying overhead while grouse shooting, about 9 miles inland, on the treeless moor. I subsequently shot another in Oct., which was in the act of taking a wounded snipe. These were both young birds. From time to time, up to the middle of Nov., I saw other specimens, but was unable to approach them. It was their general habit to perch on the peat stacks on the moss, there being no trees, or even bushes in the island, except in the Castle grounds, and a few furze hedges in the cultivated land on the Eye peninsula.” Mr. Greenwood sends me also a list of the birds of Lewis, in which are included Merlin, Sparrow Hawk, and Kestrel. Dr. Crowfoot, of Beccles, had previously informed me of this unusual appearance of the Hobby in the Lews. Further information on these birds will be found in the Third Report (for 1880-81), now nearly ready for printing.

CHIMNEY SWALLOW.

HIRUNDO RUSTICA, *Lin.*

Last seen in Berwickshire by Mr. Hardy, on the 30th Sept., 1879. Last seen on banks of Loch Lomond, on 14th Nov., 1879. When at Kinross, on the 3rd Aug., 1880, I saw immense gather-

ings of Swallows on the telegraph wires, and was told that they collect at the same points year after year. I should say there must have been thousands of them closely packed together.

SWIFT.

CYPSELUS APUS (Lin.).

Mr. Robt. Service writes me that Swifts are unusually abundant this year (May) around Dumfries, while last year there were very few.

MARTIN.

CHELIDON URBICA (Lin.).

Last seen in Berwickshire by Mr. Hardy, 3rd Oct., 1879. Mr. R. Service considers that the Martin is becoming yearly scarcer around Dumfries; he writes, "I scarcely ever see one now." At Dalwhinnie, on Loch Errochd side, Martins used to breed commonly under the wooden eaves of the hotel. I have had opportunities of observing a steady decrease during the past 20 years. This year—1880—only two or three nests are to be seen. On the coast lines of Stonehaven and St. Abbs Head, I observed considerable numbers resting in the cliffs this summer. Can any inclemency in our weather and seasons have driven them back to the warm sea-cliffs from more inland localities?

KINGFISHER.

ALCEDO ISPIDA, Lin.

Did not take its departure from Stirlingshire during the severe frost of 27th Nov. to 9th Dec.—on which latter date I saw two on the Carron River—and did not appear to leave at all during the remainder of the winter.

WREN.

TROGLODYTES PARVULUS, Koch.

Wrens, along with other species of small birds, are reported as "still very scarce" in July, 1880, by Mr. Jas. Hardy, Berwickshire, but to be increasing rapidly again in certain other localities [R. Warren, Co. Sligo, Ireland].

WILLOW WARBLER.

PHYLLOSCOPUS TROCHILUS (Lin.).

The small Warblers are reported by Mr. Service as being unusually abundant this year in Dumfriesshire, especially the

Willow Warbler. He says, "I never saw them so abundant;" and the same is very generally observed elsewhere.

MEADOW PIPIT.

ANTHUS PRATENSIS (Lin.).

A few were still lingering in sheltered localities amongst the hills of Perthshire as late as the 16th Oct., 1879.

LARK.

ALAUDA ARVENSIS, Lin.

Reported as unusually abundant in Berwickshire, while Starlings are scarcer. To those apt to jump to conclusions, this would appear to be direct evidence of the Starlings' misdeeds, as expounded in the *Scotsman* of June and July, 1880; but the increase of Larks must not be thus summarily accounted for. Unusual abundance of some particular kind of food brought into existence by the dry season is more probably the reason of the increase of the Larks this spring and summer in Berwickshire, while the decrease of Starlings is probably owing to a somewhat similar cause—local scarcity of suitable food.

THRUSH.

TURDUS MUSICUS, Lin.

As many as 700 Mavises have been caught in one night at the Skerryvore Lighthouse, off Tyree, but not this year. Mr. Maloch still notes the scarcity of Thrushes, and has not seen this season one for fifty of Thrushes, Redwings, Fieldfares, or Missel Thrushes. The absence of the foreign Thrushes [*Turdus pilaris*, and *T. iliacus*] may result from other causes connected with migration. The absence or scarcity, however, of *T. musicus*, it is believed, is still the effect of the hard winter of 1878-79 [see First Report, p. 156]. Mr. Chisholm, Bowmore, Islay, reports that the Mavis has not been seen there for the past twelve months. Scarcity is reported up to the close of the summer months of 1880.

I observed small flocks in the birch woods of Ardnamurchan on 28th Oct., 1879. Reported as still very scarce in Berwickshire by Mr. Hardy (*in lit.*, 19, vii., 80).

BLACKBIRD.

TURDUS MERULA, Lin.

Mr. Chisholm reports it much scarcer in Islay, but not quite absent. Mr. Lumsden reports them as very scarce all last autumn

on Loch Lomond side. In July, 1880, they were still scarce in Berwickshire. In Stirlingshire I observe no deficiency, and they seem to have recovered to a great extent; but Mr. Warren considers that any increase in Sligo, Ireland, is only from broods of the survivors.

FIELDFARE.

TURDUS PILARIS, Lin.

A scarcity of Fieldfares is reported from several localities where they usually appear. Great mortality took place amongst them last year, but other causes connected with migration, independent of the effects of last winter, have carried them past our shores. A large flock was observed by me at Quarter, Stirlingshire, on New Year's Day, 1880, after the fierce gale of the 28th Dec.

REDWING.

TURDUS ILIACUS, Lin.

Redwings were reported on the 22nd Oct., 1879, in Blair Athole neighbourhood, and also were seen by me in W. Argyll about the same time. Reported scarcer from several localities [see Thrush, *supra*].

CARRION CROW.

CORVUS CORONE, Lin.

Reported as "conspicuously" abundant in March, 1880, on the Solway Firth and in the Stewartry, by Mr. Service.

This species appears to be gaining ground in a northerly direction, and now frequents the Tongue district of Sutherlandshire in late summer. They are stated to breed in a wood near Melvich in considerable numbers. Mr. T. E. Buckley knew of a Hooded and Carrion Crow breeding together in 1878, on Dunrobin ground. Both parents and young were shot from the nest.

ROOK.

CORVUS FRUGILEGUS, Lin.

As repeatedly noted, Rooks always stay at home on the slightest indication of a thaw. On the 15th Dec. they stayed about all day, except a short interval for feeding.

Up to 26th Jan., 1880, only one Rook had been seen in S. Uist by my correspondent there, whereas he could have counted from 30 to 60 in one flock last winter.

In my First Report I relate the occurrence of a Rook remaining buried a long time under the snow without food. I heard, in June, 1880, in Aberdeenshire, that a similar thing happened at a farm on Donside to a common domestic fowl, which was stated to have been six weeks under the snow in the winter of 1879-80.

In July, 1880, writing to me regarding the carnivorous propensities of the Rook, developed by the unusual severity of the winter of 1878-79, Mr. Robt. Warren says—"An old friend of mine told me that he saw two (Rooks) attack a Woodcock under a bush close to his sitting room window, and before he could get out to rescue it, they had it killed and torn. Another acquaintance told me that two Rooks attacked a weakly companion, and killed and ate it in a short time."

STARLING.

STURNUS VULGARIS, Lin.

Starlings appeared in Oct. and Nov. in undiminished flocks in the Vale of Menteith and Carse of Falkirk. I observed them numerous also in Oct., near Grigadale Farm, not far from the lighthouse at Ardnamurchan Point. They were still present in the carse-lands of Stirlingshire on 10th Dec., 1879, and a few still seen further inland up to the 23rd Dec. During the hard frost they temporarily migrated to the lower carses in large numbers, but returned immediately after the frost "lifted."

In Stirlingshire and elsewhere, the breeding season of 1880 was early, and the young were in flocks early in June. An unusual scarcity of Starlings in Berwickshire is noted by Mr. Hardy, two well-frequented spots in former years being this year deserted. On the coast of St. Abbs Head, in June, I observed a good many among the cliffs. Mr. R. Warren, as already noted (*antea*, p. 300), states that Starlings seem to suffer "most from cold of any of our birds of similar size and strength." May not their disappearance from certain localities be partly, if not wholly, owing to scarcity of some particular food from the unusually dry season of 1880? With Starlings, as with other species, it proved an early breeding season in most Scottish districts, and they were noticed to go in flocks much earlier than usual.

REDPOLE.

LINOTA LINARIA (Lin. j.

In my First Report I alluded to the fact, as related by Mr. R. Service, that the nests of Redpoles around Dumfries in the spring

and early summer of 1879 were warmly lined with feathers, as I have almost invariably found them to be in more northern countries. This was attributed to the unusually backward cold spring, and late advent of summer in that year. It is interesting, therefore, to quote again Mr. Service's report on the nests of this season. He writes as follows:—"I have found a few nests this month (May) near to where they were last year, and I find that the nests are either without feathers altogether or with one or two only."

This autumn Redpoles appeared among the alders in the central districts of Scotland quite a month earlier than usual, along with Siskins.

TWITE.

LINOTA FLAVIROSTRIS (Lin.).

Twites were going in flocks in Ardnamurchan, Argyllshire, by 24th Oct., 1879. I saw them at the west end of Loch Errochd on 11th July this year, where I also saw a few Grey Linnets. The somewhat local distribution of this species at inland localities is curious and worth some attention.

GREEN LINNET.

LIGURINUS CHLORIS (Lin.).

In the unusually dry spring of 1880, up to end of May, seedsmen in Galloway were suffering much loss from large flocks of Green Linnets. "They are destroying," writes Mr. Service, "quantities of seedling firs just as the seed leaf appears above ground, pulling out the plant for the sake of the part of the seed adhering. Their beaks become round masses of soil and dirt, owing to the resinous matter of the seeds adhering to them."

SNOW BUNTING.

PLECTROPHANES NIVALIS (Lin.).

Flocks were driven down lower than usual in the first hard frost of Nov. and Dec., 1879, coming close to the houses near Remony, Loch Tayside [D. Dewar, *in lit.*].

I have received further evidence of the Snow Bunting breeding in Scotland this year, birds in full summer plumage having been again observed on the summits of the Aberdeenshire hills.

In autumn an unusually early migration of this species was noted, as also of Siskins and Redpoles.

CUCKOO.

CUCULUS CANORUS, *Lin.*

On the 10th of Oct., 1879, Mr. W. Horn again observed the Cuckoo near Aberfeldy. It appears to remain longer in this neighbourhood than elsewhere in Scotland. Cuckoos were scarcer in many places, and are reported scarce from Islay.

TURTLE DOVE.

TURTUR AURITUS, *Gray.*

One was sent in to Mr. R. Small, Edinburgh, on the 21st Sept., in the flesh, obtained at Stonehaven.

QUAIL.

COTURNIX COMMUNIS, *Bonnaterre.*

Mr. Geo. Sim had a Quail brought in on the 17th Nov., 1879, killed in the neighbourhood of Aberdeen [*in lit.*, 22, xi., 79].

BLACK GROUSE.

TETRAO TETRIX, *Lin.*

Black game are late this autumn of moving into the birch woods in any numbers. Up to 11th Nov. no great show of Black game was found in the birch woods of Ardnamurchan, from whence many migrate to Mull, and *vice versa*, annually—a flight of considerable extent. A scarcity in many localities may be directly owing to the wet weather in summer of 1879, or to the large numbers killed in patches of grain, as related in the First Report [*antea*, p. 167].

RED GROUSE.

LAGOPUS SCOTICUS (*Latham*).

It seems desirable that some more permanent record of the state of the game crop should be kept than that of the annual reports in daily papers.* I have not laid any plans as yet with this end in view, and this year I have thought it advisable to quote freely from the newspapers. Accordingly, the following extracts have been collected from different papers:—

“Disease is only local and not extensive at this date.”—*Scotsman*, 6, viii., 80.

* A summary of the extracts might be sufficient, or it might be made the subject of a separate Report, if some one of our members would take it up for another year.

Caithness-shire.—The reports from the moors in this county are somewhat conflicting, but there is no doubt that disease prevails to a considerable extent upon some of the most extensive shootings. The disease appears to be confined almost exclusively to the old birds, as many coveys of young ones may be seen without parents. What is considered a somewhat extraordinary circumstance by keepers is the fact that in some cases there were full nests as early as the 17th April, and that second broods were hatched, so that the earlier birds and coveys of young cheepers can be seen with the same pair of old ones. The disease appears to be confined to the inland moors, those nearest the sea being reported in excellent order; and it may be added that all the shootings north of a straight line from Wick to Thurso have this year, as hitherto, without exception, escaped the disease. Unless things get worse than appears at present there will be fair sport throughout the county; but on some moors where very heavy bags were made last year sportsmen must be contented with smaller returns.

Wigtownshire and Kirkcudbrightshire.—Passing from the extreme north to the extreme south, it is somewhat remarkable to find that the counties of Wigtown and Kirkcudbright differ, like Caithness, from the greater part of the country. In these counties appearances are, indeed, even worse than in the north, for owing, it is thought, to the severe frosts of May, the breeding season was very much interfered with, and coveys do not average more than six, including the old birds, while on some moors the broods are so weak that it is not intended to lift guns till the 20th. If the weather prove favourable, the Twelfth this year will, to all appearance, be one of the most successful enjoyed by sportsmen for a good many years. Black game have done equally well, and a fortnight ago coveys were seen in as forward a condition as on the opening day last year. The weather during the spring and summer was very favourable for the nesting, hatching, and rearing of the young broods of Grouse, and the coveys are large.

Dumfriesshire.—Seldom have sportsman had such a prospect of good sport on the Twelfth as they have this season.

Fifeshire.—Last autumn, in consequence of the unpropitious character of the season and the scarcity of birds, sportsmen left off shooting on the moors much earlier than is usually the case, and now the sparing of the game has shown most favourable results. The present season has been one of the best on record.

“*Forfarshire*.—Disease amongst the Grouse did at one time appear, but the birds are now in perfect health. It is impressing itself on gamekeepers that there is a want of uniformity in the numbers of Grouse, and that consequently there will be more light bags than was expected a few weeks ago. All other kinds of game are a full average.

“A Glenesk correspondent states that there is every indication that there will this season be splendid sport on the extensive shootings belonging to Lord Dalhousie in this glen. On the lower grounds the Grouse are fully an average of former years, while on the higher parts they are more plentiful than they have been since 1872.

“*Inverness-shire*.—Last year was one of the best Grouse years lately known, and from all that can be learned, there is reason to believe that the coming season will, on the whole, considerably surpass that of 1879. The Grouse disease has been reported in several quarters—notably at Kingussie, Glen Mazeran, Cawdor, and one or two other places. But, among those who have made the breeding of Grouse a special study, there can be no surprise at these traces of disease existing, and reported in a year such as the present. There is apparently no reason to doubt that 1880 will be a red-letter one in the annals of the Grouse shooter.

“*Lanarkshire*.—The reports coming from the various moors in the Carlisle district are of a very favourable nature, and promise good sport on the Twelfth. The birds entered on the pairing season in excellent condition, there having been plenty of food for them throughout the winter, and incubation was carried through very successfully.

“*Orkney*.—Sport in the Orkney Islands will be much better than usual. The dry spring and summer have been favourable for hatching, and the young birds are numerous, strong, and healthy—in fact, by the first day of the shooting season they will be too strong and wild. There are no symptoms of disease.

“*Peeblesshire*.—The sportsmen in the neighbourhood of Biggar have good prospects for the Twelfth. Grouse are reported ‘plentiful, strong, and wild.’

“*Perthshire*.—The prospects of sport on the moors of Perthshire are better this season than they have been for a good many years past. On the Rannoch moors the sport will be good, except upon a few moors where, curiously enough, the breeding was later than usual, such as Remony.

“*Ross-shire*.—All reports are very favourable.”

The above favourable prognostications have for the most part been fulfilled, but disease had begun to appear in not a few localities by the date of the closing of this Report—the end of September, 1880.

GOLDEN PLOVER.

CHARADRIUS PLUVIALIS, Lin.

Golden Plover remained unusually late, in the autumn of 1879, upon the elevated moors. On the 15th October I saw three Golden Plovers on the hills around Glen Queich, Perthshire; and on the 16th two small flocks passed over my head during a small grouse-drive. On the 15th there was $\frac{1}{4}$ inch of ice on the moor-puddles and moss-holes, which remained unmelted all day; and on the 14th was a snowfall, which sprinkled the higher Perthshire hills, and which lay unmelted all the 15th and 16th.

Golden Plover were scarcer than usual on the Stirlingshire coast in winter, and are reported as having been fully a month late of arriving in flocks this autumn near North Berwick [Dr. J. L. Crombie, *in lit.*, 12, xii., 79]. There are usually large flocks of Plover and Curlew in the fields round North Berwick, but it was well on in November before they came [see “Curlew”]. They continued scarce all winter at North Berwick, the flocks being fewer and smaller than usual. A decrease is also quite evident in Sutherland, not only during the present winter, but all through the summer of 1879 also. The present winter has been remarkably mild at Tongue, which, however, generally registers a higher temperature than at other localities around. Plover are decidedly scarcer in Islay; and, as recorded by Capt. Clarke Kennedy,* their almost total absence from Dumfriesshire and the south of Scotland, where usually they are found in vast flocks, is most remarkable.

Plover began to appear on the moors of Stirlingshire on or about the 6th March, 1880.

NIGHT HERON.

NYCTICORAX GRISEA (Lin.).

In the First Report, under this species, I committed the error of saying that “there is no record of any having been seen since 1823” until the specimen was obtained at Alloa, having neglected

* *Zoologist*, Feb., 1880, p. 66.

to refer to those mentioned by Mr. Gray in his "Birds of the West of Scotland." This is really the fifth specimen recorded during a period of sixty years.

CURLEW.

NUMENIUS ARQUATA (*Lin.*).

The Curlew is a regular frequenter of all the sea-lochs on the west of Scotland during the autumn and winter months. On the east coast they usually appear in October in flocks, but in the autumn of 1879 they were fully a month late of arriving in the neighbourhood of the sea [Dr. J. L. Crombie, *in lit.*, 12, xii., 79], and the flocks were fewer, and the individuals in the flocks not so numerous as usual.

On 6th March I saw the Curlews arrive at breeding places in Stirlingshire, and Mr. Service reports from the Stewartry that the Curlews are just taking up their spring quarters, "and some immense flocks have been passing and repassing here morning and evening to and from the Solway, as they usually do in spring before finally quitting the shore." This was about the 6th or 8th March. Curlews had returned to the shore in Berwick by the middle of July; but in Stirlingshire many still frequented the breeding haunts at that and a later date.

ESQUIMAUX CURLEW.

NUMENIUS BOREALIS (*Forster*).

Mr Geo. Sim writes to report the capture of another Esquimaux Curlew. "It was shot on the 21st September, on a hill in the forrest of Birse, Kincardineshire, by Mr. H. C. Hadden, and was sent to Mr. Sim as a 'queer-looking plover.' Like the one mentioned last year, this is a male. The measurements are $\frac{1}{2}$ inch shorter and $\frac{1}{2}$ inch less in extent of wings. The stomach contained crow-berries, the same as the specimen last year."

It is not unworthy of remark that the following rare birds should all have reached our shores about the same time and during easterly gales, viz.:—Great Snipe, Turtle Dove, Red-legged Hobby, and Esquimaux Curlew [see forthcoming Report on Migration for 1880].

SNIPE.

GALLINAGO GALLINARIA (*O. F. Müller*).

Some improvement in the numbers of Snipe took place after September [see First Report, *antea*, p. 174], but still there were not

nearly so many this November in our central Stirlingshire marshes as there were in November, 1878. In Ardnamurchan I found Snipe plentiful at several localities in end of October. They were reported to be in about the usual numbers in S. Uist in December. Entirely disappeared from inland marshes when the frost set in, nor did they reappear in any numbers after the frost and ice disappeared at the end of December. Similar reports from Islay. "Plentiful at the beginning of winter, but not so for some time past" [Mr. Chisholm, *in lit*, 27, i., 80.] Very scarce in Dumbartonshire all this season [Jas. Lumsden].

JACK SNIPE.

LIMNOCRYPTES GALLINULA (*Lin.*).

Jack Snipe appear to be a little more plentiful than last year, but still far from as common as usual in Oct., Nov., and Dec.

GREAT SNIPE.

GALLINAGO MAJOR (*Gmelin*).

Several specimens of this rare British bird have been observed or obtained in England this Sept. I have the record of one shot at Darmore Castle, Northumberland, on 21st Sept., and on the 27th Sept. I saw two near Dunipace, in Stirlingshire, which I felt convinced were of this species. Being well acquainted with the species, I was not likely to be mistaken in their identification. They were not seen afterwards.

WOODCOCK.

SCOLOPAX RUSTICOLA, *Lin.*

The first seen by me in 1879 was in Ardnamurchan, on the 28th Oct. By the 10th Nov. they were well "in" there, though, owing to open weather, much scattered. At Boquhan, Stirlingshire, a good many "cock" were seen on the 15th, after two days' frost. In Torwood, Stirlingshire, 18 were shot on 22nd Nov. As many as 86 have been killed in 3 days, by one gun, in the Island of Coll [but this was probably last winter]. In certain districts of the west of Scotland there appears to be a great and unusual dearth of Woodcock. Thus, I have the following report from Ardnamurchan:—The keeper, in beginning of Dec., says he "cannot understand where the Woodcocks have all gone to, because the weather is such that they should be abundant;

while on the contrary, not only have no more come, but those that were there have gone." The lowest temperature in Ardnamurchan during the hard frost was on the night of the 3rd Dec., when 12° F. were registered.

Numbers of Woodcock have, on the other hand, been obtained south of Edinburgh.

An equal scarcity is recorded from S. Uist by Mr. J. Henderson up to 8th Dec., only two having been shot by him up to that date. In Islay, plentiful in beginning of winter, but rare afterwards. Later—in Jan., 1880—they are, however, reported as "more numerous than last year."

WATER RAIL.

RALLUS AQUATICUS, Lin.

Much scarcer this season, but has been added to the recorded fauna of Ardnamurchan by Mr. J. J. Dalgleish [J. J. D., *in lit.*, 19, xii., 79.] I have only heard of one obtained in E. Stirlingshire this season.

They appeared more numerous in Jan., and Mr. Small, Edin., received a good many before the 15th Jan.

CORNCRAKE.

CREX PRATENSIS, Bechstein.

A Corncrake some years ago frequented the bare rock on which Skerryvore Lighthouse is built, as reported to me by Mr. Macquharie, of Tyree.

WILD GEESE.

ANSERIDAE.

Wild Geese were unusually plentiful in Tyree, and farmers there were grumbling at the unusual damage. The first flight of Wild Geese seen at N. Berwick arrived on 4th Nov., and they have been coming in large numbers since [Dr. J. L. Crombie, *in lit.*, 12, xii., 79]; but later he says, "There has been a great falling off this season in the numbers of Geese" [*in lit.*, 27, i., 80].

Mr. Maloch, Perth, says there are unusual numbers along the Tay. He writes—"I am sure we saw over two thousand" [on 23, xii., 79]. These were in all probability nearly all Pink-footed and Grey Lag Geese [see P. S., *postea*, page 326].

Wild Geese reported scarcer in Islay this winter.

WHITE-FRONTED GOOSE.

ANSER ALBIFRONS (*Gmel.*).

White-fronted Geese are common in Islay—are, indeed, the common Wild Goose of Islay. They are, this year, also common in S. Uist, where Mr. J. Henderson, on the 5th Dec., was successful in shooting four out of two lots, one of which consisted of about twenty.

GREY LAG GOOSE.

ANSER CINEREUS, *Meyer.*

This is not by any means a common species on our east coast in winter. A party of three, however, flew far inland in Stirlingshire on the 3rd of January, 1880, and a friend and myself heard them high in air. They had passed close over the village of Larbert, and alighted in a mill-lead about half-a-mile further west, where one was shot soon afterwards, and came into my possession. A day or two later a second was killed at Larbert House pond. The remaining bird continued to frequent Larbert pond, and also the marsh called “The Volley.” On a former occasion I saw, in the same neighbourhood, a flock of about sixteen, which I believe to have been Grey Lag Geese. A flock of a dozen on one occasion passed over Larbert Station in a fog, within shot; but these, though probably Grey Lags, were not identified.

WILD SWAN.

