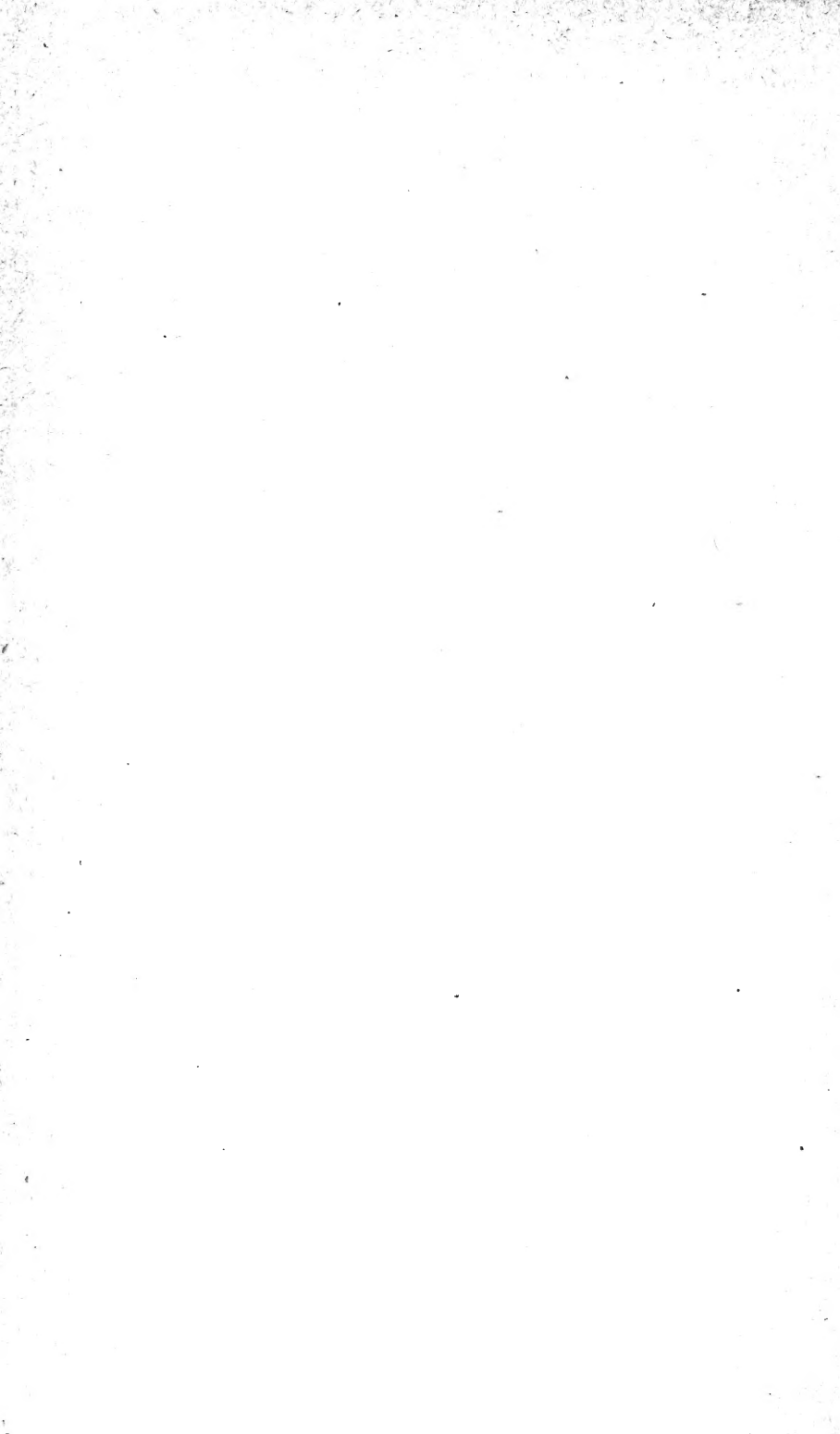




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EDITED BY

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NATURAL HISTORY DEPARTMENT, MUSEUM OF SCIENCE AND ART, EDINBURGH

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[JANUARY

NOTE ON THE SKELETON OF A SPECIMEN OF RISSO'S GRAMPUS (*GRAMPUS GRISEUS*).

By R. H. TRAQUAIR, M.D., LL.D., F.R.S.

IN the "Annals of Scottish Natural History" for January 1893, p. 1, Mr. R. Service records the occurrence of two specimens of Risso's Grampus—*Grampus griseus* (Cuv.)—in the Solway Firth. One of the specimens—that stranded near Carsethorn—Mr. Service was able to examine in its entirety, and to his good offices the Museum of Science and Art is indebted for the opportunity of obtaining its skeleton.

The bones, roughly divested of the flesh, were forwarded to Edinburgh, and have been prepared in the Natural History workshop of the museum. Unfortunately, the hyoid and pelvic bones were found to be missing, while the sternum was slightly injured; otherwise the skeleton is perfect. It is now exhibited in the Mammalian collection of the Museum.