CYGNUS MUSICUS, *Bechst.*

Two are reported from S. Uist as seen about the first week of Dec. A number frequented the Kyle of Tongue, in Sutherland, in the early part of Dec. Mr. Crawford writes also—“It is not unusual for Swans to visit some of the lochs here on their way northward.” Mr. Chisholm reports that “a goodly number of Swans take up their winter residence on Loch Gurim, a fresh-water lake in front of Ballinaby House, Islay. There is no decrease in the flock this year.” Wild Swans are reported as more than ordinarily abundant this winter in the Long Island. A flock of 26 was seen in December last, near Loch Boisdale, and about 100 have taken up their quarters on a fresh-water loch near Bornish, S. Uist. My informant has himself seen numerous parties and flocks of from two to eight together. Mr. Service reports Wild Swans as unusually plentiful this winter. Mr. M'Lellan saw a

flock of twenty in Wigtown Bay, and small parties were constantly seen all over the Stewartry—particularly at the end of Dec. and in Jan. And Capt. M'Donald, of Stein, Skye, writes—"I believe that there were more Swans seen along the coast than for many years before. Those who saw them could not tell any difference between them and those of previous years."*

BEWICK'S SWAN.

CYGNUS BEWICKI, *Yarrell*.

Great numbers of this species have occurred on our coasts. Several which came into the hands of Edinburgh naturalists were at first supposed to be *Cygnus americanus*. One received by Mr. Robt. Small, Edinburgh, shot on 29th Dec., 1879, out of a flock of 1 young and 26 adult birds, in Islay, was got by Mr. M'Neil. It was reported as "the largest of the flock."

Five Wild Swans were sent to the Edinburgh market, three being shot at Tain by Mr. Jennings,† and two in Argyllshire. Four of them, purchased by Mr. Hope, naturalist, Edinburgh, were all supposed to be of this species. I saw all the above in Jan. The identifications were based upon the original description of one by Macgillivray, but subsequent inquiry has made it doubtful if these birds really belonged to this species. From a scarcity of both old and young specimens of *C. americanus* and of *C. bewicki* in British collections, it still remains doubtful if they were correctly diagnosed.

From our knowledge, however, of the laws which appear to govern migration in autumn, I am of opinion that the original starting point of the Swans which visit our shores is not west of Iceland, but probably from Iceland and from the N.E., or from more N. localities across the pole. It seems to me a transpolar migration theory is always open to probability, but a migration from *west to east* highly improbable in the N. portions of our northern hemisphere.

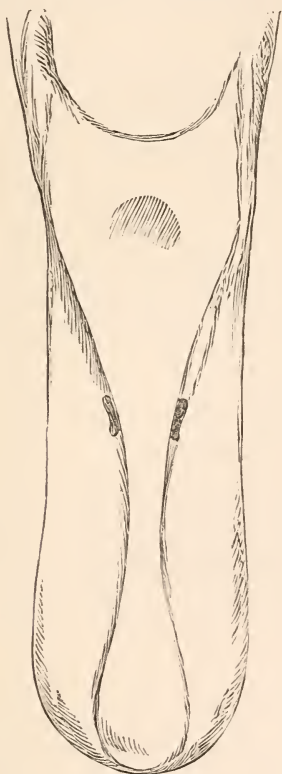
Prof. Newton, *in lit.*, to Mr. J. J. Dalglish, 9th March, 1880, says—"I herewith enclose sketches, showing the bill of an ADULT *C. bewicki*, and that of an IMMATURE *C. americanus*, as I judge it

* This is in reference to the unusual numbers of Bewick's Swan which visited our coasts this year.

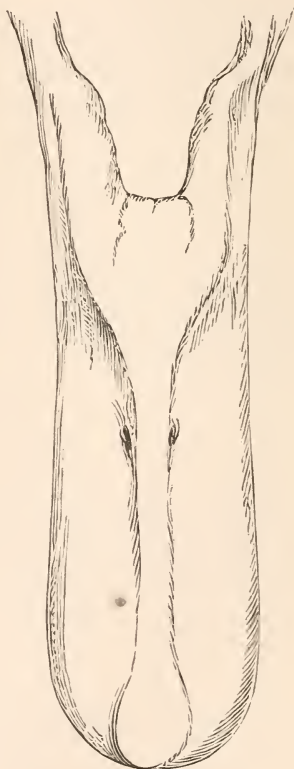
† A fourth, shot by Mr. Jennings at the same time, was used at table, and proved excellent food.

to be. The former I compared with your bird* when it was here, and the two seemed to agree perfectly. The latter, you see, differs a good deal in the form of the base of the bill, and most markedly in the outline of the bare space. . . . It is unfortunate that we have not a young *C. bewicki*, nor an old *C. americanus*; but I can hardly think that the differences shown in the sketches depend entirely on age. The upshot is that I am inclined to consider *C. americanus* as a distinct species, but that your bird is not an example of it, nor can I see any difference whatever between your bird and *C. bewicki*."

The following are rough copies taken from Prof. Newton's sketches above referred to:—



C. bewicki, ad.
Goodacre.



C. americanus, juv.
Hepburn.

Copied from Sketch by A. N.—8, ii., 80.

* One shot in Ardnamurchan.

Mr. Dresser informs me the differences, as stated by Schlegel, are as follows:—

<i>C. bewicki.</i>	<i>C. americanus.</i>
Bill yellow at base, to, or nearly to nostril.	Bill black, with a very small yellow spot on each side, which is scarcely seen in stuffed specimens.
Wing, $17\frac{2}{3}$ to $18\frac{2}{3}$ inches.	Wing, $19\frac{1}{3}$ to 20 inches.
Tail, $5\frac{11}{12}$ inches.	Tail, $7\frac{4}{13}$ to $7\frac{8}{12}$ inches.
Tarsus, 36 to 37 lines.	Tarsus, 42 lines.
Beak, 39-40 lines.	Beak, 44-45 lines.

More specimens have occurred in British seas since—in 1880-81. There seems a probability that Bewick's Swan is really the rarer species, *i.e.*, if they can be separated [see Third Report].

DUCKS.

ANATIDAE.

Most of the Duck tribe appeared on Loch Tay earlier than usual by a month [see Widgeon, Pochard, Scaup, Tufted Duck, Golden Eye, Goosander, and Velvet Scoter], and continued in unusual numbers all winter.

WIDGEON.

MARECA PENELOPE (*Lin.*).

Usually appear in numbers on the rocky coasts of the west of Scotland in Nov., and earlier frequent the fresh-water lochs. Widgeon seldom come up our Carron river in Stirlingshire, though they have been killed at times. Two were seen on 8th Dec., 1879. Amongst other Ducks, they came to Loch Tay about a month sooner than usual.

PINTAIL.

DAFILA ACUTA (*Lin.*).

On the 1st October, 1879, a male Pintail was killed by a puntsman at Culross amongst other wild fowl, and another was brought in to Mr. Hastings, Dumfries, for preservation. Another was

obtained in Uist, and exhibited at a meeting of the Royal Phys. Soc., by Mr. R. Gray, the Secretary.

WILD DUCK.

ANAS BOSCHAS, Lin.

Wild Duck, though plentiful during summer at most localities, owing to overcrowding on our latitudes by the late spring of 1879, were unusually scarce in several districts of central Scotland and elsewhere in autumn, which no doubt proves further, that the more northern latitudes were not so productive in the breeding season as usual [see First Report, p. 180]. I hardly remember seeing them so scarce in Nov. along the Carron as in 1879, whereas Teal were plentiful [*v. Teal*]. As early as 18th Sept. Wild Duck appeared in salt water off the Berwickshire coast [J. H., *in lit.*]. When the frost became more intense, in December, a few, but not so many as usual, appeared upon our streams. These were, no doubt, birds driven off the moors. Five again appeared on the 30th Sept., in salt water, at Berwick; and on 7th Oct., 13 or 14 at the same place. On 16th Oct. numerous Wild Ducks appeared in separate bodies, at sea, and continued till 10th Nov., when there were great numbers [J. H., *in lit.*]. They were much scarcer than usual at inland localities up to 11th Dec., but were plentiful in the Firth of Forth. About the 11th a slight accession to their numbers was observed on the Carron and Bonny, in Stirlingshire, but Teal scarcer. Rather more open water, owing to thaw of 9th, and to this cause Wild Duck continued more plentiful. Large quantities of Mallard (with Widgeon) reported also from North Berwick. Since then only a pair or two frequented our marsh and river up to end of January. Thereafter scarce, and so generally reported inland up to 12th Feb., when they began to return for breeding. Wild Ducks of all kinds scarcer in Islay this winter.

TEAL.

NETTIUM CRECCA (Lin.).

Teal at the beginning of winter have been abundant, a striking contrast to last year at the same season,* when they were unusually scarce. On the other hand, Wild Ducks up to 10th Dec. have been unusually scarce, at least in our marshes [see Wild Duck].

* See Report, 1878-9, page 181.

Teal continued more than usually plentiful on our inland streams in central Scotland all through the severe frost of 27th Nov. to 9th Dec. At the same date they are reported "more numerous this year than last year" in S. Uist, where the weather is also severe. From 10th to 13th Dec. only one or two were seen on the Carron, and none after that date until they returned in spring.

SHOVELLER.

SPATULA CLYPEATA (Lin.).

Capt. Clarke Kennedy met with the Shoveller breeding on Cally property in the Stewartry in June, 1878, and Mr. Hastings, of Dumfries, received a young female Shoveller in August, 1879, from Kirkmahoe, where doubtless it was bred. Col. Gordon Maitland, of Kenmure, shot two young male Shovellers on Loch Ken on 2nd Aug., 1880. There were three or four more of them—evidently a brood hatched somewhere in the vicinity. This locality is only some three or four miles from that where the two young males above-mentioned were shot [*v. Dumfries and Galloway Courier*, 17th Aug., 1880]. At Keith, in Banffshire, I did not again meet with any Shovellers, but there, this season, Ducks of all kinds were scarcer than usual in August. Two were killed at Slains, and sent to Mr. Geo. Sim, Aberdeen, for preservation. One was an old female, and the other a young bird unable to fly. Mr. Sim adds that they were known to have bred there.

TUFTED DUCK.

FULIGULA CRISTATA (Leach).

[See Ducks, *antea*, p. 320.]

POCHARD.

FULIGULA FERINA (Lin.).

[See Ducks, *antea*, p. 320].

SCAUP DUCK.

FULIGULA MARILA (Lin.)

Winter Ducks began to put in an appearance early in October. Amongst others, a Scaup was brought in to Mr. Brotherston's shop in Kelso, and one killed on Loch Tay in November, where they arrived a month earlier than usual [see Ducks, *antea*,

p. 320]. Scaup have been in extraordinary numbers in the Solway Firth, where usually they are scarce. Mr. Service writes me that, since the ice melted, they have been numerous on the lochs. Several persons living near Southerness told him that "a flock extending along the shore from Southerness to the Borron point (nearly two miles) came in at high tide, and, during the frosty weather at the end of Dec. they were in such poor condition that the local dealers would not take them at any price."

GOLDEN EYE.

CLANGULA GLAUCION (*Lin.*).

[See Ducks, *antea*, p. 320].

VELVET SCOTER.

OEDEMA FUSCA (*Lin.*).

Four appeared on Loch Tay in Nov. [D. Dewar, *in lit.*].

GOOSANDER.

MERGUS MERGANSER, *Lin.*

Reported as unusually abundant in very many localities—every little stream around Perth holding a few. Mr. Maloch has been receiving a few almost every day for some time before the 23rd Dec., for preservation.

I now know of Goosanders having bred regularly in a locality in Perthshire since about 1864. I saw the old female there again in Aug. this year, and the young were reported as having been seen and chased. They are well known to the natives under another name [see Ducks, *antea*, p. 320].

SMEW.

MERGUS ALBELLUS, *Lin.*

Mr. Hastings records one sent him for preservation, killed in Dumfriesshire. This is probably the same bird—a male—which I saw in Mr. Small's shop in Edinburgh, in Jan., and which was sent to him by Mr. Erskine, gunmaker, Newton-Stewart.

LONG-TAILED DUCK.

HARELDA GLACIALIS (*Lin.*).

Mr. Hastings records one sent in to him in Dumfries, in his paper quoted above, and adds that it is an extremely rare species

on that part of the coast, only one having previously come into his hands for preservation.

LITTLE AUK.

MERGULUS ALLE (*Lin.*).

One from Loch Lomond was exhibited at the Society's meeting on 23rd Jan., 1880 [see page 213].

GREAT NORTHERN DIVER.

COLYMBUS GLACIALIS, *Lin.*

A Great Northern Diver was shot on the Tay on 27th Nov. Mr. Maloch believes this is the only one that has been shot on the Tay for the last 10 years.

LITTLE GREBE.

PODICEPS MINOR (*Gmel.*).

Common in all the sea lochs of the west coast in Oct. Inland, during the intense frost of 27th Nov. to 9th Dec., I did not observe any [see First Report, p. 185], although there was an equal proportion of open water to that at the corresponding period of last year.

SCLAVONIAN GREBE.

PODICEPS CORNUTUS (*Gmel.*).

One obtained in S. Uist on 14th Nov. is in the collection of Mr. Caldwell.

RAZORBILL.

ALCA TORDA, *Lin.*

Seen on Loch Tay, by Mr. Dewar, in Nov. [see also Mr. W. Horn's paper on "Birds of N.W. of Perthshire," *Proc.*, vol. iv., part i., p. 67].

FULMAR PETREL.

FULMARS GLACIALIS (*Lin.*).

An adult Fulmar Petrel was obtained at N. Berwick on 27th Nov., and is now in Mr. Caldwell's collection.

GULLS.

LARIDAE.

Mr. D. Dewar saw a very small Gull (*Chroicocephalus minutus?*) on Loch Tay on 7th Dec., and says, "I know it is a rare bird. No Gull is usually seen at this time of year on the Loch."

A great many Sea Gulls were starved or frozen to death on Loch Tay this winter, and many were found dead on the beach. They are usually absent from Loch Tay in winter, but were numerous this winter.

SKUAS.

STERCORARIINAE.

[See paper by Mr. J. J. Dalgleish on the Skuas, *antea*, p. 274].

COMMON GULL.

LARUS CANUS, *Lin.*

[See Black-headed Gull, *infra*.]

HERRING GULL.

LARUS ARGENTATUS, *Gmel.*

Mr. Maloch, of Perth, informs me that a Herring Gull in the possession of a gentleman in Perth has lived for over 29 years. It is now quite blind, and has to be fed by hand. A decrease also in its size has been perceptible within the last few years.

BLACK-HEADED GULL.

CHROICOCEPHALUS RIDIBUNDUS (*Lin.*).

This species appeared in unusual numbers at various localities in autumn—end of Oct. and Nov.—no doubt following the vast shoals of sprats and other small fish. Mr. Service reports them at that time in “extraordinary numbers,” along with the Common Gull, in the estuary of the Nith. In a thaw, Black-headed Gulls travel inland, usually following a river. In very dry summers, such as that of 1880, they frequent our streams, hunting for minnows and small fish. In June we had several pairs upon one stretch of the river Carron. Their nearest breeding-station is some six miles off. Numbers, during the summer drought, frequented the shallows of our rivers, feeding on trout-fry and minnows. On the Carron—in which some 60,000 trout-fry were put in the spring of 1880—this species was unusually plentiful.

In conclusion, I desire to draw attention to the comparison of the data under each species obtained in each year. These, when compared—after a number of years’ observations are recorded—with general phenomena of meteorology of the different seasons,

will possibly enable us to arrive at some conclusions as to the causes of scarcity or abundance, peculiarities of migration, and other points of interest in the life-history of species from year to year. Once more, allow me to solicit the support and assistance of our members, as well as of Scottish ornithologists generally; and let me, also, again urge upon our members and others the desirability of keeping regular journals, either zoological or botanical, in connection with meteorological phenomena. I have here to acknowledge intelligent and obliging assistance, especially for my Third Report—now progressing (March, 1881)—from our worthy Assistant-Secretary, Mr. J. M. Campbell, of Kelvingrove Museum.

P.S. Vide supra, p. 316.—At the last moment I received a copy of Col. Drummond Hay's interesting paper, read to the Dundee Naturalists' Society on 16th February, 1881.* At page 16, speaking of the decrease in the numbers of Geese in the Tay estuary, he says, "A few occupy the same haunts, but in very greatly reduced numbers, and these are now confined almost entirely to the Grey and Pink-footed kinds—the latter being the more common of the two—the Bean and White-fronted being now scarcely or ever seen."

On the Firth of Forth our commonest species is the Pink-footed, and the Grey Lag is very rare.

* "The Grallatores and Natatores of the Estuary of the Tay: the great Decrease in their Numbers of late years: the Causes, with Suggestions for its Mitigation." Dundee: John Leng & Co., Bank Street. 1881.

ADDITIONS TO THE LIBRARY.

SESSION 1879-80.

DONATIONS.

Mr. J. A. Harvie-Brown.—The Capercaillie in Scotland.

Mr. R. Etheridge.—Palaeontology of the Coasts of the Arctic Lands.

FROM SOCIETIES.

Amsterdam. Royal Academy of Sciences. *Verhandelingen* (Afdeeling Natuurkunde). 2nd Series, XVIII. and XIX. 1879.

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- London (Ontario).* Canadian Entomologist, Monthly. Annual Report of the Entomological Society of Ontario for 1879.
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- Watford.* Natural History Society. Transactions. Vol. II., Parts 4-6.
- Vienna.* K. K. Zoologisch-botanische Gesellschaft. Verhandlungen. 29 Band. Jahrgang 1879.

BY PURCHASE.

- Annals and Magazine of Natural History.
Entomologists' Monthly Magazine.
Scottish Naturalist.
Zoological Record.
Mycologia Scotica.

LIST OF SOCIETIES, &c., TO WHICH THE PROCEEDINGS ARE SENT.

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 Trieste.—Società Adriatica di Scienze Naturali.
 Vienna.—K. K. Zoologisch-botanische Gesellschaft.

A M E R I C A .

- Boston.—Natural History Society.
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 Newhaven, Conn.—Academy of Arts and Sciences.
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 Poughkeepsie.—Society of Natural Science.
 St. Louis.—Academy of Science.
 Salem.—Essex Institute.
 Washington.—Smithsonian Institution.
 U. S. Survey of the Territories.

NATURAL HISTORY SOCIETY OF GLASGOW.

Abstract Statement of Accounts—Session 1878-79.

To Cash in Bank, per last Account, - - -	£72	3	8	By Rent and Attendance, - - -	-	-	-	£2	15	0
„ „ in hands of Treasurer, - - -	1	9	9	„ Postages, Carriages, &c., - - -	-	-	-	10	7	2
„ „ per 153 Members' Annual Subscriptions, - - -				„ Bookbinding, - - -	-	-	-	1	13	6
at 5s., - - -	38	5	0	„ „ “Proceedings,” Paper and Printing, - - -	-	-	-	51	3	0
„ „ per 22 New Members' Entry-Money, - - -				„ Magazines and Books, - - -	-	-	-	3	0	10
at 10s., - - -	11	0	0	„ Cash in Bank, per Book, - - -	-	-	-	76	15	11
„ „ per 14 Members' Arrears, at 5s., - - -	3	10	0	„ „ in hands of Treasurer, - - -	-	-	-	0	6	0
„ „ per “Proceedings,” &c., sold, - - -	5	10	6							
„ Interest from Bank, - - -	1	12	3							
„ Cash received from Treasurer of Field Naturalists' Society, per Account, - - -	12	10	3							
	£146	1	6					£146	1	5

27th August, 1879.—Compared with Vouchers, and found correct.

(Signed)

J. MANFORD.

A. MALLOCH BAYNE.

ERRATUM.

Vol. IV., Part I., Page 17—

For "*Sesia apiformis*" read "*Sesia bembeciformis*."



THE
FAUNA OF SCOTLAND;

WITH SPECIAL REFERENCE TO

CLYDESDALE

AND THE

WESTERN DISTRICT.

MAMMALIA.

BY

EDWARD R. ALSTON, F.L.S., F.G.S.

GLASGOW :

PUBLISHED BY THE NATURAL HISTORY SOCIETY OF GLASGOW,
AT THEIR ROOMS IN ANDERSON'S COLLEGE.

1880.



THE FAUNA OF SCOTLAND,

WITH SPECIAL REFERENCE TO CLYDESDALE AND THE WESTERN DISTRICT.

MAMMALIA.

INTRODUCTION.

THE following Catalogue of Scottish Mammals has been drawn up at the request of the Council of the Natural History Society of Glasgow. In its preparation I have been careful to confine my notes strictly to the department of geographical distribution, and have not entered into any details of description or economy. In the nomenclature I have endeavoured to reconcile the spirit and the letter of the British Association rules, to select the first "clearly defined" name for each species, and at the same time to avoid all *unnecessary* changes of well-known and generally accepted names.

The numerous scattered memoirs of previous writers have been collated—notably those of Walker, Low, Fleming, Selby and Jardine, the two Macgillivrays, J. Wilson, Baikie and Heddle, &c., &c.—and their observations have been compared with my own field notes and with those of many kind friends and correspondents. Amongst those to whom I am indebted for help are Professors A. Leith Adams, W. Boyd Dawkins, W. H. Flower, and A. Newton, the Rev. G. Gordon, Dr. J. Murie, and Messrs. J. M. Campbell, A. Heneage Cocks, J. G. Gordon, R. Gray, J. E. Harting, J. Kirsop, H. Saunders, and J. R. Tudor. More especially are my thanks due to Professor Turner, of Edinburgh, for many valuable notes on the Seals and Cetaceans, and to Dr. John Alexander Smith, of the same city, for corrections and additions to the account of the extinct forms. Also to Mr. Lumsden, of Arden, who obtained for me lists of the species found in Islay from Mr. M'Kenzie, and of those of Mull from Mr. Cameron; and to Mr. J. A. Harvie-Brown, of Dunipace, who, besides supplying observations from the Outer Hebrides, and rendering much other kind assistance, has procured information as to the Gaelic names from the Rev. Dr. T. M'Lauchlan, of Edinburgh, from Mr. D. Campbell, of Callander, and from other sources.

The number of well-ascertained recent Scottish Mammals recognized in the following pages is *fifty-one*, the proportions of the different orders, as compared with the faunas of England and Ireland, being shown in the following Table:—*

DISTRIBUTION OF BRITISH MAMMALS.	ENGLAND.	SCOTLAND.	IRELAND.
I.—CHIROPTERA,	12	3	7
II.—INSECTIVORA,	5	5	2
III.—CARNIVORA,	13	13	9
IV.—CETACEA,	17	16	11
V.—UNGULATA,	2	2	1
VI.—GLIRES,	12	12	7
	61	51	37

The *fifteen* English species not hitherto recorded as having occurred north of the Tweed are the following:—

- | | |
|--------------------------------------|--|
| 1. <i>Rhinolophus hipposideros</i> . | 9. <i>Synotis barbastellus</i> . |
| 2. <i>Rh. ferrum-equinum</i> . | 10. <i>Phoca hispida</i> . |
| 3. <i>Vesperugo serotinus</i> . | 11. <i>Balaenoptera laticeps</i> . |
| 4. <i>V. noctula</i> . | 12. <i>Grampus griseus</i> . |
| 5. <i>V. leisleri</i> . | 13. <i>Delphinus delphis</i> . |
| 6. <i>Vespertilio nattereri</i> . | 14. <i>D. albirostris</i> . |
| 7. <i>V. bechsteini</i> . | 15. <i>Muscardinus axellianarius</i> . |
| 8. <i>V. mystacinus</i> . | |

The *six* Scottish species not yet included in the English fauna are—

- | | |
|---------------------------------|-----------------------------------|
| 1. <i>Trichechus rosmarus</i> . | 4. <i>Delphinapterus leucas</i> . |
| 2. <i>Ziphius cavirostris</i> . | 5. <i>Delphinus acutus</i> . |
| 3. <i>Mesoplodon bidens</i> . | 6. <i>Lepus variabilis</i> . |

The *four* species found in Ireland, but not in Scotland, are *all* Bats, namely—

- | | |
|--------------------------------------|-----------------------------------|
| 1. <i>Rhinolophus hipposideros</i> . | 3. <i>Vespertilio nattereri</i> . |
| 2. <i>Vesperugo leisleri</i> . | 4. <i>V. mystacinus</i> . |

* In these Tables I have rejected several species of so-called British Bats and Cetaceans as not being well ascertained. Cf. *Bell's British Quadrupeds*, 2nd ed. (1874).

Whereas no less than *nineteen* Mammals are on the Scottish list, whose presence is not yet authenticated in the sister isle:—*

- | | |
|----------------------------------|-----------------------------------|
| 1. <i>Sorex tetragonurus.</i> | 11. <i>Ziphius cavirostris.</i> |
| 2. <i>Crossopus fodiens.</i> | 12. <i>Monodon monoceros.</i> |
| 3. <i>Talpa europaea.</i> | 13. <i>Delphinapterus leucas.</i> |
| 4. <i>Felis catus.</i> | 14. <i>Capreolus capraea.</i> |
| 5. <i>Mustela vulgaris.</i> | 15. <i>Mus minutus.</i> |
| 6. <i>M. putorius.</i> | 16. <i>Arvicola agrestis.</i> |
| 7. <i>Trichechus rosmarus.</i> | 17. <i>A. glareolus.</i> |
| 8. <i>Megaptera longimana.</i> | 18. <i>A. amphibius.</i> |
| 9. <i>Balaenoptera sibbaldi.</i> | 19. <i>Lepus europaeus.</i> |
| 10. <i>Hyperoodon laticeps.</i> | |

From the above Tables it is clear that the principal distinctions between the Mammal-faunas of England and Scotland are to be found in the aerial order of Chiroptera and among the marine Fissipedes and Cetaceans, while that of Ireland differs in the absence of no less than twelve species of land animals. My friend Professor A. Leith Adams has recently shown† that both the recent and the extinct Hibernian Mammals agree with those of Scotland rather than of England, and has given strong reasons for believing that Ireland received this part of its fauna from the south of Scotland, after its separation from Wales and western England. It therefore becomes a point of some interest to compare the fauna of the Scottish Islands with those of the mainland and of Ireland. In such an investigation it is most convenient to restrict our attention to the indigenous terrestrial Mammals, dismissing entirely the Bats, Seals, and Cetaceans, and also the introduced and cosmopolitan Rats and House-Mouse, which may almost be regarded as domestic animals. Taking the Scottish Islands in four principal groups—(I.) the Inner Islands (Skye, Mull, Islay, &c.); (II.) the Outer Hebrides (the Lews, Harris, the Uists, Benbecula, &c.); (III.) Orkney; and (IV.) Shetland—we find the distribution of Mammals, as far as I have been able to ascertain the facts, to be as shown in the following Table, which represents the known range of twenty-four species of land quadrupeds:—

* On the somewhat vexed subject of Irish Mammals I have followed the list given by Professor Leith Adams, on the authority of Mr. A. G. More, *Proc. R. Dublin Society*, 1878, pp. 40, 41. The complete absence from Ireland of some species, as the Common Shrew Weasel, Harvest Mouse, &c., has been disputed by some writers.

† *Proc. R. Irish Academy*, 2nd Ser., III., pp. 99-100; *Proc. R. Dublin Soc.*, 1878, p. 42.

DISTRIBUTION OF SCOTTISH MAMMALS.	SCOTLAND.					IRELAND.
	Mainland.	Inner Islands.	Outer Islands.	Orkney.	Shetland.	
1. <i>Erinaceus europaeus</i> , ...	+					+
2. <i>Sorex tetragomurus</i> , ...	+	?		?		
3. <i>S. minutus</i> , ...	+	?	+			+
4. <i>Crossopus fodiens</i> , ...	+	+		+		
5. <i>Talpa europaea</i> , ...	+					
6. <i>Felis catus</i> , ...	+					
7. <i>Canis vulpes</i> , ...	+	?				+
8. <i>Martes sylvestris</i> , ...	+	?	+			+
9. <i>Mustela vulgaris</i> , ...	+					
10. <i>M. erminea</i> , ...	+	+			intro.	+
11. <i>M. putorius</i> , ...	+					
12. <i>Meles taxus</i> , ...	+					+
13. <i>Lutra vulgaris</i> , ...	+	+	+	+	+	+
14. <i>Cervus elaphus</i> , ...	+	+	+	+		+
15. <i>Capreolus capraea</i> , ...	+	intro.		(ext.)		
16. <i>Sciurus vulgaris</i> , ...	+					+
17. <i>Mus sylvaticus</i> , ...	+	+	?	?		+
18. <i>M. minutus</i> , ...	+					
19. <i>Arvicola agrestis</i> , ...	+	+	+	+		
20. <i>A. glareolus</i> , ...	+					
21. <i>A. amphibius</i> , ...	+	?		+		
22. <i>Lepus europaeus</i> , ...	+	intro.	intro.	intro.		
23. <i>L. variabilis</i> , ...	+	intro.	intro.	+		+
24. <i>L. cuniculus</i> , ...	+	+	+	+	(ext.)	+
	24	7	6	7	1	12

The facts indicated by the above Table are, at first sight, somewhat contradictory. As Ireland possesses the greatest number of species in common with the mainland of Scotland, it might well be supposed to have been in connection with it up to a later date than even the Inner Islands. On the other hand we have the presence of other forms, as of the Field Vole in the Hebrides, and of the same species with the Water Shrew and Water Vole in Orkney, which are conspicuous by their absence from the Irish fauna. It appears to me, however, that this apparent contradiction may be explained, if we remember the more northern position of the Scottish Islands and the nature of the country lying between them and the south-western source from which our Mammalian fauna was undoubtedly derived.

A consideration of the relative depths of the channels which respectively divide Ireland and the Islands from the mainland of Scotland would lead us to the conclusion that the severance of the former took place first, and that the Orkneys remained longest uninsulated. An upheaval of about 240-270 feet would bring the latter again into communication with Caithness, while it would require a rise of about 300-320 feet to reunite the Hebrides with Skye, and of from 700 to 900 feet to restore land communication between the various parts of south-western Scotland and north-eastern Ireland. Nor does the distribution of Mammal life seem to me to contradict such a hypothesis. The absence from the known fossil fauna of Scotland and Ireland of most of the characteristic postpliocene English animals shows that the northward migration of these forms was slow, gradually advancing as the glacial conditions of the northern parts of our islands decreased in intensity. Thus it is not difficult to suppose that the Hedgehog, Ermine, Badger, Squirrel, and Mountain Hare, may have found their way through southern Scotland into Ireland long before they were able to penetrate into the still sub-arctic regions of the Highlands. Subsequently, when the continued depression of the land had isolated Ireland, and the improvement of the climate had continued, the Shrews and Voles may well have found their way northwards along the comparatively genial coasts, before the larger beasts of prey could find a sufficient stock of game. When they reached Orkney, however, they appear to have found it a veritable *Ultima Thule*, for the absence from Shetland of any land animal (except the half-aquatic Otter) seems to indicate that

those islands were already separated before the arrival of any form of Mammalian life.

Such a hypothesis of the dispersal of English Mammals through Scotland and Ireland appears to me to be the only one which explains the peculiarities of their present distribution, and is likewise in accord with the facts of physical geography. Should it be accepted, the recent and extinct Mammals of Scotland may be arranged in five categories, in the order of the dates of their immigration. This I have attempted to show in the following list, in which the extinct species are marked with an asterisk:—

LIST OF EXTINCT AND RECENT SCOTTISH MAMMALS, ARRANGED IN THE PROBABLE ORDER OF THEIR ARRIVAL FROM THE SOUTHWARD.

I.—Before deposit of boulder-clay:—

*1. *Elephas primigenius*.

*2. *Rangifer tarandus*.

II.—Before separation of Ireland:—

3. *Erinaceus europaeus*.

*11. *Equus caballus*.

4. *Sorex minutus*.

*12. *Sus scrofa*.

*5. *Canis lupus*.

*13. *Megaceros giganteus*.

6. *C. vulpes*.

14. *Cervus elaphus*.

*(*Ursus fossilis*.)*

15. *Sciurus vulgaris*.

7. *Martes sylvestris*.

16. *Mus sylvestris*.

8. *Mustela erminea*.

17. *Lepus variabilis*.

9. *Meles taxus*.

18. *L. cuniculus*.

10. *Lutra vulgaris*.

III.—Before separation of Hebrides:—

19. *Sorex tetragonurus* (?)

*21. *Bos longifrons*.

20. *Arvicola agrestis*.

IV.—Before separation of the Orkneys:—

22. *Crossopus fodiens*.

24. *Arvicola amphibius*.

*23. *Bos primigenius*.

V.—Since separation of Orkneys:—

25. *Talpa europaea*.

31. *Capreolus capraea*.

26. *Felis catus*.

*32. *Castor fiber*.

*27. *Ursus arctos*.

33. *Mus minutus*.

28. *Mustela vulgaris*.

34. *Arvicola glareolus*.

29. *M. putorius*.

35. *Lepus europaeus*.

*30. *Alces machlis*.

I now proceed to the consideration of the details of the distribution of the species, taking first the recent, and second the fossil and extinct forms.

LONDON, 1880.

* Remains of the Cave Bear have not yet been found in Scotland, but its former existence is rendered probable by their presence in Irish deposits.—*Cf. A. Leith Adams, loc. cit.*

I. RECENT SPECIES.

ORDER I.: CHIROPTERA.

*Family: VESPERTILIONIDAE.*1. PLECOTUS AURITUS (*Linnaeus*).

Long-eared Bat.

Not uncommon in the southern and central counties, but rarer in the north. It occurs in Arran, Islay, Mull, and probably in the other Inner Hebrides, but has not been recorded from the Outer Islands, nor from Orkney or Shetland.

[RHINOLOPHUS HIPPOSIDEROS (*Bechstein*).—The Lesser Horseshoe Bat is stated by Dr. A. R. Young to have occurred, along with the last species, at Crookston Castle, Renfrewshire (*New Stat. Acc. Renfr.*, p. 162). All inquiries as to the fate of the specimen have been in vain, and I greatly suspect a mistake in identification.]

2. VESPERUGO PIPISTRELLUS (*Schreber*).

Common Bat.

Scot., Bak, Bakie, Backie-bird (*Swed.*, Natt-baka, a bat; *Old Norse*, blaka, to flap); *Gael.*, Ialtag, Dialtag.

Much the commonest species of Bat in Scotland, extending quite to the north of the mainland, but rare in some localities, as in the west of Sutherlandshire, where I have only once seen a specimen. It is common in Arran, Islay, and Mull, but appears to be scarce in the Outer Islands. The late Capt. M'Donald, of Rodil, told Mr. Harvie-Brown that he had only once seen a Bat in Harris, and Baikie and Heddle mention a few instances of their occurrence in Orkney (*Hist. Nat. Orc.*, p. 14).

[VESPERUGO NOCTULA (*Schreber*).—Fleming identified the *Vespertilio auriculatus* of Walker's "Fauna Scotica" (*Essays Nat. Hist.*, p. 472) with this species (*Brit. An.*, p. 6), but the description agrees much better with *V. daubentonii*. The Great Bat is also stated by the late Sir William Jardine to have been seen near the River Annan, in Dumfriesshire (*New Stat. Acc. Dumfr.*, p. 175), but its occurrence in Scotland has not been confirmed. The most northern English locality which has been recorded is Northallerton, in Yorkshire (*Bell's Brit. Quad.*, 2nd ed., p. 23).]

[*ATALAPHA CINEREA* (*Beauvois*). Under the name of *Vespertilio pruinosus*, Say, the late Mr. Wolley recorded the capture of a specimen of this American species in South Ronaldsha, Orkney, in 1847 (*Zoologist*, 1849, p. 2343; *op. cit.*, 1850, pp. 2695, 2813). As he himself suggested, there can be little doubt that it was accidentally brought over in a ship. As far as I am aware this is the only known instance of an exclusively American bat having been taken in Europe.]

3. *VESPERTILIO DAUBENTONI*, *Leisler*.

Daubenton's Bat.

Appears to be pretty widely distributed on the mainland, but to be local. It was first correctly identified as a Scottish species by William Macgillivray, who took it in Aberdeen Cathedral, in 1840 (*Edin. N. Phil. Journ.*, xxxi., p. 205), and John Macgillivray captured eighty individuals in two clusters in the same building (*Ann. and Mag. Nat. Hist.*, viii., p. 230). Fleming had already recorded its occurrence in Fifeshire under the name of *V. emarginatus* (*Brit. An.*, p. 6); Macgillivray found it in Dumfriesshire (*Nat. Libr.*, xxii., p. 95); Mr. R. Gray tells me he has met with it in Kirkcudbright; a specimen captured in Glasgow Green, is preserved in the University Museum (*Alston, P. N. H. S. Glasg.*, i., p. 203); and another, caught in the West-end Park, has been lately submitted to me by Mr. J. M. Campbell. As above remarked, this probably may be the *V. auriculatus* of Walker, but his description is quite insufficient for certain identification, otherwise his name would take priority of Leisler's.

ORDER II.: INSECTIVORA.

Family: ERINACEIDAE.

4. *ERINACEUS EUROPAEUS*, *Linnaeus*.

Hedgehog.

Scot., Hurchin, Hyrchoune (*Barbour*). (From Old French, *Erigon*, a hedgehog, or from Low Germ., *hurken*, to crouch or curl?)

Gael., Crainaig.

Very common in the Lowlands, and rapidly spreading to the northward, but has not yet been met with in Sutherlandshire.

The Rev. G. Gordon informs me that it is increasing in numbers in Morayshire, where it was formerly rare. Mr. Colquhoun says that it is common in Bute (*Sporting Days*, p. 101), but it is unknown in Arran, Mull, Islay, the Hebrides, Orkney and Shetland. The history of the increase of range of this and the next species in Scotland would well repay careful investigation.

Family: TALPIDAE.

5. TALPA EUROPAEA, *Linnaeus.*

Mole.

Scot., Moudie, Moudiewart (Old English, *Mouldwarp*, a mole; *Angl. Sax.*, *molde*, soil, *weorpan*, to throw); Earth-hound (*Aberdeen*).

Gael., Fmh, Uir-reathaldh, Uireabh (*lit.*, earth-plougher).

Like the last species, the Mole has greatly extended its range of late years, and is now well known throughout the mainland to Sutherlandshire and Caithness. Thirty-six years ago it was recorded as spreading rapidly in west Argyllshire (*New Stat. Acc. Argyl.*, pp. 380, 439). In Mull it is said to have been accidentally introduced in a boat-load of earth from Morven early in the last century, but it appears to be unknown in the rest of the Scottish Islands.

Family: SORICIDAE.

6. SOREX TETRAGONURUS, *Herman.*

Common Shrew.

Scot., Shrew-mouse; *Orc.*, Sheer-mouse.

Gael., Daltag, Daltag-fheior (from *Gael.*, *dall*, blind, and *fheoir*, grass).

Common in all the mainland counties, as it is said to be in Arran, Islay, and Mull; "not very numerous" in Orkney (*Hist. Nat. Orc.*, p. 14), but some doubt remains as to whether it is not the next species that is found there. According to W. Macgillivray, the Common Shrew is found in the Outer Hebrides on sandy pastures, where it is termed *Luch-fheior* (*Edinb. Journ. Nat. and Geogr. Sc.*, II., p. 162), a name properly belonging to the Field Vole (*infra*, p. 28); but, as will be seen directly, the Hebridean Shrew is *Sorex minutus*.

7. SOREX MINUTUS, *Linnaeus*.

Lesser Shrew.

Has been generally confounded with the last species, and appears to be generally less numerous. J. Macgillivray, who first recorded it as a Scottish animal under Jenyns' name of *S. rusticus*, considered it to be as abundant as the Common Shrew near Aberdeen (*Ann. and Mag. Nat. Hist.*, VIII., p. 23), and the Rev. G. Gordon tells me that specimens which he sent to Mr. Jenyns from Morayshire were identified by that gentleman with the same species. In the south-west it is not rare in the Upper Ward of Lanarkshire (*Alston, Fauna W. Scotl.*, p. v.). Mr. Harvie-Brown has recently sent me an example of the Shrew of the Outer Hebrides, caught by him this summer in South Uist, and I was much interested in finding that it belonged to this species, the only one yet positively known to occur in Ireland.

8. CROSSOPUS FODIENS (*Pallas*).

Water Shrew.

Gael., Famh-uisge (*lit.*, water-mole).

Both the white-throated form and the dark race, formerly separated as *C. remifer* (Geoffroy), are widely but locally distributed throughout the mainland, and intermediate varieties constantly occur. The species was first added to the Scottish fauna by the late Dr. Scouler, who took specimens near Glasgow (*Mag. Nat. Hist.*, VI., p. 512), and it has since been found as far north as Sutherlandshire, where it is not uncommon. Baikie and Heddle state that one was killed in Waas, Orkney (*Hist. Nat. Orc.*, p. 14), and it is not rare in Arran, but I have been unable to ascertain its existence in any of the other Islands.

ORDER III.: CARNIVORA.

Family: FELIDAE.

9. FELIS CATUS, *Linnaeus*.

Wild Cat.

Gael., Cat-fhiadhaich (*lit.*, wild cat), Braiene.

Once generally distributed over the mainland, the Wild Cat has been totally extirpated in the Lowlands and in many parts of the Highlands. It is still to be found, however, in the wilder districts of most of the northern counties, especially in the deer-forests,

where it is left comparatively undisturbed. Till of late years its southern outpost was the mountainous country around Loch Lomond, whence there are specimens in the Glasgow University Museum; but it is now extinct in that neighbourhood (*Lumsden, P. N. H. S. Glasgow*, III., p. 189), and I believe that none now exist south of the northern districts of Argyll and Perthshire. There appears to be no evidence that the Wild Cat was ever found in any of the Islands, Pennant's statement that it was a native of Arran being probably erroneous.

Family: CANIDAE.

10. CANIS VULPES, *Linnaeus*.

Fox.

Scot., Tod (Old Islandic, *toa*, a fox).

Gael., Sionnach, Balgair, Madadh-ruadh (*lit.*, red hound).

Universally distributed on the mainland, both in the Lowlands and Highlands, but absent from the Islands, except Skye (Duns). In Mull there is a tradition that Foxes were formerly found, but were exterminated about the middle of the last century.

Family: MUSTELIDAE.

11. MARTES SYLVESTRIS, *Nilsson*.

Yellow-breasted Marten.

Scot., Mertrick (Ang. Sax., *mearth*, a marten).

Gael., Taghan (from Gael., *taghanach*, surly, sulky?).

Like the Wild Cat, the Marten has been exterminated in most parts of the Lowlands, but a few still linger in some parts of the south-west. Macgillivray mentions a Lanarkshire specimen (*Nat. Libr.*, XXII., p. 168), and one was killed in Ayrshire, near Maybole, in 1876 (*Alston, Fauna W. Scotl.*, p. vi.). In the Highlands also it is much reduced in numbers, and in many places is already quite extinct, but still finds a refuge in the wilds of most of the counties north of Perth and Argyll, especially in the deer-forests. It does not appear to be a native of any of the Inner Islands, but, curiously enough, is well known in the Outer Hebrides, where it was noted as far back as 1715 by Martin (*West. Isles*, p. 36). When Macgillivray wrote (1838) it was "abundant" in Harris, but Mr. Harvie-Brown informs me that it is now almost exterminated there.

[*MARTES FOINA* (*Linnaeus*).—The White-breasted Marten has been constantly included in lists of Scottish Mammals, but there appears to be no evidence of its ever having been found in any part of Britain. The older writers trusted entirely to coloration, and consequently confused any pale-breasted specimens with the common continental species. The two forms may be readily distinguished, however, by the colour of the under-fur, and by several cranial and dental characters, of which the most striking are these:—In *M. foina* the under-fur is greyish-white, and the last upper molar is notched externally, whereas in *M. sylvatica* the under-fur is reddish-grey, and the last upper molar is simply rounded externally (*cf. Alston, P. Z. S.*, 1879, pp. 468-474; *Zoologist*, 1879, pp. 441-448).]

12. *MUSTELA VULGARIS*, *Erzleben*.

Common Weasel.

Scot., Whitrit, Quhitrit (from *Scot.*, *quhid*, to move swiftly?) Common to the next species.

Gael., Neas, Nios (from *Gael.*, *nimh*, poison?) Common to the next species.

Found throughout the mainland, although hardly so common in most places as the next species. It is not a native, however, of any of the islands, except Bute, where Mr. Colquhoun says it is rare (*Sport. Days*, p. 100). As will be seen presently, the statements of Low and of Baikie and Heddle, as to the Common Weasel having been introduced into Shetland, are erroneous.

13. *MUSTELA ERMINEA*, *Linnaeus*.

Stoat or Ermine.

Scot. and Gael. (See last species.)

Generally a more plentiful species than the last in Scotland, and found in most of the Inner Islands, being extremely common in Skye, Mull, Bute, and Islay, but it is not found in Arran, the Outer Hebrides or Orkney. From information supplied to me by Mr. J. R. Tudor and Mr. Howard Saunders, it appears that the "Weasels" of the Mainland of Shetland are really Stoats. According to Low (*Faun. Orc.*, p. 29) they were introduced through malice, and the assertion of Baikie and Heddle (*Hist. Nat. Orc.*, p. 11), that they became extinct, is incorrect—they are still over-abundant.

14. *MUSTELA PUTORIUS*, *Linnaeus*.

Polecat.

Scot., Foumart (also Old and local English).

Gael., Fochlan (from Gael., *fochal*, dirt?).

Now rare or extinct in many of the southern counties, and locally rather than generally distributed in the Highlands. It is not found in any of the Islands.

15. *MELES TAXUS* (*Schreber*).

Badger.

Scot., Brock (from the Gaelic? or from *Scot.*, *broakit*; Danish, *broged*, spotted, striped. Also Old and local English?)

Gael., Brochd (from Gael., *broc*, mottled grey?).

The Badger, now, like the Polecat, a very scarce animal in the south, has been recorded of late years from Lanarkshire (*Alston, Fauna W. Scotl.*, p. vi.) and Kirkcudbright (*R. Service, Zoologist*, 1878, p. 427), and Mr. Harvie-Brown informs me that it appears not to be very rare near Yetholm. It is still far from uncommon in suitable localities in the Highlands, but is unknown in the Islands.

16. *LUTRA VULGARIS*, *Erxleben*.

Otter.

Shetl., Tyke.

Gael., Dobhran, Dorchie (from *dobhar*, water?); Beast-dhu, Madadh-donn (*lit.*, brown hound); Balgar in the Hebrides (which is properly the fox).

Although reduced in numbers by persecution, the Otter is universally distributed along river-courses and around lakes, and on the northern and western shores it is found wherever a rocky coast provides it with a suitable dwelling-place. It is also a native of all the principal Scottish Islands.

*Family: PHOCIDAE.*17. *PHOCA VITULINA*, *Linnaeus*.

Common Seal.

Scot., Selch, Selcht, Selchie (Old German, *Selach*).

Gael., Ron.

Found round the coasts in all localities where it is comparatively free from intrusion, especially on the north and west shores, and among the Islands.

[*PHOCA HISPIDA*, *Schreber*.—The Ringed or Marbled Seal may perhaps be the “Bodach” (*lit.*, old man) of the Hebrideans, a small and rare species reported by M’Neil of Colonsay to the late Mr. J. Wilson (*Mag. Zool. and Bot.*, I., p. 541-544). No recent Scottish specimens have, however, been yet recorded, although fossil remains in brick-clays of various localities have been identified by Prof. Turner (*P.R.S. Edin.*, 1869-70, pp. 105-114, and *Jour. Anat. and Phys.*, IV., pp. 260-270). One specimen has been taken on the coast of Norfolk (*Bell’s Br. Quad.*, 2nd ed., p. 249), and the supposed existence of the species in the Hebrides is worthy of further investigation.]

18. *PHOCA GROENLANDICA*, *Fabricius*.

Greenland or Harp Seal.

There can be little doubt that this large Seal occasionally visits the coasts of Scotland, although the existing records are far from satisfactory. Macgillivray doubtfully referred a young Seal taken in the Firth of Forth to the present species, and mentions a second specimen in the University Museum of Edinburgh (*Nat. Libr.*, XXII., p. 210), but Prof. Turner informs me that the latter cannot now be identified. The late Mr. H. D. Graham believed that he saw three examples in Jura, and thought that the species was confused by the islanders with the Gray Seal under the name of “Tapvaist” (*P.N.H.S. Glasg.*, I., pp. 53-54); and Mr. Harvie-Brown saw what he fully believes to have been four examples of *Phoca groenlandica* in the Sound of Harris in 1870. The late Dr. Saxby says that the Greenland Seal is not very rare in Shetland during bad weather (*Zoologist*, 1864, p. 9090); but the only thoroughly well-authenticated British-killed specimen yet recorded is one in the Kendal Museum, which was taken on the coast of Lancashire in 1868, and identified by Mr. Thos. Gough and Prof. Turner (*Jour. Anat. and Phys.*, IX., pp. 163-165).

19. *CYSTOPHORA CRISTATA* (*Erxleben*).

Hooded Seal.

A rare straggler. Baikie and Heddle state that specimens are “said to have been killed at Rousay and at Papa Westra,” and give the Orcadian name of “Bladder-nosed Seal,” by which the species is well known to the northern whalers (*Hist. Nat. Orc.*, pp. 13, 98), and Mr. Howard Saunders was this year assured that the

"Bladder-nose" is well known as a visitor to the Vae Skerries, Shetland. A young example was killed near St. Andrews on the 22nd July, 1872, as recorded by Mr. R. Walker (*Scot. Nat.*, II., p. 1), and two others have been obtained on the English coasts. As far back as 1577 mention is made in Hollinshed's "Cronicle" of "sundry fishes of monstrous shape, with cowls over their heads like unto Monks and in the rest resembling the body of Man," whose appearance in the Firth of Forth was followed by pestilence and murrain. These may not improbably have been Hooded Seals.

20. HALICHOERUS GRYPHUS (*Fabricius*).

Gray Seal.

Orc., Haaf-fish.

Gael., Tapvaist (in the Hebrides).

Very abundant on the rocky shores of the Outer Hebrides, where the great breeding-place at Haskeir, off North Uist, has often been described, and among the Orkney and Shetland Islands. Comparatively rare on the coasts of the mainland, especially on the east; but Prof. Turner has recorded it from near Montrose and St. Andrews, and believes it to be more common than is usually supposed on the east coast, where the Tay fishermen call it the "Black Seal" (*Jour. Anat. and Phys.*, IV., pp. 270-271). The Gray Seal was formerly confused with the Arctic *Phoca barbata*, but there is no good evidence that the latter has ever visited the British coasts (*cf. Bell's Br. Quad.*, 2nd ed., pp. 238, 263).

Family: TRICHECHIDAE.

21. TRICHECHUS ROSMAREUS, *Linnaeus*.

Walrus.

Now a very rare straggler, though it was probably a more frequent visitor to our coasts in old times. Sir R. Sibbald mentions it on the authority of Boethius, and its remains have been found in peat-bogs in England. One was killed at Caolas Stocnis, on the east coast of Harris, in December, 1817, and was examined by Macgillivray (*Nat. Libr.*, XXII., p. 223). A second, shot in June, 1825, on Edday, Orkney, was recorded by Mr. R. Scarth (*Edin. Phil. Mag.*, XIII., p. 383), and its head is preserved in the University Museum at Edinburgh. A third is reported by Baikie and Heddle to have been seen in Hoy Sound in 1827 (*Hist. Nat. Orc.*, p. 14), and a fourth was killed in April, 1841, on the East Heiskar, near

Harris, as recorded by Dr. R. Brown (*Ann. and Mag. Nat. Hist.*, 4th Ser., VII., p. 65), who has been further informed of two being seen about Orkney and Shetland in 1857 (*P. Z. S.*, 1868, p. 433).

ORDER IV.: CETACEA.

[Family: *BALAENIDAE*.]

[*BALAENA MYSTICETUS*, *Linnaeus*.—The Greenland Right-Whale has generally been included in Scottish lists, but the Right-Whale which certainly visited the British seas in old times was probably the more southern species, *B. biscayensis*, Eschricht, which appears to be now almost extinct on the European side of the Atlantic. There is, however, no authentic evidence of the occurrence of any Right-Whale on our coasts in modern times, most of the records being referable to one or other of the Rorquals (*cf. Bell's Br. Quad.*, 2nd ed., pp. 381-391).]

Family: *BALAENOPTERIDAE*.

22. MEGAPTERA LONGIMANA (*Rudolphi*).

Hump-backed Whale.

Only one authenticated specimen of this large Cetacean has been captured in the Scottish seas, an adult measuring in length 48 feet, which was towed into Wick Bay in March, 1871; its pectoral limbs each measured 14 feet. A description of this specimen was published by Mr. W. Reid, in "Land and Water" (1st April, 1871); the skeleton was not preserved, but Prof. Turner obtained some of the baleen for the Anatomical Museum of the University of Edinburgh. The species has also occurred at least twice on the English coasts (*cf. Bell's Brit. Quad.*, 2nd ed., p. 394).

23. BALAENOPTERA MUSCULUS (*Linnaeus*).

Common Rorqual, or Razor-back.

Orc., Finner. (Common to next two species.)

Appears not to be uncommon off the Orkney and Shetland Isles; three, taken there in 1856, were described by Dr. Duguid (*P. Z. S.*, 1856, p. 187), and distinguished as a new species, *Physalus duguidii*, by Gray (*Cat. Seals and Whales*, p. 158; *cf. Bell's Br. Quad.*, 2nd ed., p. 399). A number of other large Rorquals have been recorded as occurring on the shores of the mainland and in the

Hebrides. Thus Prof. Turner tells me that one was stranded in 1848 near Kingask, Fife, and another was brought into Stornoway in 1871, specimens of the baleen of both of which animals are in his possession. Again, one was stranded at Wick in 1869, and another towed into Peterhead in 1871, portions of the skeletons of both of which are in the Museum of the University of Aberdeen, and have been described by Dr. Struthers (*Jour. Anat. and Phys.*, VI., pp. 107, 125). But in most cases the descriptions have not been sufficiently exact to enable zoologists to determine whether they belonged to this or the next species. In future it is to be hoped that the number of the ribs and vertebrae of such visitors will be noted, and specimens of their baleen (or whale-bone) retained, even when it is not practicable to preserve the whole skull.

24. BALAENOPTERA SIBBALDI (*Gray*).

Sibbald's Rorqual.

Orc. (See last species.)

This very large Rorqual has repeatedly occurred on the eastern coasts of Scotland. The specimen stranded near Abercorn in 1692, and described by Sir Robert Sibbald, was probably of this species. One about 80 ft. long was found dead in October 1831 near North Berwick, and its skeleton, prepared by Dr. Robert Knox and Mr. Frederick Knox, is now in the Museum of Science and Art, Edinburgh. In November 1869 a gravid female of 78 ft. in length was stranded in the Firth of Forth, near Longniddry, and was carefully described in the *Transactions of the Royal Society of Edinburgh* (XXVI., pp. 197-251, pls. v.-viii.), by Prof. Turner, who also states that one about 90 ft. long came ashore with its sucker at Hamna Voe, Shetland, in October of the same year. The Longniddry skeleton is now in the Anatomical Museum of the University of Edinburgh. Prof. Turner has also obtained the skeleton of a specimen stranded at Wick in 1871, and the ear-bones and nasals of one stranded at Aberdour, Fife, in 1858.

25. BALAENOPTERA ROSTRATA (*Fabricius*).

Lesser Rorqual.

This comparatively small species is a not unfrequent visitor to the northern and eastern coasts, more rarely to the western. One was taken near Largo in 1832; and in the Anatomical Museum of the University of Edinburgh is preserved the skeleton of a young

one captured near Queensferry in February 1834, and prepared by Dr. Robert Knox. Prof. Turner tells me that in the same Museum is the skull and baleen of a specimen stranded at Burntisland in 1870, the skull and baleen of one taken at Dunbar in 1871, and some baleen-plates of one caught in the herring nets off Anstruther in 1872. Another specimen was caught in the Firth of Forth in 1858. The Lesser Rorqual has also been recorded from Shetland, and the skull of one which was cast ashore on Islay in 1866 is now in the Museum of the University of Cambridge. In the Museum of Anderson's College, Glasgow, there is a sub-fossil skull of a small Whale, which was found in brick-clay near Stirling, which is probably referable to this species.

[BALAENOPTERA LATICEPS (*Gray*).—Rudolphi's Rorqual has been supposed to visit our shores, the Islay Rorqual mentioned above having been referred to this rare species by MM. Gervais and Van Beneden (*Ostéogr. des Cétacés*, I., p. 200). Mr. J. W. Clark, however, informs me that a more careful examination of the skull at Cambridge shows that it belonged to the last species.]

Family: PHYSETERIDÆ.

26. PHYSETER MACROCEPHALUS, *Linnaeus*.

Sperm-Whale, or Cachalot.

Stray individuals, usually old bulls, occasionally wander from the semi-tropical seas, and Prof. Turner has collected evidence of at least eight authentic occurrences on the coasts of Scotland. A tooth was found by Mr. G. Petrie in a structure at Hoxay, Orkney, which probably dates from the 9th or 10th century (*Turner, P. R. S. Edin.*, 1871-2, p. 638). A male, 52 feet long, came ashore at Limekilns, on the Forth, in February 1689, as recorded by Sir Robert Sibbald, in his "*Phalainologia Nova*," and another, about the same size, at Cramond in 1701 (*Turner, op. cit.*, 1870-1, p. 367). One of 57 feet in length was taken at Monifieth in February 1703 (*op. cit.*, p. 368), and one of 63 feet on the west coast of Ross-shire in 1756 (*Hamilton, Nat. Libr.*, xvi., p. 179). A second example ran ashore at Cramond in December 1769. It was also a male, measuring 54 feet, and was described by Robertson in the *Philosophical Transactions* of 1770. Low mentions two taken in Hoy Sound about 1800, and says that the species "is often drove ashore about the Orkneys" (*Faun. Orc.*, p. 161). One, said to have been about 60 feet long, was

killed near Oban, in May 1829 (*Turner, P. R. S. Edin.*, 1870-1, p. 365), and a large male was washed ashore near Thurso in July 1863. The skeleton of the latter is now in the British Museum, and is described in Prof. Flower's admirable monograph (*Tr. Z. S.*, vi., pp. 309-372). Lastly a male, said to be nearly 60 feet long, was stranded in Loch Scavaig in Skye, in July 1871 (*Turner, P. R. S. Edin.*, 1871-2, p. 632). Several others have occurred from time to time on the English coasts.

27. HYPEROODON ROSTRATUS (*Chemnitz*).

Common Beaked-Whale.

A much more frequent visitor to our shores than any of the preceding species, specimens being killed almost every autumn on some parts of the coast. Fishermen usually confound it with the other smaller Whales under the names of "Bottle-nose," "Grampus," and "Muc-mhara." Two crania of this Whale are in the Anatomical Museum of the University of Edinburgh, one from a specimen caught at Queensferry and the other from one killed in Hamna Voe, Shetland.

28. HYPEROODON LATIFRONS, *Gray*.

Broad-fronted Beaked-Whale.

This Whale has only been distinguished from the last by its skull, its external characters remaining still undescribed. The skull on which Gray founded the species was sent from Orkney, and passed through Warwick's collection to the British Museum (*Zool. "Erebus" and "Terror,"* I., p. 27). A female, 28 feet in length, was taken in the Firth of Forth in October 1839, and its skeleton is preserved in the Edinburgh Museum of Science and Art (*Gray, Cat. Seals and Whales*, p. 339). As far as is at present known, the Broad-fronted Beaked-Whale would appear to be everywhere a rare animal.

29. ZIPHIUS CAVIROSTRIS, *Cuvier*.

Cuvier's Whale.

The only recorded British specimen of this little known Cetacean was taken off Hamna Voe, Mainland of Shetland, in 1870, and its skull, now in the Anatomical Museum of the University, was described and figured by Prof. Turner in the *Transactions of the Royal Society of Edinburgh* (xxvi., pp. 759-778, pl. xxix-xxx) Only a few specimens of the species are known to zoologists.

30. MESOPLODON BIDENS (*Sowerby*).

Sowerby's Whale.

This interesting Whale was first described by Sowerby, from a male, 16 feet in length, which was cast ashore in 1800 at Brodie, Morayshire (*Brit. Miscell.*, pl. i.); its imperfect skull is now in the Oxford Museum. There is also a skull in the Edinburgh Museum of Science and Art, which Prof. Turner thinks was probably that of a second Scottish example (*Tr. R. S. Edin.*, xxvi., p. 773). Three specimens are known to have occurred on the coasts of Ireland, and a few on those of the Continent (*cf. Bell's Br. Quad.*, 2nd ed., pp. 431-434).

*Family: DELPHINIDAE.*31. MONODON MONOCEROS, *Linnaeus*.

Narwhal.

Only two occurrences of the Narwhal on our shores are on record. One was taken in the Firth of Forth, in June 1648, as mentioned by Tulpius (*Obs. Med.*, p. 376), and a second entangled itself among rocks in the Sound of Weesdale, Shetland, in September 1808. This example was carefully described by Fleming (*Mem. Wern. S.*, i., pp. 131-148). The Narwhal has only once been taken on the coast of England.

32. DELPHINAPTERUS LEUCAS (*Pallas*).

White Whale, or Beluga.

Another rare straggler from the Arctic seas. Two young males were cast ashore from the Pentland Firth, near Thurso, in 1793, and were examined by Col. Imrie (quoted by Barclay and Neill). An adult male, 13 feet in length, was killed in the Firth of Forth in June 1815, and described by Barclay and Neill (*Mem. Wern. S.*, iii., pp. 371-395, pt. xvii.-xviii.); its stuffed skin is still preserved in the Edinburgh Museum of Science and Art. In Orkney, Baikie and Heddle record that a dead White Whale was stranded on Auskerry, in October 1845 (*Hist. Nat. Orc.*, p. 22). My friend Mr. J. G. Gordon tells me that he saw a large white Cetacean, presumably an individual of this species, in Loch Etive in June 1878; and Prof. Flower has recently recorded the capture of a Beluga on the east coast of Sutherlandshire, near Dunrobin, in June 1879 (*P. Z. S.*, 1879, p. 667). No English examples have hitherto been met with.

33. ORCA GLADIATOR (*Lacépède*).

Killer, or Grampus.

Shet., Pict-Whale, Fleckit-Whale (*lit.*, spotted-whale), Lupster, (leapster?)

Mr. G. Gatherer informed Prof. Turner that small herds of this species are sometimes observed about Shetland, and that individuals are occasionally seen in the schools of Pilot-Whales. Eighteen were driven ashore in Bressay Sound in February 1871, and the skull of one was identified by Prof. Turner, and preserved in the Anatomical Museum of the University of Edinburgh (*Tr. R. S. Edin.*, xxvi., pp. 469-470). Baikie and Heddle speak of the "Grampus" as being abundant about the Orkneys during the herring fishing (*Hist. Nat. Orc.*, p. 21), and Fleming says that it frequents the Firth of Tay in pursuit of salmon (*Brit. An.*, p. 34); but it must be remembered that fishermen and sailors apply the names "Grampus" and "Bottle-nose" indiscriminately to all the smaller Cetaceans. A Killer, 21 feet long, was captured at Granton, in the Firth of Forth, in March 1876, and the skeleton was obtained for the Edinburgh Museum of Science and Art.

34. GLOBICEPHALUS MELAS (*Trail*).

Pilot-Whale.

Shetl., Caa'ing Whale (*lit.* driving-whale); *Orc.*, Bottle-nose.

Gael., Muc-mhara (*lit.*, sea-sow.) (The latter names common to most smaller Cetaceans).

Herds or "schools" of this interesting species appear about the Shetlands almost every year, and great numbers are often driven ashore by the islanders. In 1834 a shoal of 780 was thus captured at Sumburgh (*Bell's Br. Quad.*, 1st ed., p. 485); in September 1845 no less than 1,540 are said to have been taken in Quendall Bay (*Zoologist*, 1846, p. 1207); and, in 1852 about 1,100 were seen near Scalloway, but escaped (*Martin's Life of Aytoun*). In Orkney they are not so often seen, and are said to be rarer of late years (*tom. cit.*). Baikie and Heddle say that they appear there in herds of from 50 to upwards of 500 (*Hist. Nat. Orc.*, p. 21). Among the Hebrides the occurrence of the Pilot-Whale is only occasional, but several large shoals have been recorded. In 1805 a herd of about 500 appeared, and more than 300 were taken, and in 1832

92 were captured at Stornoway (*Nat. Libr.*, xvi., pp. 214-215). In July 1869 about 200 visited the same place, and were almost all secured. The coasts of the mainland of Scotland are more rarely visited, but in April 1867 a school, estimated at 200, entered the Firth of Forth, between 20 and 30 of them being secured (*Alston, Zoologist*, 1867, pp. 801-803). These specimens were well utilized in the cause of science; one of them afforded the material for Dr. Murie's excellent monograph of the anatomy of the species (*Tr. Z. S.*, viii., pp. 235-301); the structure of another was described by Prof. Turner (*Jour. Anat. and Phys.*, ii., pp. 66-79); the skeleton of a third is in the Edinburgh Museum of Science and Art; and that of a fourth in the Museum of the University of Glasgow. A single Pilot-Whale was cast up on the Berwickshire coast in 1856 (*Hardy, Zoologist*, 1856, p. 5095), and stragglers have occurred on the shores of England, and even in the Channel (*Bell's Br. Quad.*, 2nd ed., p. 454).

35. PHOCOENA COMMUNIS, *F. Cuvier*.

Porpoise.

Shetl., Nisack (from Norse, *Nisse*, a hobgoblin?).

Scot., Pelloch (from the Gaelic?)

Gael., Puthag (*lit.*, the blower).

By far the commonest Scottish Cetacean, and especially abundant among the Islands. Both Low and Baikie and Heddle observe that they appear to be migratory in Orkney, none being seen in winter (*Faun. Orc.*, p. 163; *Hist. Nat. Orc.*, p. 21), and the same observation has been made in the north of Europe and in Greenland.

36. DELPHINUS TURSIO, *Fabricius*.

Bottle-nosed Dolphin.

The only Scottish specimens of which I have been able to learn are two, the skeletons of which are preserved in the Museum of Science and Art and the Museum of Surgeons' Hall, Edinburgh, and which are stated to have been captured many years ago in the Firth of Forth (*cf. Bell's Br. Quad.*, 2nd ed., p. 468). Dr. Murie informs me that herds of this species sometimes appear off the west coast.

37. DELPHINUS ACUTUS, *Gray*.

White-sided Dolphin.

This beautiful Dolphin appears not to be very rare in the

Orcadian seas. It was first described by Gray from an Orkney skull (*Spic. Zool.*, No. 2), which is now in the Museum of Leyden. An adult female from the same locality was described by Knox, under the name of *D. tursio* (*Cat. Prep. Whales*, 1838), and its skeleton is now in the Edinburgh Museum of Science and Art. In August 1858 about 20 were captured in Scalpa Bay, as recorded by Dr. Duguid, who states that the species is often seen about the Orkneys (*Ann. and Mag. N. H.*, 3rd ser., xiv., pp. 133-136). It has also been taken off the Faroes, and on the coasts of Norway and of Ireland (*Ogilby, Zoologist*, 1876, p. 5077).

[*DELPHINUS DELPHIS*, *Linnaeus*.—The Common Dolphin, although a more southern species than the preceding, probably occasionally visits the coasts of Scotland as it does those of Norway; but I have been unable to find a single trustworthy account of its capture. Off the south coast of England it appears not to be rare.

DELPHINUS ALBIROSTRIS, *Gray*.—The White-beaked Dolphin is another species whose appearance in Scottish waters is to be expected, as it seems frequently to visit the Faroes and the east coast of England (*Cunningham, P. Z. S.*, 1876, p. 686), but as yet its actual occurrence does not seem to have been recorded.]

ORDER V.: ARTIODACTYLA.

Family: CERVIDAE.

38. *CERVUS ELAPHUS*, *Linnaeus*.

Red-Deer.

Gael., Fiadh (general); Damh, Cabrach (*lit.*, the antlered), Croichdeach (stag); Eilid, Mavlag, Maviseach, Adh, Grighagh (hind); Mang (young deer); Laogh (calf).

Formerly generally distributed over the mainland and Islands (excepting apparently Shetland), the Red-Deer has long been extinct in the Lowlands and in Orkney, where antlers are found in the "Picts' houses" or "Brochs," as well as in the peat. Mr. Harvie-Brown informs me that Red-Deer have also been long extinct in the Outer Hebrides south of Benbecula, although their remains are found in peat as far south as Barra. They are still preserved, however, in North Uist and the Lews, in most of the Inner Islands, and in parts of the mainland counties of Caithness, Sutherland, Ross and Cromarty, Inverness, Banff, Aberdeen, Forfar, Perth, Stirling,

Dumbarton, and Argyll—in all of which large tracts of land have been set aside as deer-forests. The most southern station of the Red-Deer in Scotland is the Island of Arran, where it appears to be indigenous.

[CERVUS DAMA, *Linnaeus*.—The Fallow-Deer (*Gael.*, Dathais) thrives in parks as far north as Sutherlandshire (*Harvie-Brown, P. N. H. Glasg.*, III., p. 229), and exists in a semi-wild state in some places, as in Islay and Mull. Although the species existed in Britain in prehistoric times, it appears to have become extinct before the Roman period, and modern “wild” Fallow-Deer are probably all descended from escaped specimens (*cf. Brooke and Boyd Dawkins, Nature*, XI., pp. 210, 226). Fallow-Deer were kept at Stirling by the Scottish Kings as far back as 1283, as is shown by the royal accounts (*Innes’ “Scotland in Middle Ages,”* p. 125).]

[CARIACUS VIRGINIANUS (*Gmelin*).—The Virginian Deer was introduced into Arran about 1832, and still thrives there, although their numbers have been reduced of late years (*Alston, in Bryce’s “Arran,”* 4th ed., 1872, p. 313).]

39. CAPREOLUS CAPRAEA, *Gray*.

Roe-Deer.

Scot., Ra, Rae.

Gael., Earba, Earb; Boc-earb (Roe-buck.)

The very interesting history of the distribution of the Roe-Deer in Britain is at present being investigated by Mr. J. E. Harting. It was formerly found all over Scotland and England, as is proved, not only by remains found in peat, lake-bottoms, &c., but by numerous allusions in history and tradition. The advance of civilization and the general destruction of forests gradually drove it back, till, at the end of the last century, it appears to have been strictly confined to the Highland counties. Pennant said that the first which were to be met with in his time (going northwards) were in the woods on the south side of Loch Rannoch. In 1792, the minister of the parish of Dingwall had only *once* seen a Roe (*Old Stat. Acc.*, III., p. 5), and the species is stated to have reappeared at Little Dunkeld about 1786 (*op. cit.*, VI., p. 362). Walker in his “*Mammalia Scotica*” gives only Ross, Inverness, Argyll, and Perthshire as localities (*Essays Nat. Hist.*, 1812, p. 506). Protection and the great increase of plantations have

worked a wonderful change, and Roe-Deer are again found in all suitable places from Sutherlandshire to Wigtownshire. They do not appear to be indigenous to any of the Scottish Islands, and are still unknown in the Outer Hebrides, Orkney and Shetland, but they were long ago introduced into Islay, and more recently into Mull and Jura.

[BOVIDAE.]

[*BOS TAURUS*, *Linnaeus*.—The White Bull of Cadzow and Chillingham has usually been enumerated among our existing native quadrupeds, and has been held by many zoologists to be the direct descendant of the fossil *Urus* or *Bos primigenius* (*cf. infra*, p. 37). The known facts of the history of the breed have lately been well collected in the Rev. J. Storer's work on the "Wild White Cattle of Great Britain" (London, 1879), but that gentleman has given far too much credence to statements of Boethius and his copyists. To me the evidence appears overwhelmingly to prove that the modern Park Cattle are *not* wild survivors of the *Urus*, but are the descendants of a race which had escaped from domestication, and had lived a feral life until they were enclosed in the parks and chases of the mediaeval magnates. The original Scotch herds of whose former existence we are acquainted were seven in number, namely—

I. *Blair Athole* (Perthshire). Broken up in 1834 (*Storer*, p. 345).

II. *Kincardine* ("Kincarnia," Perthshire), mentioned, in 1578, by Leslie (*Storer*, p. 137).

III. *Stirling* (Stirlingshire). In the Royal Park, also recorded by Leslie (*Storer*, p. 137).

IV. *Cumbernauld* (Dumbartonshire). Destroyed by the Earl of Lennox in 1570, according to Dalzell, but stated by tradition to have survived till the last century (*Storer*, p. 322).

V. *Cadzow* (Lanarkshire). The only existing herd, now numbering over forty head (*Storer*, p. 338).

VI. *Auchencruive* (Ayrshire). Destroyed late in the last century (*Storer*, p. 329).

VII. *Drumlanrig* (Dumfriesshire). Also exterminated towards the end of the last century (*Storer*, p. 328).

Besides these ancient herds, attempts have at various times been made to establish White Cattle in other parks, as at Taymouth, Dalkeith, Ardrossan, and Kilmory, but, according to Mr. Storer, they now only survive at the last-named place, and are considered to be in a semi-domesticated state.]

ORDER VI.: GLIRES.

SCIURIDAE.

40. SCIURUS VULGARIS, *Linnaeus*.

Squirrel.

Old Scot., Conn (Sir D. Lindsay); (Sw., *ikorn*, *ekorre*, a squirrel).
Gael., Fheorag (*lit.*, the alert).

The history of the distribution of the Squirrel in Scotland is similar to that of the Roe-Deer, and is being fully worked out by Mr. Harvie-Brown, so that a mere sketch will be here sufficient. In the middle ages it appears to have been widely spread, being found in 1630 even in Sutherlandshire (*Sir R. Gordon*), but, owing doubtless to the same causes which banished the Roe-Deer, it became very rare, if not extinct. Subsequently it was re-introduced by several landowners in the last and present centuries, and from these centres it has gradually spread once more over the mainland, reaching Sutherlandshire about 1869 (*Alston and Harvie-Brown, P. N. H. S. Glasg.*, II., p. 144), and South Ayrshire, where it was long absent, in 1877. It is not found in any of the Scottish Islands.

[MYOXIDAE.]

[MUSCARDINUS AVELLANARIUS (*Linnaeus*).—The Dormouse is included in Walker's "Mammalia Scotica" (*Essays Nat. Hist.*, p. 499), but without any special locality, and is stated by Fleming to be "rare in Scotland" (*Brit. An.*, p. 22). It was "reported" to Macgillivray "to occur near Gifford, in East Lothian" (*Nat. Libr.*, XXII., p. 236), and is included in a list of the animals of Careston, in Forfarshire (*New Stat. Acc. Forf.*, p. 523), but I have been quite unsuccessful in seeking for any confirmation of these vague statements.]

MURIDAE.

41. *MUS RATTUS*, *Linnaeus*.

Black Rat.

Scot., Ratton, Rotten (common to next species). *Orc.*, Blue Rat. *Gael.*, Radan (common to next species).

Appears to be almost extinct as a native species, although examples sometimes occur near sea-ports; thus Mr. J. M. Campbell lately showed me a fine specimen which was killed on a wharf at Glasgow in 1874. The Rev. G. Gordon, who recorded the existence of the Black Rat in Morayshire in 1844 (*Zoologist*, 1844, p. 424), informs me that it is now quite extinct there; but it is stated by Mr. H. Stewart to be still found in Wigtownshire (*Field*, 23rd Aug., 1879). In 1848 the Black Rat was confined in Orkney to South Ronaldshay, as recorded both by Baikie and Heddle (*Hist. Nat. Orc.*, p. 15), and by Wolley (*Zoologist*, 1849, p. 2344); and it appears to have been owing to this that a belief became prevalent that the Hamster (*Cricetus frumentarius*, Pallas) had become naturalised in that island (*Hist. Nat. Orc.*, p. 16). In investigating the range of the Black Rat it must be remembered that the black variety of the Water Vole is very often confused with *Mus rattus*.

42. *MUS DECUMANUS*, *Pallas*.

Brown Rat.

Scot. and Gael. (see last species).

Seems to have invaded the south of Scotland from England about the middle of the last century, first appearing in Selkirkshire between 1770 and 1777 (*New Stat. Acc. Peeblessh.*, p. 136). In Morayshire the Rev. G. Gordon says that Brown Rats arrived at the sea-ports about 1814 (*Zoologist*, 1844, p. 424). In Orkney, Baikie and Heddle state that they have become very numerous, but in Rousay they suddenly died out about 1836, and there were none in 1848 in Enhallow or in Damsay (*Hist. Nat. Orc.*, p. 15). They were introduced into Mull from a wrecked vessel, and were at first treated as pets by the inhabitants. The species is now universally distributed both on the mainland and in the Islands, being found even on uninhabited islets in the Sound of Harris, where they feed principally on molluscs.

43. *MUS MUSCULUS*, *Linnaeus*.

House-Mouse.

Gael., Luch.

Universally distributed wherever there are human habitations. Baikie and Heddle state, however, that, like the last species, Mice are absent from the islands of Enghallow and Damsay (*Hist. Nat. Orc.*, p. 15). They are abundant in the Outer Hebrides.

44. *MUS SYLVATICUS*, *Linnaeus*.

Wood-Mouse, Long-tailed Field-Mouse.

A common species throughout the whole of the mainland, in Orkney (*Hist. Nat. Orc.*, p. 14), and in most, if not all, of the Inner Islands; but I have not been able to obtain any positive evidence of its existence in the Outer Hebrides or in Shetland.

45. *MUS MINUTUS*, *Pallas*.

Harvest Mouse.

Appears to be generally but locally distributed in the eastern Lowland counties, but to be absent in the west, although it is not rare in the north-west of England. W. Macgillivray has recorded it from Midlothian, Fifeshire, and Aberdeenshire (*Nat. Libr.*, xxii., p. 257), it is included in a list of the animals of Alloa, and its size and weight correctly noted (*New Stat. Acc. Clackmannansh.*, p. 9), and Mr. R. Gray informs me that he caught one in Kincardineshire in 1869. This eastern distribution in Scotland of a comparatively southern form is interesting as analogous to the range of certain birds, as commented on by Messrs. Gray and Anderson in their "Birds of Ayr and Wigtown" (p. 4).

[What is the "Button-Mouse," reported to Baikie and Heddle to exist in Orkney, only two inches long, and "frequently found asleep, rolled up in the shape of a ball" (*Hist. Nat. Orc.*, p. 15, foot-note)?]

46. *ARVICOLA AGRESTIS*, *De Selys*.

Common Field-Vole, Short-tailed Field-Mouse.

Scot., Water-Mouse.

Gael., Luch-fheior (*lit.*, grass-mouse.)

Common throughout the mainland, in the Inner Islands, and in Orkney (*Hist. Nat. Orc.*, p. 16), but not found in Shetland. In the Outer Hebrides it was not met with by W. Macgillivray, but was

reported to Mr. Harvie-Brown by the late Capt. M'Donald of Rodil, and by Mr. Henderson, Loch Boisdale; and in 1879 Mr. Harvie-Brown captured a specimen, now in the British Museum, at Newton, North Uist. Occasionally appears in vastly increased numbers, and is then extremely destructive. This took place to a great extent in the south-eastern counties in the spring and summer of 1876.

47. ARVICOLA GLAREOLUS (*Schreber*).

Red Field-Vole, Bank-Vole.

First noticed in Scotland by W. Macgillivray (*Nat. Libr.*, xxii., p. 257), and appears to be widely but locally distributed. It has not yet been recorded, however, from further north than Morayshire, where the Rev. G. Gordon informs me that it is extremely common, nor from any of the Islands.

48. ARVICOLA AMPHIBIUS (*Linnaeus*).

Water-Vole or Water-Rat.

Gael., Radan-uisge (*lit.*, water-rat).

Very generally distributed on the mainland, and is found, though apparently not plentifully, in Orkney (*Hist. Nat. Orc., Addenda*). I have no satisfactory evidence of its existence in the Inner Islands, though it is said to be found in Islay and Mull, and it is certainly absent from the Outer Hebrides. The black variety, which W. Macgillivray described as distinct under the name of *Arvicola ater* (*Mem. Wern. S.*, vi., p. 424), is local rather than rare, and has been met with in Sutherland (*Alston and Harvie-Brown, P. N. H. S. Glasg.*, ii., p. 145), Banff, Aberdeen (*Macgillivray, loc. cit.*), Midlothian, Stirling, Dumbarton, and Lanarkshire.

Family: LEPORIDAE.

49. LEPUS EUROPAEUS, *Pallas*.

Common Hare.

Scot., Maukin, Bawd (Aberdeensh., also Old English. These names appear to be forms of *malkin* and *bawdrons*, old English and Scottish names for the Cat, and to have been transferred to the Hare, just as the name *puss* often is in popular language).

Gael., Gearr (*lit.*, short-tailed), Maidheach (from Gael., *magh*, a plain), Mìol baidhe (*lit.*, yellow-beast.)

Generally distributed in the Lowlands, local in the Highlands; in west Sutherlandshire rare, and confined to the limestone district of Assynt (*Alston and Harvie-Brown, P. N. H. S. Glasg.*, II., p. 146). The species does not appear to be indigenous in any of the Islands, but has been very generally introduced. It was first brought to the Lews by Seaforth, shortly before 1797 (*Old Stat. Acc.*, XIX., p. 272), and became numerous, but is said now to be decreasing; was introduced into Coll about 1787 (*op. cit.*, x., p. 401), into Mull in 1814 or 1815, and into Orkney in 1832, where, in 1848, Hares were abundant in the Mainland and in Hoy (*Hist. Nat. Orc.*, p. 16).

50. LEPUS VARIABILIS, *Pallas.*

Mountain Hare.

Scot., Blue Hare, White Hare.

Gael., Maidheach-geal (*lit.*, white hare).

Very numerous throughout the Highlands, but does not appear to be indigenous in the Outer Hebrides, where Mr. Harvie-Brown was informed that it was first turned out about 1850; it is also stated to have been only recently introduced into Mull. In Orkney they are said to have been formerly found, as is shown by a passage in Sibbald's "*Scotia Illustrata*," and by a 17th century manuscript, quoted by Baikie and Heddle (*Hist. Nat. Orc.*, p. 17), but they have long been extinct. About twenty years ago the Mountain Hare was introduced into the south-western hill-country, and it is now not rare in many of the upland districts of Peeblesshire, Ayrshire, and Lanarkshire (*Alston, Fauna W. Scotl.*, p. viii).

51. LEPUS CUNICULUS, *Linnaeus.*

Rabbit.

Gael. Coinein, Coineanach (from old English *coney*?).

Old Scot. and Orc., Cuning.

A rapidly-spreading species in Scotland, and may now be said to be universally distributed, although local in the Highlands owing to the character of the country; but forty or fifty years ago Rabbits were unknown in many parts even of the Lowlands where they now abound. They appear to have been introduced into the Islands, and must have been long established in Orkney, for Martin states that their skins were an article of export in 1715 (*West. Isles*, p. 357), and in 1795 no fewer than 36,000 skins were

sold at Stromness (*Old Stat. Acc.*, xvi., p. 448). At the end of the last century they abounded in Colonsay (*op. cit.*, xii., p. 329), and early in the present they were introduced into Mull, where they are now very plentiful. Professor Duns says that they have not thriven in the Lews, but the contrary is the case in almost all the other Western Islands.

II. FOSSIL AND EXTINCT SPECIES.

ORDER I.: CARNIVORA.

Family: CANIDAE.

1. CANIS LUPUS, *Linnaeus.*

Wolf.

Gael., Faol, Mhadadh-alluidh (*lit.*, savage hound), Lub, Allamadadh, Mactire (*lit.* earth's son).

Of extinct Scottish Mammals the Wolf comes first in systematic order, but last in date of extirpation. My friend, Mr. J. E. Harting, has recently discussed the history of "The Extinct British Wolf" (*Pop. Science Review*, 1878, pp. 53-61, 141-154, 251-266, 396-406), and I must here confine myself to the most important records of its existence in Scotland. The oldest evidence is afforded by the semi-fossil skulls which have been found in marl in Forfarshire (*Lyell, Princ. of Geol.*, II., p. 536) and elsewhere, and the roll is carried on by popular tradition and by allusions in the older chronicles and charters. In 1427 James I. passed an act which contained a chapter "of Wolf-birdis," whereby the Barons of the realm were ordered to "chaise and seik the quhelpis of the wolfis and gar slay thame." "Ilk man not rysand with the Barrone" was fined a wedder, but the nobles appear to have wished to keep the sport to themselves, for it was further ordained "that na man seik the wolf with schot, bot allanerlie in the tymes of hunting of thame." Twenty years later, an Act of James II. removed this latter restriction, placing the affair in the hands of "the Scherif or the Baillies" of each county, and directing that "he that slayeis ane wolf in ony time" is to receive a penny from each householder in the parish. Wolves were included in the game lists of the great hunting parties at which the successive

Earls of Athole entertained James V. in 1528, and Queen Mary in 1563, and there is abundant proof of their existence in the next century. Sir Ewan Cameron of Lochiel is traditionally said to have slain the last in Lochaber in 1680, and this has till recently been always quoted as the last Scottish Wolf; but there is good traditional evidence that the brutes lingered much later in other parts of the Highlands. The last in Morayshire, and probably in Scotland, is said to have been slain by M'Queen of Pall-a-chrocain in 1743, and as that celebrated sportsman lived till 1797 the tradition was still fresh when two versions of it were independently recorded by the brothers Stuart, in the notes to their "Lays of the Deer Forest," and by Sir Thomas Dick Lauder, in his well-known "Account of the Moray Floods of 1829." For further details on this interesting subject I must refer the reader to Mr. Harting's excellent papers quoted above, and to Mr. J. Hardy's observations, published in the "History of the Berwickshire Naturalists' Club" (iv., pp. 268-292, vi., pp. 129-130).

Family: URSIDAE.

2. *URSUS ARCTOS*, *Linnaeus*.

Brown Bear.

Old Scot., Bar.

Gael., Math-ghamhainn, Mathan.

A skull and rib of the Brown Bear, found in a semi-fossil condition in peat moss in Dumfriesshire, was identified by the late Sir Wm. Jardine, and recorded by Dr. J. A. Smith (*P. S. Antiq. Scotland*, viii., p. 216). This skull, Dr. Smith informs me, was purchased by him at the sale of the Applegarth collection, and presented to the Museum of the Royal Society of Antiquaries of Scotland. The species probably was exterminated at a comparatively early period, for although British Bears are mentioned by several classical writers (as Martial, Claudian, &c.), and once or twice in Saxon chronicles, there is no satisfactory record of their existence later than the ninth or tenth century. In Gaelic tradition the Bear appears in some mythical tales (*Campbell, Tales of W. Highlands*, i., pp. 164-175), and is said to have given their name to the Mc Mhathains or Mathisons (*Notes and Queries*, 6th ser., xi., p. 105), but there appear to be now only vague traditions of its existence as a Scottish beast of chase.

ORDER II.: PROBOSCIDEA.

*Family: ELEPHANTIDAE.*3. ELEPHAS PRIMIGENIUS, *Blumenbach.*

Fossil Elephant or Mammoth.

Remains of the Mammoth have been found in Scotland, both under and in the boulder-clay, the Rein-Deer being the only other Scottish Mammal whose bones have yet been found in deposits of such antiquity. A tusk was found between Edinburgh and Falkirk, and bones near Kilmaurs (*Bald., Mem. Wern. Soc.*, iv., pp. 58-64), near Airdrie (*Craig, P. Geol. S. Glasg.*, III., p. 415), and at Clifton-hall (*Cat. Western Scott. Fossils*, p. 152), and a molar tooth, now in the Hunterian Museum of the University of Glasgow, near Bishopbriggs (*Bryce, Geol. Arran and Clydesd.*). Besides these, Professor W. Boyd Dawkins informs me that there are remains from Caithness-shire in the Kelvingrove Museum at Glasgow, and Mr. J. Kirsop tells me that he has a well preserved molar found at Baillieston, near Glasgow.

ORDER III.: PERISSODACTYLA.

*Family: EQUIDAE.*4. EQUUS CABALLUS, *Linnaeus.*

Fossil Horse.

Bones of a small Horse, not distinguishable from the recent species, have been found in marl in Forfarshire (*Lyell, Princ. Geol.* II., p. 336), and in peat in Renfrewshire (*Craig, Tr. Geol. S. Glasg.*, iv., p. 18). The latter specimens are preserved in the Hunterian Museum of the University of Glasgow. There is no reason to believe that the Horse survived in Scotland in a really wild state in historical times, although Boethius mentions *Equi feri* in the sixteenth century (*Reg. Sc. Descr.*, fol. ix.), and John Taylor, in his "Pennyles Pilgrimage," speaks of having seen "wild horses" in Braemar in 1618, for in both cases ordinary hill-ponies are probably meant.

[*Family: RHINOCERONTIDAE.*]

[RHINOCEROS, sp.?—Horns of a Rhinoceros are stated to have been found in marl-pits in Forfarshire, and in Blair-Drummond Moss (*Fleming, New Phil. Journ.*, XI., p. 297), but it seems probably that the specimens in question were the horn-sheaths of one of the Fossil Oxen (*cf. Smith, P. S. Antiq. Scotland*, IX., pp. 636-638).]

ORDER IV.: ARTIODACTYLA.

*Family: SUIDAE.*5. SUS SCROFA, *Linnaeus.*

Wild Boar.

Old Scot., Baar (Ang.-Sax., *bar*, a boar).

Gael., Torc, Torc-neimh (*lit.*, fierce boar), Cullach, Fiadh-chullach (*lit.*, wild swine).

Scottish Wild Boars have not only left their remains in marl-pits and peat-bogs (*Lyell, Princ. Geol.*, II., p. 356), but have had their memory preserved both in tradition and in history. In Gaelic they are mentioned as beasts of chase in the Fionnean fragments of poetry, and they play an important part in such mythical legends as that of "Diarmid and the Magic Boar" (*cf. Campbell, Tales of the West Highlands*, I., p. xci., III., pp. 36-90, IV., p. 168). When the Baron of Avenel granted certain rights in Eskdale to the monks of Melrose in the reign of Malcolm IV. (1153-1165) he specially reserved the right of hunting the Wild Boar (*Morton, Ann. Teriotdale*, p. 273), but in the next century Boars appear to have required special protection, for in 1263 there is an item in the accounts of the Sheriff of Forfar for corn for the *Porci sylvestris* (*Innes, Scotl. in Middle Ages*, p. 123). How much later they existed in Scotland, I have been unable to ascertain.

*Family: CERVIDAE.*6. ALCES MACHLIS, *Ogilby.*

Elk.

Gael., Lon (*lit.*, food, a beast fit for food), Miol (*lit.*, the wild beast).

The palaeontological evidence that the true Elk was formerly a native of Scotland has been fully discussed in Dr. J. A. Smith's

excellent memoir (*P. S. Antiq. Scotland*, ix., pp. 297-345), where will be found full details of the discovery of its remains in Sutherland, Perth, Forfar, East and Mid Lothian, Roxburgh, Selkirk, Peebles, and Berwickshire. In England its antlers have been found associated with Romano-British remains, but historic evidence of its date of extinction in Britain is wanting. Aldrovandus quotes Julius Capitolinus as to certain *Cervi palmati* which were brought from Britain, and exhibited in the games of the Emperor Gordian (in the 4th century), but there can be no certainty as to the species meant (*cf. Scoular, J. Geol. Soc. Dublin*, i., pp. 197-209). Whittaker, in his "History of Manchester," suggests, that the traditional animal named *Segh* by the Welsh may have been the Elk, and the Highlanders still preserve stories of a gigantic extinct Deer, which they term either *Miol* (*Scrope, Days of Deer-stalking*, p. 344, foot-note) or *Lon*. In the older fragments of Gaelic poetry it is described as the chief object of the chase of Fionn and his followers, and several descriptive epithets are applied to it, as *luath*, swift, *dubh*, black or dark, and *spagach*, shambling (*Campbell, Tales of W. Highlands*, ii., p. 102, iv., pp. 163, 255). An ancient poem, quoted by the brothers Stuart in their "Lays of the Deer Forest" (ii., p. 9), alludes to the *Lon* as a woodland animal—

"Us gòrm mheall-àild nam mìle guibhas,
Nan lùb, nan earba, 's nan *lon*."

which they translate—

"The blue height of a thousand pines,
Of Wolves and Roes and of Elks."

It does not appear improbable that the Elk may have survived in the great northern forests to a comparatively late period, and corroborative evidence is afforded by the fresh condition of a shed antler, discovered in Strath Halladale, Sutherlandshire, which is stated by Dr. Smith to have "apparently lost nothing of its animal or mineral constituents."

7. RANGIFER TARANDUS (*Linnaeus*).

Rein-Deer.

As in the case of the Elk, we are indebted to Dr. J. A. Smith for a careful study of the history of the Rein-Deer as a Scottish species (*P. Soc. Antiq. Scotland*, viii., pp. 186-222), and I must refer the reader to his excellent paper for full details of the discovery of its remains in Orkney, Caithness, Sutherland, Ross, West Lothian,

Lanark, Dumbarton, Ayr, and Dumfriesshire. These have been found both under the boulder-clay and in comparatively recent deposits, and in Caithness and Sutherland they are associated with human remains in the ruined "Brochs." Attention was long ago directed by Fleming (*Brit. An.*, p. 27) to a passage in Torfaeus in which he states that the Jarls of Orkney of the 12th century were in the habit of passing over to Caithness to chase the Roe and Rein-Deer (*Rer. Orcad. Hist.*, lib. i., cap. xxxvi.). The source from which Torfaeus copied was undoubtedly the "Orkneyinga Saga," and the original passage in Jonas Jonaeus' *editio princeps* (Hafniae, 1780, p. 384) is as follows:—

"Thar var sithr Jarla naer hvert sumar at far: yfer á Katanes oc thar upp á merkr at veida rauddyri edr hreína."

This Jonaeus renders—

"Solebant Comites quavis fere aestate in Katanesum transire ibique in desertis feras rubras & rangiferos venari."

In the English edition of Jon A. Hjaltalin and G. Goudie (Edinburgh, 1873, p. 182) the words are translated—

"Every summer the Earls were wont to go over to Caithness and up into the forests to hunt the red-deer or the rein-deer."

Through the kindness of Professor Newton I have obtained the opinion of the celebrated Icelandic scholar Mr. Eiríkr Magnusson, of Cambridge, who informs me that neither version is quite correct as regards the latter words. The literal translation is—

"It was the custom for the Earls (Rögnvald and Harald) nearly every summer to go over into Caithness and then up into the woods to hunt red-deer or reins."

Mr. Magnusson further observes that the word *edr* has two meanings, equivalent to the Latin *sive* and *vel*, and he therefore considers it uncertain whether the proper reading is that they went to hunt *either* Red-Deer or Rein-Deer, or whether, as appears to him more likely, the Sagaman was under the impression that *rauddyr* and *hreín* were synonymous terms.

It will thus be seen that the evidence of the "Orkneyinga Saga" as to the survival of Rein-Deer in Scotland till the 12th century is much less positive than has been generally represented. On the other hand, it receives a certain amount of confirmation from the fact already noticed, that remains of the animals have been found in the ruined "Brochs" of the northern counties, and also from a rude figure on a sculptured stone, copied by Dr. Smith, which certainly appears to be intended to represent a Rein-Deer. This

stone, which was found near Grantown, Inverness-shire, is now in the Museum of the Society of Antiquaries at Edinburgh, and both the general pose and the development of the antlers seem to preclude the possibility of its being intended to represent a Stag.

8. MEGACEROS GIGANTEUS (*Blumenbach*).

Gigantic Irish Deer.

Remains of the true Elk appear to have been frequently mistaken for those of this species, and Dr. J. A. Smith has only been able to find two authenticated instances of the occurrence of remains of the Gigantic Deer in Scotland—namely, a skull, found at Maybole, Ayrshire, in marl, and two portions of antlers at Crofthead, Renfrewshire, in laminated clay, which probably date from the glacial epoch. In both cases the remains were associated with those of *Bos primigenius*, and in the latter (which are preserved in the Hunterian Museum of the University of Glasgow) with *Equus caballus* (*P. S. Antiq. Scotland*, ix., pp. 345-350). The evidence which has been brought forward as to the survival of the Gigantic Deer in historical times appears to be quite untrustworthy (*cf. Scoular, J. Geol. Soc. Dublin*, i., 197-209).

Family: BOVIDAE.

9. BOS PRIMIGENIUS, *Bojanus*.

Gigantic Fossil Ox, or Urus.

As in the case of the Deer, the history of the discovery in Scotland of remains of Fossil Oxen has been carefully reviewed by Dr. J. A. Smith (*P. S. Antiq. Scotland*, ix. pp. 587-674), who has collected records of the occurrence of bones of the present species in Orkney, Caithness, Sutherland, Aberdeen, Perth, Fife, Lanark, Renfrew, Ayr, Kirkcudbright, Dumfries, Berwick, Roxburgh, and Selkirkshire. Almost all these remains have been found in deposits of comparatively recent date, those in Orkney and Caithness-shire being discovered in the ruins of early human habitations, while skulls found in marl-beds in Selkirkshire were associated with bronze weapons. There is no authentic evidence, however, that the Urus survived in these islands to historical times, for the records of Boethius and other mediaeval chroniclers of gigantic Wild Oxen existing in Scotland up to the 16th century appear to be quite untrustworthy, and the claim that has been set up for the

park breed of White Cattle as being their direct descendants is quite unsupported by what little we know of their history (*cf. supra*, p. 25).

10. *BOS LONGIFRONS*, *Owen*.

Smaller Fossil Ox.

In the paper referred to under the last species, Dr. J. A. Smith has shown that remains of the Smaller Fossil Ox have been found in the Hebrides and Orkney, as well as in Caithness, Sutherland, Ross, Forfar, Kincardine, Stirling, Lanark, East, West, and Mid Lothian, Wigtown, Kirkcudbright, and Roxburghshire. They are often associated with remains of human industry, and may in some cases have belonged to domesticated animals. In geological age there appears to be now no doubt that this species is even more recent than the last, and all the evidence seems to point to its being the ancestor of the short-horned races of our domestic Cattle.

ORDER V.: GLIRES.

Family: CASTORIDAE.

11. *CASTOR FIBER*, *Linnaeus*.

Beaver.

Gael., Losleathan, Dobhran-losleathan (*lit.*, broad-tail, broad-tailed otter; *cf.* Welsh *Llodyddan*; Irish, *Davaran-loisleathan*); Beathodach (from Old Gael. *beathra*, water).

The palaeontological and traditionary evidence of the existence of the Beaver in Scotland has been investigated by Neill (*Edin. Phil. Journ.*, I., pp. 177-187), and by Dr. C. Wilson (*New Phil. Journ.*, 2nd Ser., VIII., pp. 1-40). The first recorded sub-fossil skull was one from Perthshire, presented by Dr. Farquharson to the Scottish Society of Antiquaries in 1788; others have been since found in Roxburghshire and Berwickshire. Of its range into the historical period the evidence is not very satisfactory. In the 12th century, Giraldus de Barri, who met with Beavers in Wales, was informed that they still existed in one river in Scotland, but were rare (*Itiner. Cambr.*, lib. ii., cap. 3). In a capitular of export duties of David I. (1124-1153), skins of *Beveris* are included (*Acts Parl. Scotl.*, I., p. 303); but they are not mentioned in a similar act of

1424. The late Prof. Cosmo Innes, however, pointed out to me that too much trust must not be given to these documents, as the lists of commodities appear in some cases to have been adopted from similar English or foreign enactments. Boethius includes *Fibri* among the wild animals which were found round Loch Ness "*incomparabile numero*" (*Regn. Sc. Desc.*, 1527, fol. ix.), and Bellenden follows him, but, as usual, little or no reliance can be placed in his testimony, which was probably founded on hearsay. Traditions of the "Broad-tailed Otter" survive in many parts of the Highlands, and the animal is said once to have been plentiful in Lochaber (*Neill, l.c.*); but it was probably extinct long before the time of Boethius.

CONCLUSION.

In bringing this article to an end, I would wish to point out to Scottish field-naturalists that the distribution of Mammalian life requires revision, especially in the Islands. The Shrews, Mice, and Voles especially deserve attention, as does the supposed occurrence of the Greenland and Ringed Seals in Scottish waters. More accurate records of the visits of the rarer Cetaceans are much to be desired, and the gradual extension of range of some of the terrestrial Mammals, as the Hedgehog, Mole, Squirrel, and Roe-Deer, deserve careful investigation. Till further information has been collected on these points our knowledge of our native Mammals cannot be considered satisfactory.

Finally, I desire to express my special thanks to my friend, Mr. J. B. Murdoch, of Langside, for his kind assistance in seeing the foregoing pages through the press.

THE
FAUNA OF SCOTLAND;

WITH SPECIAL REFERENCE TO

CLYDESDALE

AND THE

WESTERN DISTRICT.

FRESH AND BRACKISH-WATER OSTRACODA.

BY

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GLASGOW :

PUBLISHED BY THE NATURAL HISTORY SOCIETY OF GLASGOW,
AT THEIR ROOMS IN ANDERSON'S COLLEGE.

1880.

THE FAUNA OF SCOTLAND,

WITH SPECIAL REFERENCE TO CLYDESDALE AND THE WESTERN DISTRICT.

FRESH AND BRACKISH-WATER OSTRACODA.

INTRODUCTION.

IN undertaking the preparation of a Catalogue of the Fresh and Brackish-water Ostracoda, chiefly of the West of Scotland, I have had great misgivings whether at the present time it could be brought to a satisfactory issue. I have to express my thanks to Dr. G. S. Brady for his valuable assistance in all cases of doubtful species. I may mention that the new species in this Catalogue will be described and figured in a joint Paper by Dr. G. S. Brady and myself.

To approach exhaustiveness, even in the most distant way, the various localities would not only have to be visited once, but several times in the year, as different species appear at different seasons. My opportunities have not allowed me to visit as many localities, nor these so frequently, as I could have wished, in the West of Scotland, and still fewer in the East; the list can therefore only be regarded as a record chiefly of characteristic species of the localities which have come under my observation.

The Fresh and Brackish-water Ostracoda, it is to be remembered, form but a small section of the Entomostraca, and the species will necessarily be fewer when confined to a limited area. The catalogue was at first intended to comprise gatherings only from the West of Scotland, but, on further consideration, it was thought advisable not to limit the boundary strictly to any one part of the country, as the more widely apart they are, the better will the districts show the various aspects of distribution.

One point in regard to distribution may be noticed, viz., there appears to be a greater dissimilarity of species between the east and west coasts of Scotland than between England and Scotland. In

the neighbourhood of Edinburgh *Cypris gibba* is plentiful, sometimes gregarious almost to the exclusion of all others, whereas, on the west coast, it has been my experience to find that species but sparingly distributed.

Goniocypris mitra and *Cypris punctillata* are common to the east of Scotland and the fen districts of England, but are not yet recorded in the West of Scotland. Still, it is true that, on a comparison of localities one with another, so far as the results have been brought out, there is less difference existing between stations widely apart than might have been expected. The means of distribution do not seem to depend so much on the facilities of transport as on the conditions of locality. Ostracoda may be abundant in ditches and absent in the lochs and tarns that receive their waters. Examples of this are so common that they must be familiar to every one who has paid any attention to the subject.

The Ostracoda in this list, which may be considered to belong exclusively to brackish water, but never by choice to be purely marine, are *Cypris salina*, *Cypridopsis aculeata*, *Cytheridea torosa*, and its variety *teres*. The latter species and variety, although more estuarine, may be placed in the same category. *Cypris incongruens* and *Cypridopsis obesa* are frequently found in brackish water, but as frequently in purely fresh water. Many other species are occasionally met with in water more or less brackish, as in ponds a little above high-water mark, subject to the spray of the sea during high tides and storms, but chiefly in fresh water quite beyond the reach of marine influences. A group of small ponds lying close together along the south-west shore of the island of Cumbrae, and apparently subject to an equal amount of spray, may here be referred to. These ponds are mostly within a few yards of each other, and seem to be exposed to similar conditions, yet their microscopic fauna are found, when compared, to differ widely. A list of Ostracoda found in ten of these sub-brackish patches of water will best show the great number of reputed fresh-water species associated with those which constantly affect brackish water, and also the diversity in the numbers and grouping of species existing between one pond and another. This mixture of fresh and brackish-water species is all the more remarkable, as none of these ponds communicate with the others, nor with any fresh-water stream. All of them, as stated, are within a short distance of each other, only a little above high-water mark, and subject to the spray of the sea. The effect of this

spray in transporting saline matter is well known, to the discomfort of the inhabitants of the cottages along the shore, the salt obscuring their windows after every storm.

All the gatherings were purposely taken for comparison on the same day, 15th October, 1878, so that they should all be alike so far as regards weather conditions and season of the year. Seeing that the same species are often found widely apart, there can be no doubt that there are ample means of transport to distant localities afforded to these minute organisms—much more, we should think, to those of closer proximity. It appears that some other condition than the saline element is necessary for the presence of one of our most characteristic brackish-water species—viz., *Cypridopsis aculeata*—as only in three of these ponds do we find it. *Cypris salina*, another characteristic brackish-water species, has not been found here, but is met with in other similarly situated ponds on the island. Among the above-mentioned sub-brackish pools we find the following undoubted fresh-water species:—

<i>Cypris compressa</i> ,	in 9 of the ponds,	more or less common.
„ <i>granulosa</i> , sp. nov,	in 1 of the ponds,	moderately common.
„ <i>tesselata</i> ,	in 5 of the ponds,	more or less common.
„ <i>lavis</i> ,	in all „	more or less common.
	and in 1 „	exceedingly abundant.
„ <i>orum</i> ,	in 1 „	moderately common.
„ <i>gibba</i> ,	in 1 „	rare.
„ <i>incongruens</i> ,	in 2 „	moderately rare.
„ <i>obliqua</i> ,	in 5 „	more or less common.
<i>Cypridopsis villosa</i> ,	in 2 „	moderately rare.
<i>Condonia albicans</i> ,	in 3 „	moderately rare.
„ <i>detecta</i> ,	in 5 „	moderately common.
„ <i>candida</i> ,	in 3 „	moderately common.
„ <i>Kingsleii</i> ,	in 3 „	moderately rare.
<i>Notodromas monachus</i> ,	in 3 „	moderately common.
<i>Limnocythere inopinata</i> ;	in 1 „	rare.

Others might be added from other brackish localities—amongst them *Cypridopsis vidua*, *Cypris fusca*, and *Cypris reptans*. From the circumstance that these species are uniformly inhabitants of inland fresh water, although occasionally found in brackish water, we cannot call them “brackish” species, and scarcely even “sub-

brackish" species; but that they can accommodate themselves to either habitat there can be no doubt.

We thus see that, independently of the saline element, some ponds are more favourable to certain species of Ostracoda than others, and we may reasonably assume that different species are in some degree influenced by the different growths of the vegetation of the ponds during the season. This holds true in regard to other orders of the Microzoa. And it is a fact, howsoever we may explain it, that scarcely any two of these ponds are alike in the vegetation which they support, so that the causes of difference between them, whatever it may be, influences the plant as well as the animal life.

These observations require to be followed out over a more extended area, and a larger accumulation of facts obtained before any satisfactory conclusions can be arrived at. Hitherto there has been but little done in this department of Natural History in Scotland, and few to lead or assist. For these reasons it has been in a great measure overlooked, and other branches of a more popular kind preferred.

It may be useful to refer to a few of the places which have yielded the best results both in variety and abundance of species of Ostracoda, as it frequently happens, when information is derived only from maps, or from persons unacquainted with this class of organisms, that the collector is left wholly uncertain as to the suitability of a locality for his pursuit. Many fine sheets of water are quite barren of Ostracoda, or nearly so, while, on the other hand, they are often abundant in places where such organisms might be least expected.

Govan Colliery Dam, a short distance east of Crosshill, Glasgow, may almost be mentioned as a thing of the past. There can be no doubt that, considering the demand for suburban ground for building purposes, this small patch of water, so accessible from the city, and which has yielded for years many fine gatherings of various species of Ostracoda, will shortly be filled up and disappear. It has yielded the following species:—

<i>Cypris gibba</i> ,	-	-	-	Ramdohr.
———— <i>lævis</i> ,	-	-	-	Müller.
———— <i>compressa</i> ,	-	-	-	Baird.
———— <i>virens</i> ,	-	-	-	Jurine.
———— <i>reptans</i> ,	-	-	-	Baird.

<i>Cypridopsis obesa</i> ,	-	-	Brady & Robertson.
<i>Candona candida</i> ,	-	-	Müller.
———— <i>nitens</i> ,	-	-	Sp. nov.
———— <i>compressa</i> ,	-	-	Koch.
———— <i>detecta</i> ,	-	-	Müller.
———— <i>albicans</i> ,	-	-	Brady.
———— <i>similis</i> ,	-	-	Baird.
<i>Limnocythere inopinata</i> ,	-	-	Baird.

Hairmyres, two miles west of East Kilbride, is an old limestone quarry, in disuse for upwards of twenty years, and mostly grown over with moss and varied species of pondweed. Amongst this pondweed Ostracoda are moderately plentiful. Some parts are very ochreous, yet there the Ostracoda are not uncommon and in fine condition. The following species are generally met with:—

<i>Cypris fusca</i> ,	-	-	-	Straus.
———— <i>compressa</i> ,	-	-	-	Baird.
———— <i>striolata</i> ,	-	-	-	Brady.
———— <i>granulosa</i> ,	-	-	-	Sp. nov.
———— <i>lævis</i> ,	-	-	-	Müller.
———— <i>tessellata</i> ,	-	-	-	Fischer.
<i>Candona compressa</i> ,	-	-	-	Koch.
———— <i>albicans</i> ,	-	-	-	Brady.
———— <i>candida</i> ,	-	-	-	Müller.
———— <i>diaphana</i> ,	-	-	-	B. & R.
———— <i>hyalina</i> ,	-	-	-	B. & R.
———— <i>Kingsleii</i> (male),	-	-	-	B. & R.

Possil Marsh, or *Loch*, about three miles north of Glasgow, is of considerable extent, with both hard and swampy margins, and mostly well grown up with vegetation, though at the same time there is a large portion of clear water. At the north end a number of weedy, stagnant ditches are connected with the loch, and far exceed it in richness and variety of Ostracoda. This is one of those places where, when judging from appearance, we expect much but get little. The following species are from the marsh and ditches:—

<i>Cypris fusca</i> ,	-	-	-	Straus.
———— <i>tessellata</i> ,	-	-	-	Fischer.
———— <i>lævis</i> ,	-	-	-	Müller.

<i>Cypris striolata</i> ,	-	-	Brady.
———— <i>compressa</i> ,	-	-	Baird.
———— <i>reptans</i> ,	-	-	Baird.
<i>Cypridopsis vidua</i> ,	-	-	Müller.
———— <i>obesa</i> ,	-	-	B. & R.
<i>Notodromas monachus</i> ,	-	-	Müller.
<i>Candona candida</i> ,	-	-	Müller.
———— <i>detecta</i> ,	-	-	Müller.
———— <i>similis</i> ,	-	-	Baird.
———— <i>diaphana</i> ,	-	-	B. & R.
———— <i>Kingsleii</i> ,	-	-	B. & R.

Frankfield Loch, about four and a half miles east of Glasgow. No place could have a more promising appearance for Ostracoda. It covers about seven or eight acres, nowhere deep, and in most places it can be waded in. There is an abundance of marsh plants growing all over it, and the margins are grassy, with many ditches filled with vegetation, which harbour a fair proportion of Ostracoda and other Microzoa.

<i>Cypris fusca</i> ,	-	-	Straus.
———— <i>reptans</i> ,	-	-	Baird.
———— <i>virens</i> ,	-	-	Jurine.
———— <i>tessellata</i> ,	-	-	Fischer.
———— <i>levis</i> ,	-	-	Müller.
———— <i>compressa</i> ,	-	-	Baird.
———— <i>granulosa</i> ,	-	-	Sp. nov.
<i>Cypridopsis vidua</i> ,	-	-	Müller.
———— <i>villosa</i> ,	-	-	Jurine.
<i>Candona detecta</i> ,	-	-	Müller.
———— <i>candida</i> ,	-	-	Müller.
———— <i>nitens</i> ,	-	-	Sp. nov.
———— <i>compressa</i> ,	-	-	Koch.
———— <i>Kingsleii</i> ,	-	-	B. & R.
———— <i>albicans</i> ,	-	-	Brady.

Woodend Loch, about three-quarters of a mile to the south of Gartcosh Station, on the Caledonian Railway, and seven miles east of Glasgow. This loch is nearly half a mile long, and about a quarter of a mile broad; the margins on the north-western side are flat and shallow, and overgrown with vegetation, chiefly grass; and this is, perhaps, the best side for the capture of Ostracoda.

The following species were taken, 5th June, 1878:—

<i>Cypris fusca</i> ,	-	-	-	Straus.
———— <i>striolata</i> ,	-	-	-	Brady.
———— <i>compressa</i> ,	-	-	-	Baird.
———— <i>ovum</i> ,	-	-	-	Jurine.
———— <i>lævis</i> ,	-	-	-	Jurine.
———— <i>tumefacta</i> ,	-	-	-	B. & R.
———— <i>reptans</i> ,	-	-	-	Baird.
<i>Cypridopsis vidua</i> ,	-	-	-	Müller.
<i>Candona albicans</i> ,	-	-	-	Brady.
———— <i>detecta</i> ,	-	-	-	Müller.
———— <i>nitens</i> ,	-	-	-	Sp. nov.
———— <i>compressa</i> ,	-	-	-	Koch.
———— <i>Kingsleii</i> ,	-	-	-	B. & R.
———— <i>similis</i> ,	-	-	-	Baird.

Johnston Loch, about 7 miles east of Glasgow, and a little to the north of Gartcosh Railway Station, is of a quadrangular form, and about a quarter of a mile each way. The greater part of the margin is covered with weed, and not very deep, and the bottom is hard for a considerable distance from the shore, affording good footing. No place could be more convenient for collecting Microzoa. *Daphniadæ* are in great abundance; *Hydrachna* and *Lynceidæ* are common. The species taken 3rd June, 1878, were—

<i>Cypris fusca</i> ,	-	-	-	Straus.
———— <i>tessellata</i> ,	-	-	-	Fischer.
———— <i>compressa</i> ,	-	-	-	Baird.
———— <i>striolata</i> ,	-	-	-	Brady.
———— <i>lævis</i> ,	-	-	-	Müller.
———— <i>reptans</i> ,	-	-	-	Baird.
<i>Cypridopsis vidua</i> ,	-	-	-	Müller.
<i>Notodromas monachus</i> ,	-	-	-	Müller.
<i>Candona candida</i> ,	-	-	-	Müller.
———— <i>nitens</i> ,	-	-	-	Sp. nov.
———— <i>detecta</i> ,	-	-	-	Müller.
———— <i>Kingsleii</i> ,	-	-	-	B. & R.
<i>Limnocythere inopinata</i> ,	-	-	-	Baird.

Bishop Loch is about 7 miles east of Glasgow, near Gartcosh Station, and is nearly a mile in length by a quarter of a mile in

breadth. A great part of the margin is covered with tall grass and other aquatic vegetation. The Ostracoda found in it are—

<i>Cypris fusca</i> ,	-	-	-	Straus.
———— <i>tumefacta</i> ,	-	-	-	B. & R.
———— <i>lævis</i> ,	-	-	-	Müller.
———— <i>compressa</i> ,	-	-	-	Baird.
———— <i>striolata</i> ,	-	-	-	Brady.
<i>Cypridopsis vidua</i> ,	-	-	-	Müller.
<i>Candona candida</i> ,	-	-	-	Müller.
———— <i>detecta</i> ,	-	-	-	Müller.
———— <i>nitens</i> ,	-	-	-	Sp. nov.
———— <i>compressa</i> ,	-	-	-	Koch.
———— <i>Kingsleii</i> ,	-	-	-	B. & R.
———— <i>diaphana</i> ,	-	-	-	B. & R.
<i>Limnocythere inopinata</i> ,	-	-	-	Baird.
———— <i>Sancti-Patricii</i> ,	-	-	-	B. & R.

The last two were got in a ditch close by the Loch.

Antermoney Loch is 10 miles north-east of Glasgow, about a mile east of Miltown Station. It covers about 33 acres, and at its greatest depth is 20 feet. It shallows towards the sides, which are mostly hard and gravelly, but a large portion is swampy and grown over with tall grass. At different times of the year there are different crops of vegetation.

A day or two before my visit, heavy rains having fallen, the loch was much above its usual height, and, as it had been extremely dry some weeks before, it seemed very unfavourable for a successful take of Ostracoda, and so it turned out. One species only was very abundant—*Cypris tessellata*—but almost all young, and at this stage they were all coarsely marked. Although this gathering was rather poor, I have no doubt, from the appearance of the place, that if trials were made at favourable times good gatherings would be obtained. 4th November, 1878—

<i>Cypris reptans</i> ,	-	-	-	Baird.
———— <i>tessellata</i> ,	-	-	-	Fischer.
———— <i>lævis</i> ,	-	-	-	Müller.
———— <i>compressa</i> ,	-	-	-	Baird.
<i>Cypridopsis vidua</i> ,	-	-	-	Müller.
<i>Candona albicans</i> ,	-	-	-	Brady.

<i>Candona detecta</i> ,	-	-	-	Müller.
———— <i>candida</i> ,	-	-	-	Müller.
<i>Limnocythere inopinata</i> ,	-	-	-	Baird.

Duddingston Loch, Edinburgh.—This loch is an irregular oval about three-quarters of a mile in length and about half as broad. The greater part of the margins are well covered with vegetation, and although soft and swampy at both ends, there is ample extent of hard borders both on the north and south sides to work from without inconvenience. The Ostracoda are rather above the average in number of species, including a few of rare occurrence. This abundance is all the more remarkable as the loch is well stocked with fish and frequented by swans, neither of which are considered favourable to the increase of Ostracoda. The species obtained are—

<i>Cypris virens</i> ,	-	-	-	Jurine.
———— <i>lævis</i> and var.,	-	-	-	Müller.
———— <i>compressa</i> ,	-	-	-	Baird.
———— <i>ovum</i> ,	-	-	-	Jurine.
———— <i>punctillata</i> ,	-	-	-	Norman.
———— <i>gibba</i> ,	-	-	-	Ramdohr.
———— <i>reptans</i> ,	-	-	-	Baird.
<i>Cypridopsis obesa</i> ,	-	-	-	B. & R.
———— <i>vidua</i> ,	-	-	-	Müller.
———— <i>villosa</i> ,	-	-	-	Jurine.
<i>Candona candida</i> ,	-	-	-	Müller.
———— <i>lactea</i> ,	-	-	-	Baird.
———— <i>detecta</i> ,	-	-	-	Müller.
———— <i>compressa</i> ,	-	-	-	Koch.
———— <i>albicans</i> ,	-	-	-	Brady.
———— <i>similis</i> ,	-	-	-	Baird.
———— <i>diaphana</i> ,	-	-	-	B. & R.
———— <i>Kingslevi</i> ,	-	-	-	B. & R.

Lochmaben, Dumfriesshire.—There are a number of lochs in this neighbourhood of easy access, and during a day's stay I had a few hauls in six of them. Mill Loch is close to the burgh, and is of considerable depth. It contains the far-famed "Vendace," which Sir William Jardine considered to be closely allied to the *Salmo albulæ* of Linné. The west end of the Loch is the most favourable for Ostracoda collecting, being shallow and weedy. The Year

Loch is a little to the west, and has a good flat weedy margin on the south side, rich in Microzoa. Still a little further westward is what is called the "Blind" or "Spectacle Loch." It is rather deep round the edges, and overgrown with water-lilies; and I am much inclined to support Dr. Brady's opinion, that where lilies are plentiful Ostracoda are scarce. On the eastern side, close to the village, we have "Kirk Loch," said to cover 50 acres. It did not seem to promise well on the side we were on, and only a few trials were made, which did not yield much. A little to the east is "Castle Loch," which is of considerable extent, being said to be three miles in circumference, and to cover above 150 acres. Like other large lochs, the margins are too much dashed by the waves to favour the growth of weed suitable to harbour Ostracoda. At some little distance to the north east is "Broom-hill Loch," or, as it is called by some, "Loch Broom." This is also a large loch, but, unlike some of the others, has a great extent of low weedy margin favourable to the growth of Ostracoda. Amongst the gatherings from this loch were *Cypris cinerea* and *Darwinella Stevenstoni*, new to Scotland. The following were obtained from the six lochs on 16th July, 1879:—

<i>Cypris fusca</i> ,	-	-	-	-	-	Straus.
—— <i>virens</i> ,	-	-	-	-	-	Jurine.
—— <i>tumifacta</i> ,	-	-	-	-	-	B. & R.
—— <i>laevis</i> ,	-	-	-	-	-	Müller.
—— <i>striolata</i> ,	-	-	-	-	-	Brady.
—— <i>ovum</i> ,	-	-	-	-	-	Jurine.
—— <i>compressa</i> ,	-	-	-	-	-	Baird.
—— <i>granulosa</i> ,	-	-	-	-	-	Sp. nov.
—— <i>cinerea</i> ,	-	-	-	-	-	Brady.
—— <i>reptans</i> ,	-	-	-	-	-	Baird.
<i>Cypridopsis vidua</i> ,	-	-	-	-	-	Müller.
—— <i>villosa</i> ,	-	-	-	-	-	Jurine.
<i>Notodromas monachus</i> ,	-	-	-	-	-	Müller.
<i>Potamocypris fulva</i> ,	-	-	-	-	-	Brady.
<i>Candona candida</i> ,	-	-	-	-	-	Müller.
—— <i>detecta</i> ,	-	-	-	-	-	Müller.
—— <i>albicans</i> ,	-	-	-	-	-	Brady.
—— <i>compressa</i> ,	-	-	-	-	-	Koch.
—— <i>Kingslei</i> ,	-	-	-	-	-	B. & R.

<i>Candona euplectella</i> ,	-	-	-	Sp. nov.
<i>Darwinella Stevensoni</i> ,	-	-	-	B. & R.
<i>Cytheridea lacustris</i> ,	-	-	-	G. O. Sars.

Callum's Tarn.—This is on the south-east end of Bute, about a quarter of a mile northward of Callum's Bay, on the eastern side of Callum Glen, 380 feet or so above the sea-level. The tarn is about 200 yards long, and 50 broad, and is well filled with vegetation. The greater part of the eastern side is firm turf, the two ends and western side are softer, but can be worked with little difficulty, and are the richest in Ostracoda. There are three other smaller tarns on the same ridge towards the south, and another, a short distance from the first, towards the north. These I have found of little consequence—still they are worth a trial, for different seasons gave different results, as below:—

9th August, 1879.

<i>Cypris lævis</i> ,	-	-	-	Müller.
— <i>compressa</i> ,	-	-	-	Baird.
— <i>striolata</i> ,	-	-	-	Brady.
— <i>obliqua</i> ,	-	-	-	Brady.
— <i>tessellata</i> ,	-	-	-	Fischer.
— <i>reptans</i> ,	-	-	-	Baird.
<i>Cypridopsis villosa</i> ,	-	-	-	Jurine.
<i>Notodromas monachus</i> ,	-	-	-	Müller.
<i>Candona candida</i> ,	-	-	-	Müller.
— <i>detecta</i> ,	-	-	-	Müller.
— <i>euplectella</i> ,	-	-	-	Sp. nov.
<i>Limnocythere inopinata</i> ,	-	-	-	Baird.

2nd November, 1878.

<i>Cypris lævis</i> ,	-	-	-	Müller.
— <i>granulosa</i> ,	-	-	-	Sp. nov.
— <i>striolata</i> ,	-	-	-	Brady.
— <i>obliqua</i> ,	-	-	-	Brady.
— <i>tessellata</i> ,	-	-	-	Fischer.
— <i>gibba</i> ,	-	-	-	Ramdohr.
— <i>virens</i> ,	-	-	-	Jurine.
<i>Cypridopsis villosa</i> ,	-	-	-	Jurine.
<i>Candona candida</i> ,	-	-	-	Müller.
— <i>detecta</i> ,	-	-	-	Müller.
— <i>euplectella</i> ,	-	-	-	Sp. nov.
— <i>albicans</i> ,	-	-	-	Brady.
— <i>compressa</i> ,	-	-	-	Baird.
— <i>Kingsleii</i> ,	-	-	-	B. & R.
— <i>diaphana</i> ,	-	-	-	B. & R.

Craigengower Tarn, on the hill-side, south of Craigengower farm, Cumbrae. This patch of water may be about 30 yards long, by about 15 broad. It is well covered with vegetation. The tarn is tolerably firm round the margins, and may be 2 or 3 feet deep towards the middle. Spiders and beetles are in abundance, and at all times it may be calculated upon to yield a gathering of Ostracoda of more or less interest, such as—

<i>Cypris striolata</i> ,	-	-	-	-	Brady.
— <i>lævis</i> ,	-	-	-	-	Müller.
— <i>obliqua</i> ,	-	-	-	-	Brady.
— <i>reptans</i> ,	-	-	-	-	Baird.



<i>Cypridopsis villosa</i> ,	-	-	-	Jurine.
<i>Notodromas monachus</i> ,	-	-	-	Müller.
<i>Candona candida</i> ,	-	-	-	Müller.
——— <i>detecta</i> ,	-	-	-	Müller.
——— <i>hyalina</i> ,	-	-	-	B. & R.
——— <i>Kingslei</i> ,	-	-	-	B. & R.
——— <i>similis</i> ,	-	-	-	Baird.

Lewis and Skye.—These islands, so far as can be judged from a brief excursion, are far from being good hunting ground for fresh-water Ostracoda. Although lochs and tarns are in abundance they are mostly in peat, which, from its acidulous properties, does not favour the development of those animals possessing a calcareous covering. Besides, there is a great sameness in the character of the lochs, the product of one being nearly like that of a dozen others, and it is only now and again that we happen to find one of a different mineral character. It is chiefly to the flat ochreous marshes and roadside ditches that we owe our best results.

LEWIS.

<i>Cypris levis</i> ,	- - -	Müller.
—— <i>compressa</i> ,	-	Baird.
—— <i>granulosa</i> ,	-	Sp. nov.
—— <i>virens</i> ,	- - -	Jurine.
—— <i>salina</i> ,	- - -	Brady.
<i>Cypridopsis villosa</i> ,	-	Jurine.
<i>Potamocypris fulva</i> ,	-	Brady.
<i>Candona candida</i> ,	-	Müller.
——— <i>detecta</i> ,	- -	Müller.
——— <i>Kingslei</i> ,	-	B. & R.
<i>Cytheridea torosa</i> ,	-	Jones.

SKYE.

<i>Cypris ornata</i> ,	- -	Müller.
—— <i>reptans</i> ,	- -	Baird.
—— <i>levis</i> ,	- - -	Müller.
—— <i>compressa</i> ,	-	Baird.
—— <i>gibba</i> ,	- - -	Ramdohr.
—— <i>obliqua</i> ,	- -	Brady.
<i>Cypridopsis villosa</i> ,	-	Jurine.
——— <i>aculeata</i> ,	-	Lilljeborg.
<i>Potamocypris fulva</i> ,	-	Brady.
<i>Candona</i> sp.?		
——— <i>detecta</i> ,	- -	Müller.
——— <i>candida</i> ,	-	Müller.
——— <i>Kingslei</i> ,	-	B. & R.

LIST OF SPECIES.

POTAMOCYPRIS FULVA, *Brady*.

- Bardia fulva*, Brady. *Monog. Recent Brit. Ost.*, p. 474, pl. xxviii., fig. 21.
 ———— Brady & Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv.,
 vol. iii., p. 365, pl. xviii., figs. 1-4.
Potamocypris fulva, Brady. *Nat. Hist. Trans. Northumberland and*
Durham, vol. iii., p. 365, pl. xiv., fig. 4.
 ———— Brady, Crosskey, and Robertson. *Monog. Post-ter.*
Entom., p. 130, pl. 1, figs. 20-24.

Rather rare—Garnock old water-course, Kilwinning (J. Smith); Montrose Basin; Scarpa Floe, Orkney (D. O. Drewit); Hillerhurst Old Quarry, Kilwinning; side of Glasgow and Paisley Canal; the islands of Lewis and Skye.

CYPRIS FUSCA, *Straus*.

Cypris fusca, Straus-Durekheim. *Mem. du Mus. d'Hist. Nat.*, vol. vii., p. 59.

———*pilosa*, (?) Müller. *Entomostraca*, p. 59, tab. vi., figs. 5-6.

———*oblonga*, Brady. *Ann. and Mag. Nat. Hist.* (1864), vol. xiii., p. 59, pl. iii., figs. 1-4; and *Trans. Tyneside Nat. Field Club*, vol. vi., p. 104, pl. ii., figs. 1-4.

Candona hispida, Baird, *Brit. Entom.*, p. 161, tab. xix., fig. 4.

Cypris fusca, Brady, *Mon. Rec. Brit. Ost.*, p. 362, pl. xxiii., figs. 10-15.

Not uncommon in ponds, lochs, and shallow ditches, all the year round. Common in Frankfield Loch, near Glasgow, and in brackish ponds in Cumbrae. In a ditch in a plantation about a mile from Bothwell, on the Bellshill Road, the species was found in great abundance, together with a few of a long variety. Common in the lochs of Lochmaben.

In confinement they are occasionally very active, swimming about, and sometimes coming up and resting on the side of the vessel. At other times, although plentiful in the gathering, scarcely one is seen till they have been a day or two in confinement.

CYPRIS INCONGRUENS, *Ramdohr*.

Cypris incongruens, Ramdohr, *Ueber die Gattung Cypris; der naturforsch.*

Freunde zu Berlin Magazin, 2 Jahrg., 1808,

p. 86. Lillj., *De Crust. ex ord. trib.*, p. 119.

Brady, *Mon. Rec. Brit. Ost.*, p. 362.

Cypris aurantia, Jurine. *Brit. Entom.*, p. 159, tab. xiv., fig. 13.

Monoculus aurantius, Jurine. *Hist. des Monocles*, p. 173.

——— *ruter*, Jurine. *Op. cit.*, p. 172.

Found not unfrequently on bottom mud of lochs and ponds; common in Lochend Loch and Gartcosh Loch, east of Glasgow; very abundant in a brackish lagoon on Hunterston shore, Ayrshire; moderately common in a greenhouse tank, Cumbrae; also in the bottom mud of a mill cooling pond, Paisley. Where the water issued into the pond, the temperature was 90° Fahr. and the surface water 80° Fahr., and they were found in the mud furthest from the heat. The only other Ostracod seen was *Cypridopsis vidua*, which was abundant at a grassy margin where the heat was 85°

Fahr., none being found in the cooler mud. On the other hand, none of *C. incongruens* were found at the margins in the greater heat with *C. vidua*. *C. incongruens* swims briskly through the water in confinement. When brought to the side with the brush, it shuts its valves and ceases to move, making no attempt to escape, and seldom resuming action for some time.

CYPRIS VIRENS, *Jurine*.

Cypris virens, Lillj. *De Crust. ex ord. trib.*, p. 117.

————— Brady. *Mon. Rec. Brit. Ost.*, p. 364.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Ent.*, p. 124.

Monoculus virens, Jurine. *Hist. de Monocles*, p. 174.

Cypris tristriata, Baird. *Brit. Entom.*, p. 152.

A common species in ponds and ditches, sometimes in ponds more or less brackish, above high-water mark. In confinement it swims with great briskness, yet it is easily brought to the side with a camel-hair pencil, and lies motionless for a time before resuming its activity. When left on the surface of the water it seems to have little power to go down again. When attempting to swim on the surface, it goes round and round in a very circumscribed circle, appearing at times as if turning on a pivot; yet when under water it makes frequent curves and deflections. It can swim in straight lines, but apparently not with the same speed. When swimming, all the feet, as well as the antennæ, appear to be in motion. The colour is generally green, but subject to much variation from that colour to greenish drab—in some cases banded or mottled with greenish black.

CYPRIS OBLIQUA, *Brady*.

Cypris obliqua, Brady. *Mon. Rec. Brit. Ost.*, p. 364.

Common in tarns and ponds. In great abundance in a tarn on the hill above Callum's Bay, south-east end of Bute; abundant and dark in colour in an old quarry hole, subject to the spray of the sea, Cumbræ; but when the gathering was taken, the water was nearly dried up, and the weed all in a state of decay. Common in a tarn on a hillside on Craigengower farm, and all bright green. In a gathering at Glen Helen, Isle of Man, the colour being a fine brown; Isle of Skye moderately common.

CYPRIS ORNATA, Müller.

Cypris ornata, Müller. *Zool. Dan. Prodrom.*, 2391. *Entom.*, p. 51. Lillj.,
De Crust. tab. x., figs. 19-22. Brady, *Nat. Hist. Trans.*
Northumberland and Durham, vol. iii., p. 364.
Monoculus ornatus, Jurine. *Hist. des Monocles*, p. 120.

Locally common. Abundant in a very small, shallow ditch, Cumbræ, in fine condition, all of a cream colour, with dashes of green and orange, March 18. Plentiful in a small patch of water at Thorntonhall, near Busby, April 12. In a ditch in a plantation near Bothwell, May 24. Little Loch, Ayrshire (J. Smith). In this loch the specimens were small, not young-like, but stunted, and unusually dark in colour. Isle of Skye, moderately common, Aug. 18. Burnside Loch, about a mile south-east of Rutherglen, common and in good condition, Nov. 22. The ground colour of this species varies considerably.

CYPRIS TUMEFACTA, Brady and Robertson.

Cypris tumefacta, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, s. 4.,
 vol. vi., pl. iv.

Moderately common, but rather local. Loch Goin and the Garnock old water-course, Eglinton Iron-works (J. Smith); Bishop and Woodend Lochs, moderately common; Blue Loch on ferruginous grassy margin, rare; common in ferruginous ditches beside Eddleston Water, at Railway Station, Peebles, 6th June; Mill Loch and Castle Loch, Lochmaben, more or less common, 16th July.

CYPRIS PUNCTILLATA, Norman.

Cypris punctillata, Norman. *Ann. and Mag. Nat. Hist.*, Jan., 1862, p. 43.
 Brady. *Mon. Rec. Brit. Ost.*, p. 365.
 ——— *cuneata*, Baird. *Proc. Zool. Soc. Lond.*, 1850, p. 255.

Found in Duddingston Loch, Edinburgh (Dr. Baird); since on several occasions in the same loch (D. R.); Linlithgow Loch in the month of September. Rather rare in Scotland, and smaller than the English specimens I have seen.

CYPRIS TESSELATA, Fischer.

Cypris tessellata, Fischer. *Mem. des Sar. Etrangers*, St. Petersburg, vol.
 vii., p. 159; Brady, *Mon. Rec. Brit. Ost.*, p. 366.
 ——— *affinis*, Lillj. *De Crust. ex ord. trib.*, p. 46; Brady, *Ann. and Mag.*
Nat. Hist., 1864, vol. xiii., p. 60.

Not uncommon. Moderately common in old sand quarry subject to the spray of the sea, Cumbrae. Common in Johnston Loch (June), and Mugdock Loch (October); Antermoney Loch (October), very common, but all immature. Dr. Brady says that it is his experience to find this species haunting small grassy pools where the water is considerably impregnated with organic matter.* This appears also to be the case, to some extent, on our side of the border; yet it is frequently met with in lochs of considerable extent.

CYPRIS SALINA, *Brady*.

Cypris salina, Brady. *Mon. Rec. Brit. Ost.*, p. 368.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 124.

———— *strigata*, Baird. *Brit. Entom.*, p. 157.

Not uncommon in brackish water. Common in a pond on the Hunterston shore, opposite Millport, subject to the spray of the sea. Moderately common in a pond at Ferry House, Cumbrae, now filled up, where the *confervæ* of the pond were washed up a foot or more by the waves of the sea during a storm at high tides. Yet, after the subsidence of the storm, this species, together with *Cypris aculeata*, was found to have kept its place, being still plentiful. This pond was very small, not covering more than two superficial poles, and must have been quite salt when covered by the sea; yet in the dry season of the year, being supplied by a drain, it must have been comparatively fresh. In brackish water, Lewis.

CYPRIS GIBBA, *Ramdohr*.

Cypris gibba, Ramdohr. *Mag. und Gesellch. naturforsch. Freunde zu Berlin*, ii., p. 91.

————— Jones. *Mon. Ent. Ter. Form.*, p. 15.

————— Brady. *Mon. Rec. Brit. Ost.*, p. 369.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 127.

? *Cytherina expansa*, Reur. *Haidinger's Abhandl.* Band iii., p. 60.

Not uncommon in fresh-water gatherings. Although a *Cypris*, its true habitat appears to be in the mud at the bottom. A gathering from a clay hole at Portobello, near Edinburgh, sent me by Mr. James Bennie, was crowded with this species. It is also common in Dunsapie Loch, Arthur's Seat, Edinburgh. This

* *Mon. Rec. Brit. Ost.*, p. 366.

species is of a cream-colour or a dirty white. In a ditch at Rowan Bridge, on the side of Glasgow and Paisley Canal, the greater number were greenish. In Govan Colliery Old Dam they had all a fine reddish tinge, as was also the case at Craiglockhart Curling Pond, near Edinburgh.

CYPRIS STRIOLATA, *Brady*.

Cypris striolata, Brady. *Ann. and Mag. Nat. Hist.*, 1864, vol. xiii., p. 60; and *Mon. Rec. Brit. Ost.*, p. 372.

Moderately common amongst muddy roots of vegetation and bottom mud. In Loch Libo and Johnstone Loch, rather common, but in poor condition. Common in an old ferruginous limestone quarry, Hairmyres. Abundant in an upper reach of a mill-dam at Cadder Wilderness, where the water does not all draw off; the bottom was all soft black mud with a little weed and confervæ, and many decaying leaves from overhanging trees; the water did little more than cover the mud, all having a very unclean aspect. Common on Upper Braid Farm Loch, near Edinburgh. In this patch of water the shells of many were so soft and flexible that they were more or less corrugated or dimpled. Very fine and well marked in Pendreich Dam, Bridge of Allan.

This species is closely allied to *Cypris compressa*, but rather larger, and generally of a darker purplish colour, and less shining. It is readily distinguished by the fine striæ on the shell, yet in some cases this is only seen under a good microscope. It comes still more closely to *Cypris granulata*, *sp. nov.*, which is smaller and paler in colour.

CYPRIS COMPRESSA, *Baird*.

Cypris compressa, Baird. *Brit. Entom.*, p. 154. Lillj. *de Crust.*, *ex. ord. trib.*, p. 112. Brady, *Mon. Rec. Brit. Ost.*, p. 372. Brady, Crosskey, and Robertson, *Mon. Post-ter. Ent.*, p. 123. ——— *punctata*, Zenker. *Anat.-Sys. Stud. über die Krebsthiere*, p. 77.

Frequent in ponds and ditches, and occasionally in brackish water; chiefly in the mud at the bottom, and sometimes under varied circumstances. Generally in pure water, but also where it is quite otherwise. In a gathering at the Port-Eglington Terminus, of the Glasgow and Paisley Canal, they were common where the water was covered with floating oil from the refuse of neighbouring factories, and the mud from which they were dredged was of the

most offensive character. At Oban, moderately common in brackish water in company with *Cypridopsis aculeata*. In Johnstone Loch. In an old limestone quarry where the water was very shallow. In an old dried-up dam, with only as much water as formed a soft mud. In Craigengower tarn, Cumbræ. In Blae Loch, near Lugton Station, and at Hairmyres old limestone quarry. When in confinement they swim through the water with great alertness. Like many of the same family, when touched with a hair pencil they withdraw within their shells, but not so readily as some of their allies do, for they make some attempt to escape. When left undisturbed they soon again resume their activity. This species, together with other smooth-shelled Ostracoda, when stirred up to the surface, float seemingly with little power to go down into the water again. Dr. Baird,* speaking of the Cypridæ, states that they seem to be "endued externally with a species of varnish to protect them from the action of the water, as whenever they rise to the surface the shell becomes perfectly dry, and floats there in spite of the animal's struggles to again immerse itself." This is true to a great extent when they are confined in a glass or earthenware vessel. A dozen of *Cypris compressa* were put on the surface in a wine glass on 8th March, and on 28th May, they were still on the surface and alive, although they had a weakly appearance. None had got to the side of the glass, although clustered together in small groups; when brought to the side of the vessel they were repelled from it, whereas inanimate chips of matter were drawn to it. On the other hand, they could readily take hold of any plant met with in the water, and in this way could readily regain immersion. They did not seem to come to the surface of their own accord, but apparently only when brought there under accidental circumstances.

CYPRIS GRANULATA, *sp. nov.*

Found in an old Limestone Quarry, Hairmyres, one and a half miles west of East Kilbride. April 15th.

In Frankfield Loch. May 1.

In Duddingston Loch. June 15.

An old furrow in pasture ground, Stobs, near Kilwinning, June 22.

**Nat. Hist. Brit. Entom.*, p. 144.

In Mugdock Loch, near Milngavie. Oct. 1.

In a brackish pond, No. 4, Cumbrae.

In Blae Loch. May 30.

In Lewis and Skye. July 31.

CYPRIS LÆVIS, Müller.

Cypris lævis, Müller. *Entom.*, p. 52. Brady. *Mon. Rec. Brit. Ost.*, p. 374.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Ent.*, p. 126.

———— *pantherina*, Fisher. *Ueber das genus Cypris*, p. 163.

———— *ovum*, Lillj. *De Crust.*, p. 113.

———— Jones. *Mon. Ter. Ent.*, p. 14.

Cypria ovum, Zenker. *Anat.-Sys. Stud.*, p. 70.

Common everywhere in summer and winter. Some years ago it was in great abundance in a hothouse tank containing the Victoria Lily in the Botanic Gardens, Glasgow. The creatures had perforated the broad leaves of the plant like a sieve, and had laid their eggs to the number of 3 to 4 in each perforation. The eggs were of a transparent greyish colour, and in their advanced stage showed the shell well formed. The heat of the water in the tank ranged about 70° Fahr. Also abundant in a gathering taken under the ice in a tarn on Craigengower Farm, Cumbrae, in the month of January.

No other species that I know of in this country is occasionally found in such numbers. In a roadside pond thickly matted with weeds, at Glen-Helen, Isle of Man, in a few minutes' gathering I had more than filled a half-ounce phial of this species alone, and a similar gathering was obtained in a tarn on the south-east end of Bute. Although these creatures may be found abundantly at one time, yet at another they may be comparatively rare in the same pond.

CYPRIS OVUM, Jurine.

Cypris ovum, Brady. *Mon. Rec. Brit. Ost.*, p. 373.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 155.

Monoculus ovum, Jurine. *Hist. des Monocles*, p. 179.

This species appears to be more common in England than in the west of Scotland. It is apt to be mistaken for *C. lævis*, but when looked at from above is seen to be more elliptical and less tumid. It is met with in lochs, ponds, and canals, moderately common; in a group of marsh ponds on the west side of Houston (Crosslees) Railway Station; and in Duddingston Loch, Edinburgh.

CYPRIS CINEREA, *Brady*.

Cypris cinerea, Brady. *Mon. Rec. Brit. Ost.*, p. 374.

Broomhill Loch, Lochmaben, moderately common, July 16 (D. R.).
Mickle Fell, Yorkshire, at an elevation of 2000 feet (Dr. Brady).
Lewis, at an elevation of 600 feet (D. R.).

CYPRIS REPTANS, *Baird*.

Cypris reptans, Lillj. *De Crust.*, p. 123.

————— Brady. *Mon. Rec. Brit. Ost.*, p. 370.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*,
p. 123.

Candona reptans, Baird. *Trans. Berw. Nat. Club*, i., p. 99; and *Brit. Entom.*,
p. 167.

————— Jones. *Mon. Ter. Entom.*, p. 16.

Moderately common amongst the roots of vegetation, and occasionally in the mud at the bottom, but apparently at no great depth. Excessively abundant in the month of May in the old dam that supplies the engine of the Govan Colliery. They were rather thin, and of a bright green colour, with very little of the usual clouding. The pond was covered at the time with old matted green *confervæ*.

CYPRIDOPSIS VIDUA, *Müller*.

Cypridopsis vidua. Brady. *Mon. Rec. Brit. Ost.*, p. 375.

Cypris vidua, Müll. *Entom.*, p. 55.

————— Baird. *Brit. Entom.*, p. 152.

————— Lillj. *De Crust. ex ord. trib.*, p. 111.

————— *sella*, Baird. *Brit. Entom.*, p. 158.

Monoculus vidua, Jurine. *Hist. de Monocles*, p. 175.

This well-marked species is common in lochs, tarns, and canals, but is rather local. It is not in any of my gatherings from either Lewis or Skye. Common in Glasgow and Paisley Canal; Loch Fad, Bute; Duddingston Loch, Edinburgh; Mill Loch, Lochmaben. In great abundance in a cooling pond at Mr. Barr's turning works, Paisley, the temperature of the water being 85° Fahr. In a jar that I had kept for ten days the water had acquired a strong offensive smell from plant and animal decomposition, yet this species seemed to all appearance in good health; the only other Entomostracan that had survived with it was *Cyclops quadricornis*. In confinement it makes little or no effort to escape when pursued,

allowing itself unresistingly to be pushed to the side with a hair pencil. The young, when viewed from above, are more compressed posteriorly than the adult; at this stage the dark bands are absent or nearly so.

CYPRIDOPSIS VILLOSA, *Jurine*.

Cypridopsis villosa, Brady. *Mon. Rec. Brit. Ost.*, p. 377.

Monoculus ———, Jurine. *Hist. des Monocles*, p. 178.

Cypris Westwoodii, Baird. *Brit. Entom.*, p. 156.

? *Cypris elongata*, Baird. *Brit. Entom.*, p. 156.

Found in a small creek of Lochlomond at Luss; in a small pond near Banff; in Frankfield Loch, near Glasgow; in Loch Libo, near Dalry; in Fullwood, Hairlaw, and Craiglaw Dams; in all moderately rare. Also in a number of the ponds along the shores of Cumbrae, subject to the spray of the sea. Moderately common in the Isles of Skye and Lewis. Common in lochs of Lochmaben. This species appears to be more a mud than a plant dweller. The young have few or no hairs on the carapace, and are much smaller, posteriorly, than the adult.

CYPRIDOPSIS ACULEATA, *Lillj.*

Cypridopsis aculeata, Brady. *Mon. Rec. Brit. Ost.*, p. 376.

Cypris aculeata, Lillj. *De Crust. ex ord. trib.*, p. 117.

————— Norman. *Ann. and Mag. Nat. Hist.*, 1862, vol. ix., p. 44.

Frequents water more or less brackish. It was abundant in a pool at Ferry House, Cumbrae, now filled up. This pond was just at the edge of high-water mark, and subject to the overflow of the sea during storms and high tides. Also in brackish pools along the shores of the south-west end of Cumbrae. Isle of Skye. When confined they cluster together on bits of floating algæ, appearing like batches of small mussels.

CYPRIDOPSIS OBESA, *Brady and Robertson*.

Cypridopsis obesa, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv., vol. iii., pl. xviii.; and vol. vi., p. 19.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 128.

Rather sparingly distributed in Scotch localities. Moderately rare in Lochend and Duddingston Lochs, Edinburgh; Lochlomond,

rare; moderately common in the old dam that supplied the water to the Govan Colliery, Glasgow; Loch Libo, rare.

CYPRIDOPSIS NEWTONI, *Brady and Robertson.*

Cypridopsis Newtoni, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv., vol. iv., p. 14.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 129.

Moderately common in Fullwood Dam.

Little Loch, and Pilmuir Dam. In a small pond a little above high water, Cumbrae, and in Hayton Dam, Peebles.

GONIOCYPRIS MITRA, *Brady and Robertson.*

Goniocypris mitra, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv., vol. vi., July, 1870, pl. xii.

So far as yet known this species has only been found in Scotland in Lochend Loch, Edinburgh. A parcel of mud which was sent me by Mr. James Bennie, contained some single valves of it. In hopes to procure living examples I made a further search, but failed to find any but dead shells. The loch at this time was being drained and filled up with rubbish from the town, which gives reason to suspect that the species had been killed by the poisonous nature of the refuse. The process of filling up has been abandoned, and the loch has been full of water for some time. I have tried for the same species since, but without finding a trace of it. That may arise, however, not from its extinction in the loch, but because the former gatherings were from mud in very low water, when the loch was partially drained, and the latter from the high margins when the loch was in flood. A boat and dredge may now be required to obtain it.

NOTODROMAS MONACHUS, *Müller.*

Notodromas monachus, Lillj. *De Crust. ex ord. trib.*, p. 95.

————— Brady. *Mon. Rect. Brit. Ost.*, p. 379.

Cypris monocha, Müll. *Entom.* (1785), p. 60.

————— Baird. *Brit. Entom.*, p. 153.

Monoculus monachus, Jurine. *Hist. des Monocles*, p. 173.

Not uncommon in grassy ponds and tarns. On Great Cumbrae in ponds along the shore subject to the spray of the sea. Loch Libo, rather rare and small. Lochs of Lochmaben, moderately

common. This species is rather local in its distribution in Scotland, besides being inconstant in its haunts. Many years ago it was in great abundance in a tarn on Little Cumbrae. Although the same tarn has recently been searched over and over again, this species has been met with only sparingly on one or two occasions. In some of the brackish ponds along the shores of Great Cumbrae it has been met with plentifully in autumn, and in the same ponds on the following spring not one was to be seen—not even a vestige of their dead shells. This is the case occasionally with other species of Ostracoda, but not so markedly as has been noticed with *Notodromas monachus*.

CANDONA ALBICANS, Brady.

Candona albicans, Brady. *Ann. and Mag. Nat. Hist.*, vol. xiii., p. 61, pl. iv., figs. 6-10; *Trans. Tyneside Nat. F.C.*, vol. vi., p. 107, pl. iii., figs. 6-10; *Mon. Rec. Brit. Ost.*, p. 381, pl. xxv., figs. 20-25; and pl. xxxvi., fig. 12.
 ————— Brady, Crosskey, and Robertson, *Mon. Post-ter. Entom.*, p. 133, pl. i., figs. 10-13.

Moderately common in Paisley Canal and Duddingston and Lochend Lochs, Edinburgh; common in Baron Loch, Mannor, Peeblesshire; very fine in Frankfield Loch; large and in beautiful condition in a wet furrow of old pasture land, Kilwinning; common in lochs of Lochmaben; one only in gatherings from Skye.

CANDONA LACTEA, Baird.

Candona lactea, Baird. *Proc. Zool. Soc. Lond.*, p. 255, pl. xviii., figs. 25-27.
 ————— Brady. *Mon. Rec. Brit. Ost.*, p. 382, pl. xxiv., figs. 55-58.
 ————— Crosskey, Brady, and Robertson. *Mon. Post-ter. Entom.*, p. 134, pl. i., figs. 14-16.

Found in Duddingston Loch, and Paisley Canal. This species appears to be rather rare in Scotland.

CANDONA EUPLECTELLA, sp. nov.

Found in Callum's Tarn, Bute. In tarn on Little Cumbrae. In Year Loch, Blind Loch, and Broomhill Loch, Lochmaben.

CANDONA COMPRESSA, Koch.

Cypris compressa, Koch. *Deutschlands Crustaceen*, H. 21, pl. xvii.
Candona compressa, Lillj. *De Crust. ex ord. trib.*, p. 129, tab. xxvi., figs. 1-3.

- Cypris setigera*, Jones. *Mon. of Tert. Entom.*, p. 12, pl. 1., figs. 6a.-6d.
Candona compressa, Brady. *Mon. Rec. Brit. Ost.*, p. 382, pl. xxvi., figs. 22-26.

Not uncommon in Glasgow and Paisley Canal, Govan Colliery Dam, Hairmyres old quarry, Frankfield and Bishop Lochs, Duddingston and Lochend Lochs, Edinburgh; Mill and Year Lochs, Lochmaben; both Cumbræ and Bute.

CANDONA CANDIDA, Müller.

- Cypris candida*, Müller. *Entom.*, p. 62, tab. vi., figs. 7-9.
Monoculus candidus, Jurine. *Hist. de Monocles*, p. 176, pl. xix., figs. 7-8.
Candona lucens, Baird. *Brit. Entom.*, p. 160, tab. xix., fig. 1.
 ———— *candida*, Lillj. *De Crustaceis*.
 ———— Jones. *Ter. Entom.*, p. 19, pl. i., figs. 8a, 8f, 5a, 5p.
 ———— Brady, *Mon. Rec. Brit. Ost.*, p. 383, pl. xxv., figs. 1-9; pl. xxxvi., fig. 13; and pl. xxvii., fig. 1.
 ———— Crosskey, Brady, and Robertson, *Mon. Post-ter. Entom.*, p. 135, pl. ii., figs. 29-30.

Common nearly everywhere in lochs, ponds, and ditches. Not being a swimmer it is chiefly found in mud, yet it is by no means sluggish, as it may be seen scampering over and burrowing in and out of it. Met with both in deep and shallow water, and not unfrequently in water more or less brackish. In Lochlomond it has been found at a depth of 40 fathoms. Like some of its congeners, it is occasionally met with in water of very questionable quality. In a creek of the Leven, at Dumbarton, which is used as a kind of dock for timber, and apparently also as a receptacle for refuse of the neighbourhood, the black mud at the bottom, which had a most offensive odour, contained this species plentifully, and without the least appearance of sickliness.

CANDONA DETECTA, Müller.

- Cypris detecta*, Müller. *Entomostraca*, p. 49, tab. iii., figs. 1-3.
Candona ——— Baird. *Brit. Entom.*, p. 161.
 ———— Brady. *Mon. Rec. Brit. Ost.*, p. 384, pl. xxiv., figs. 35-38; and pl. xxxvii., fig. 2.
 ———— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 134, pl. 1., figs. 7-9.

In ponds, lakes, and ditches everywhere. Common in Glasgow and Paisley Canal and Frankfield Loch. In Loch Urie, Arran (J.

Campbell), 1250 feet above sea level. Common in a small pool in the little islet, the site of the vitrified fort in the Kyles of Bute; no other Ostracod being found in the same gathering. This pool is only a few feet above high-water mark, and a few yards in diameter, and must be subject to a considerable amount of spray. Also in great abundance in a newly dried-up pool, a little above high-water, on Hunterston shore, Ayrshire, on the damp mud, under a thick coat of dry moss. The only other species found with it were two examples of *Candona candida*, and three of *Cypridopsis aculeata*.

CANDONA SIMILIS, *Baird*.

Candona similis, Baird. *Brit. Entom.*, p. 162, pl. 19, figs. 2-2a.

————— Brady and Robertson, *Ann. and Mag. Nat. Hist.*, ser. iv., vol. vi., p. 52, pl. 1, fig. 62.

Has been more generally met with in lochs than in smaller patches of water. Moderately common in Woodend and Lochend Lochs, near Glasgow, and in Burnbath Loch and Houston Dam, Bridge of Weir. Common in Duddingston Loch, Edinburgh.

CANDONA NITENS, *sp. nov.*

Found in Mugdock Loch, near Milngavie, moderately rare. Oct. 1st.

Johnstone Loch, moderately common. June 3rd.

Frankfield Loch, rare. May 1st.

Crosslee, moderately common. May 17th.

Bishop Loch, moderately common. May 30th.

Pilmuir Dam, Burnside Loch, Govan Colliery Dam, Hairlaw Loch—common.

CANDONA KINGSLEII, *Brady and Robertson*.

Candona Kingsleii, Brady and Robertson, *Ann. and Mag. Nat. Hist.*, ser. iv., vol. vi., p. 17., pl. ix., figs. 9-12.

Not unfrequently in both deep and shallow water. In Lochlomond in 12 to 20 fathoms. Baron Loch, Peebleshire; Frankfield Loch; Eaglesham Dam; Long Loch (J. Smith). Common in both Skye and Lewis. Lochearnhead (P. Cameron).

CANDONA DIAPHANA, *Brady and Robertson*.

Candona diaphana, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv., vol. vi., p. 18, plate v., figs. 1-3.

In Hairmyres and Lambriden old limestone quarries, moderately

common; Mugdock Loch, near Milngavie; brackish pond, Millport.

CANDONA HYALINA, *Brady and Robertson.*

Candona hyalina, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv., p. 18, pl. ix., figs. 5-8; plate v., figs. 4-11.

In Frankfield Loch, St. German Loch, and Little Loch; Craigton Dam, and Possil Marsh; Hairmyres old limestone quarry, Dumfries.

DARWINELLA STEVENSONI, *Brady and Robertson.*

Polycheles Stevensoni, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, vol. vi., p. 25, pl. vii., figs. 1-7; and pl. x., figs. 4-14.

Darwinella ——— Brady and Robertson, *ib.*, vol. ix., p. 50.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 141, pl. ii., figs. 13-17.

At Loch Broomhill, Dumfriesshire, the only Scotch locality yet recorded.

LIMNICY THERE INOPINATA, *Baird.*

Cythere inopinata, Baird. *Brit. Entom.*, p. 172, pl. xx., figs. 1, 1a-e.

Limnocythere —, Brady. *Mon. Rec. Brit. Ost.*, p. 419, pl. xxix., figs. 15-18; pl. xxxviii., fig. 9; pl. xxxix., fig. 1.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 173, pl. x., figs. 8-11.

Not unfrequently found amongst the mud in lochs, ponds, and canals. In Duddingston and Lochend Lochs, Edinburgh, St. German and Mugdock Lochs near Glasgow, Glasgow and Paisley Canal, moderately common.

The species is not rare, although not generally met with in consequence of being chiefly confined to the mud.

LIMNICY THERE SANCTI-PATRICII.

Limnocythere Sancti-Patricii, Brady and Robertson, *Ann. and Mag. Nat. Hist.*, ser. iv., vol. iii., p. 17, pl. xviii., figs. 8-11; and pl. xxi., fig. 4.

In Loch Libo, rare; in a ditch at the side of Bishop Loch but not communicating with it.

CY THERIDEA LACUSTRIS, *G. O. Sars.*

Cythere lacustris, G. O. Sars. *Zool. Reise i Sommeren*, 1863, p. 30.

Cyprideis torosa, Jones (in part). *Ter. Entom.*, p. 21, pl. ii., figs. 1a-1d; and woodcut, p. 16, fig. 2.

Cytheridea lacustris, Brady. *Mon. Rec. Brit. Ost.*, p. 427, pl. xxvi., figs. 18-21; and pl. xl., fig. 2.

Not uncommon in Glasgow and Paisley Canal, west of Pollok-shields, and sparingly in the Clyde, near Langbank. This species is rather sluggish, mostly stationary on the mud, or partly embedded in it, with the valves partially open, apparently satisfying itself with what the movement of the water may bring in its way.

CYTHERIDEA TOROSA, Jones.

Candona torosa, Jones. *Ann. and Mag. Nat. Hist.*, ser. ii., vol. vi., p. 27, pl. iii., fig. 6.

Cyprideis torosa, Jones. *Mon. Ter. Ent.*, p. 21, pl. ii., figs. 1a-1i.; and woodcut, fig. 2, p. 16.

Cytheridea torosa, Brady and Robertson. *Ann. and Mag. Nat. Hist.*, ser. iv., vol. vi., p. 21, pl. viii., figs. 6-7.

————— Brady, Crosskey, and Robertson. *Mon. Post-ter. Entom.*, p. 178, pl. xv., figs. 11-12. Var. *teres*, pl. vii., figs. 1-2.

In brackish water, chiefly estuarine. In great abundance on the banks of the Garnock on Misk Farm, near Kilwinning, in small holes, a few feet wide, formed in the turf, the bottom being soft mud covered by a few inches of water, and overflowed by high tides. The margins of those pools are excavated for many inches all round. Small eels, from three to four inches long, are common in the bottom mud.

Var. *teres*.—Generally in company with the above.

The following remarks may help beginners, who generally work at great disadvantage and loss of time from not knowing properly when or how to collect, or how to preserve what they may have collected. The latter is perhaps the greatest source of discouragement to many, who find, after a few years' enthusiastic labour, that they have only accumulated a vast amount of ill-arranged and often cumbersome material, neither pleasant to look upon nor useful to consult.

In this, as in all other branches of Natural History, it is absolutely necessary (1) to have the locality affixed to every specimen intended for preservation. To do this is within the reach of every one who collects for himself. If it is neglected to be done at the time of collection, it may be impossible to do it with any certainty afterwards. (2) The next important point is to

have the name attached to the specimen upon the first opportunity, and not left merely to memory, and it then becomes a useful assistant in other determinations. (3) Every specimen which it is desirable to keep should be carefully laid past and arranged with others in the most convenient way for reference.

I shall indicate briefly—

- (1) Where the Ostracoda are principally to be found.
- (2) What season of the year is most favourable for procuring them.
- (3) By what means they may best be secured.
- (4) How to preserve them most conveniently for inspection and reference.

I. *Places where to be found.*—They are to be found in lakes, tarns, ponds, lagoons, canals, ditches, and often in very small patches of water, and in slow-running streams; but in the latter by no means commonly, except in weedy recesses protected from the currents, or where clumps of thickly-growing plants abound.

Nowhere, throughout Scotland, is there any want of such places either in number or variety, whether we regard the depth of water, varying from the thinnest covering to the deepest lakes, or their situations, ranging from the sea level to high mountain tarns; or the character of the basin in which they lie, rock, peat, clay, &c.; or, lastly, the impregnated mineral contents. Ostracoda are generally more abundant in the smaller tarns or ponds, overgrown with weeds, than in deep and large sheets of water, where the surging of the waves is unfavourable to marginal vegetation; yet I often find, that places greatly overgrown with plants are not always the richest in Ostracoda, but sometimes the reverse—probably in such cases by affording more suitable conditions to a greater host of enemies. Ostracoda are occasionally obtained in small tarns and ponds where the water has been nearly dried up, leaving only a little at some central depression; and even in the damp mud, whence the water has disappeared, good gatherings are met with, as well as in the scanty water of furrows in old pasture land, and which are dry during the greater part of the summer. It is indeed surprising, as regards many of these patches of water, how speedily after rain they are found swarming with Ostracoda and other Microzoa. In some instances it has been observed that, after the rains certain species are absent which had been present before the

ponds dried up, while by next season they again become abundant. Whatever means of distribution there may be, it is very probable that this renewed life proceeds in a great measure from ova. That the ova retain vitality for a long time is certain. The late Dr. Baird, of the British Museum, showed Dr. G. S. Brady and myself a jar containing numerous forms of animal life which had made their appearance from mud taken from a dried-up canal in India during the hot season, and kept in the dry state for a considerable time after reaching this country before being subjected to water. Shortly after water was supplied, many living forms made their appearance. Where the pools are small and subject to be dried up during summer they seldom contain many species, although in such cases one species may prevail greatly. Limestone districts are favourable to Ostracoda, but all rock or clay surfaces are better than peat. Where there is nothing but pure peat, or peaty ponds fringed with *Sphagnum*, few or no Ostracoda may be expected. They are seldom searched for successfully where the lakes or pools have risen much by heavy rain-falls, nor in mill-dams, where the water is drained off rapidly, leaving broad, bare margins. It is otherwise where the water in the pools is decreasing gradually by evaporation. Then these animals appear to have time to follow the water, and may be taken abundantly when thus brought closer together in the small shallow pools left here and there. Moorland roadside ditches are more promising than those at some distance from the road. This may arise from a supply of material from the drainage of the road, which may be requisite to build up the shells of these minute crustaceans. Ostracoda are seldom absent in ditches or marshes which contain a little ochreous deposit with a metallic bluish scum on the surface of the water; they are more common in broad shallow ditches than in those more narrow and deep, and are rarely met with in springs or in ponds abounding with fish. Neither do they thrive where amphipods prevail. These little bivalve crustaceans are not always fastidious in their choice of habitat, sometimes disporting in pure fresh water, at other times revelling in water of very questionable character, while others affect brackish water, although they live in very different degrees of the saline element.

The Govan Colliery Dam, which is close to the terminus of a railway, is subjected to the dust from loading and unloading of the waggons, and to the deleterious fumes of a range of brick kilns

within a dozen of yards or so, and is generally covered with a sprinkling of soot from the neighbouring factories. It is further the play pond for the children of the vicinity to sail their small boats upon. In spite of all these apparent disadvantages against the Ostracoda, I seldom fail to obtain a fair gathering of them in this small patch of water, whether in summer or winter. Their survival under all these circumstances may be that what is harmless and healthful to them may be death to their enemies. The *Cypridæ* proper are seldom if ever found in very deep water, but mostly amongst the vegetation, while the *Candonæ* are met with at greater depths. In Lochlomond I have found them at a depth of 40 fathoms. Although these small crustaceans appear to be greatly more abundant on the plains than on the mountains, Dr. G. S. Brady records *Cypris cinerea*, *C. compressa*, *C. striolata*, &c., from a pool near the summit of Mickle Fell in Yorkshire, at an elevation of 2000 feet.

From the foregoing it is evident that the abundance of these organisms in one place cannot always be taken as an index of their profusion in another, although the two may be of quite similar appearance. In the one, these forms of life may be swarming; in the other, absent or nearly so. So little can we depend upon apparent similarity in this respect that, in collecting, it is well to make trial of even the most unlikely spots, and, although we may meet with frequent disappointments, we shall, on the other hand, often find what we will deem prizes where they are least expected.

2. *Time for Collecting.*—The best time for collecting these organisms is in summer, as they are then met with in the greatest abundance. There can be little doubt that heat is conducive to their increase and development. In a hot-house tank, where the heat was kept up to about 65° Fahr., one species of Ostracoda (*Cypris incongruens*) was abundant. In another tank outside of the building, where the water was supplied from the same source, but to which artificial heat was not imparted, the same species was present, but comparatively few in numbers. How far an increase of temperature may contribute to their increase of numbers or improvement of condition, or how far it may be borne with impunity, does not seem to be accurately known. Dr. G. S. Brady states that he has found them in the water of mill cooling ponds at a temperature of 100° Fahr., and the water might at times be even

hotter.* At Messrs. Barr & Co.'s cooling pond, Paisley, I have found them at a temperature of 85° Fahr.; the species was *Cypridopsis vidua*. I may mention, in passing, that the species which have come under my own observation as having been subject to high temperature—viz., *Cypris lævis*, *Cypris incongruens*, and *Cypridopsis vidua*—were all unusually light in colour. For some time I kept a gathering of Ostracoda in a broad shallow vessel placed near my window. In the cold mornings of March not one of them was to be seen; but further on in the day, when the sun was hotter, the different species of *Cypris* came from their hiding places in the mud to swarm about actively up the sides of the vessel, more particularly on the side next the light; and the non-swimmers (*Candonæ*) came more to the surface of the mud. This I have often repeated with the same result—hence the better prospect of collecting “when the sun shines.” Yet good gatherings may occasionally be made during the colder seasons of the year, and I have even had some excellent hauls in the month of January, when I had to break the ice and work underneath it. These gatherings were not only fair in numbers and variety, but contained species not found as a rule in the same tarns during the months of summer. It is by no means of rare occurrence to find a species abundant at one season and entirely absent in the same place at another. On returning to search the same lake or pool after an interval of two or three months at any period of the year, all the same species will seldom if ever be met with, or grouped in the same proportions. As one instance amongst many I may state that a gathering was taken on May 21, 1878, in the old dam which supplied the Govan Colliery. It was about 70 yards in circumference and a foot or two deep; the whole was covered with green *confervæ*, rather ropy but not slimy, and a little grass round the sides. The number of Ostracoda obtained was twelve species. This gathering presented a remarkable feature in the excessive abundance of *Cypris reptans*, far exceeding anything I had ever seen before of this species. Another gathering was taken from the same dam, November 20, 1878. There were little or no *confervæ* this time—nothing except a little grass round the sides and some thin growths out from the margins towards the middle. *Cypris reptans* was now only represented by a few examples, which were

* Brady, *Monograph Rec. Brit. Ostrac.*, p. 368.

all that were seen remaining of a species so numerous on a former occasion. It was, however, plentifully replaced by *Cypris virens*, which, on the other hand, had been wholly absent in the first gathering.

On March 9, 1879, after the severe frost, the dam was again visited. It showed little new growth of vegetation, further than some straggling blades of grass, the sides still fringed with the old autumnal weeds. There was no great variety found this time. *Cypris reptans* was wholly absent, so was *Cypris virens*. The prevailing Ostracod now was *Cypris compressa*.

Another gathering was taken on May 21, 1879, just a year after the first trial was made. On this occasion there were no *confervæ* nor *Cypris reptans*, both so abundant on the same date last year, showing that we cannot be certain of finding even the same species where they had been abundant in the same month of the previous year. This probably depends on the time of reproduction, or to some extent on the different varieties of animal and vegetable life that abound at the various seasons, and are more or less favourable in respect of food, shelter, &c., to the different species of Ostracoda.

3. *Mode of Collection*.—Unlike the marine, the fresh and brackish-water Ostracoda are within the reach of everyone, and the mode of capture is so easy that it can offer no obstacle to the pursuit. They are generally collected with a hand net; but when it is desirable to examine the ooze from the bottom of deep lakes, a boat and dredge are necessary. The size of the net usually employed has the ring of the mouth about 10 inches in diameter, and the net about 20 inches deep. Such nets are to be had ready-made, which screw from the handle and fold into 3 segments, so as to be more portable. In my own experience, I find one of much smaller size very efficient, one without the folding joints, having the ring only 6 inches in diameter, and the muslin bag not less than 24 inches deep, and rounded at the bottom. The greater the proportion the bag is to the ring the more freely the water will pass. The mesh of the net may be about 100 threads to the inch. The ring is made of $\frac{1}{4}$ -inch brass wire, which is strong enough to bear the pressure amongst pond weeds, or in raking the mud from the bottom. A socket or screw projects from the ring for the reception of the handle, whether a walking-stick or other rod more or less long.

A rod from 6 to 9 feet long has a great advantage over a

walking-stick, both in reaching to a greater distance and affording a greater leverage. The rod may be made to screw off in two or three lengths of 3 feet each, and can be conveniently carried in a sheath. This smaller size of net has the great advantage of admitting conveniently a brass wire sieve, with a hoop about an inch deep to fit into the ring of the muslin net, preventing weeds and other coarse material from getting into the bag, but sufficiently open to allow all the Microzoa to pass through. I find a sieve with a $\frac{1}{4}$ -inch mesh very suitable. This protecting sieve requires to be fitted tight into the mouth of the muslin net, so as not to fall out when working, but sufficiently easy to be taken off when the contents of the bag are turned out. For security, it is better to have the sieve slung to the neck of the handle by a short cord. The size of net is large enough to take in abundance of water with the Microzoa, and is exceedingly well fitted to sweep and probe amongst the vegetation, or to rake up the mud from the bottom, being at the same time quite conveniently portable. The common Dutch hoe has been used for the frame of the net, by piercing the inner edge of the front plate with holes to sew the bag to. The remaining part of the mouth of the bag is attached to the fork and back part of the hoe, but is not so well adapted for working advantageously amongst the vegetation. To work the net, simply sweep it through the vegetation along the margin of the pond; this done, remove the sieve, invert the bag, and convey the contents into a white saucer with water or wide-mouthed bottle, which will, in most cases, indicate whether there is anything worth further trial, though it often happens that repeated trials afford good results in the same place where they had failed to be seen by the first inspection. The Ostracoda generally withdraw within their shells and become motionless when alarmed, and are difficult to be seen in this state among the *debris* of the gathering, but, where they do exist, more or less of them come to the surface, and are readily detected in an open vessel, but equally as well and more easily by examining the contents of the net when the water is well pressed out.

To have the full benefit of the gathering for Ostracoda, it is necessary to take some of the mud, which in most cases can be readily procured by scraping the sides or bottom of the pool with the ring of the net. In order to reduce the bulk as much as possible, all the impalpable mud should be washed thoroughly away till the water runs off clear. This can be done either in the working net, or