The specimen when recent measured, according to Mr. Service, 8 feet in length, but the length of the mounted skeleton is only 7 feet 5 inches; the difference being due to the shrinkage of the intervertebral disks in drying, as well as to the fact that the caudal termination of the vertebral column does not reach quite to the posterior margin of the tail flap.

The skeleton is that of a young individual (female);

the epiphyses being ununited, the sternum remaining in three pieces, and the teeth having been still covered by the gum. The upper jaw is of course edentulous; the teeth of the lower jaw, three on each side, displayed in the prepared skeleton, being placed near the symphysis. They vary from $\frac{3}{4}$ to $\frac{7}{8}$ of an inch in length, the anterior being the shortest: calcification, though not complete, has extended considerably below the margin of the crown.

But the most noteworthy peculiarity of the skeleton is the remarkable want of lateral symmetry displayed by the pectoral limbs and by the anterior part of the sternum. The left flipper is fully one inch longer than the right; the former measuring $1\ 3\frac{1}{2}$, the latter $1\ 2\frac{1}{2}$ inches in length. No difference in size is observable in the scapulæ or humeri of the two limbs, but the radius and ulna are at once seen to be larger on the left side. On the left flipper the 2nd digit has 8 ossifications, the 3rd six; while on the right these members are respectively 7 and 4. In the normal adult the number of these ossifications are 10 in the 2nd, and 8 in the 3rd digit.¹

The sternum consists of three pieces, of which the anterior is very unsymmetrical, being much larger on the left than on the right side of the mesial line. The left side of the second piece has unfortunately been cut away; the third piece is symmetrical. This want of lateral symmetry in the limbs constitutes the principal point of interest in this skeleton, and I am not aware of any similar case having been recorded in any of the Cetacea.

ON THE OCCURRENCE OF THE RED-BREASTED FLYCATCHER (*MUSCICAPA PARVA*) IN THE OUTER HEBRIDES.

By J. A. HARVIE BROWN, F.R.S.E., F.Z.S., and
WM. EAGLE CLARKE, F.L.S.

THANKS to Mr. Wm. A. Tulloch, one of the keepers at the Monach Islands lighthouse, we are enabled to add another record to the few visits of this species to Britain, and to

¹ For these and other details regarding the skeleton of *Grampus griseus*, see Sir William Flower's paper in "Trans. Zool. Soc., London," vol. viii. pp. 1-21.

indicate a considerable extension to its known range as a wanderer. This is one of the successes accruing to our annual inquiries into the migratory movements of birds in and around Scotland, to which Mr. Tulloch is a valued contributor.

A Red-breasted Flycatcher was captured at the Monach Island, some thirteen miles west of North Uist, on the 22nd of October 1893, and was forwarded to us in the flesh. This specimen, though "far gone" when received, has by careful treatment been made into a passable mounted specimen, and has been presented by Mr. Tulloch to the collection of British Birds in the Edinburgh Museum of Science and Art.

The bird is a young male of the year, and agrees well with most of the published descriptions, the four central tail feathers being black. The crop contained, strange to say, several seeds of the canary-grass (*Phalaris canariensis*) in a stained condition, but the gizzard was quite empty.

Though this summer visitor to Central and Eastern Europe has on one occasion, in 1883, occurred north of the Tweed, namely at Berwick, yet it has not hitherto been recorded in Scottish territory—at least Mr. Muirhead excludes the county of the borough and town of Berwick-on-Tweed from the area treated of in his "Birds of Berwickshire."

ON THE EXTENSION OF THE DISTRIBUTION OF THE STOCK DOVE (*COLUMBA ŒNAS*) IN SCOTLAND.

By J. A. HARVIE-BROWN, F.R.S.E., F.Z.S.

ON the 21st February 1883 I read a paper at the meeting of the Royal Phys. Soc., entitled "On the Stock Dove (*Columba œnas*), with remarks upon its extension of range in Great Britain." Since that date I have obtained additional evidence of the very rapid and remarkable increase of this species and its farther extensions. This I propose to epitomise in the present paper, because it is thought that separate studies of single species whose increase and extension of range are phenominally rapid and regular are

amongst the best materials possible to enable naturalists to arrive at the larger and wider questions connected with distribution and migration. In my previous paper I have with sufficient exactitude traced the spread towards the north through England into Scotland: in the present paper I purpose simply to record chronologically the facts as ascertained, and continue my previous series, and make a few concluding remarks.

From the last-dated records of the former paper therefore—viz. at Gartmore, Vale of Menteith, 15th January 1883; and Garden (nest and eggs) 14th April 1883—we start afresh.¹

A very visible increase has since occurred from localities east of the central range of the Stirlingshire hills, many localities being known to me where Stock Doves have bred to the south of Stirling; and the birds have also become common as far west of Stirling as Aberfoyle, penetrating in this direction well up the valleys among the hills, as clearly shown by our correspondents Mr. James Stirling of Garden, Col. Duthie of Row, Doune, and others, to whom the bird has indeed become familiar since its first-recorded advent in 1883.

But while the species has thus spread across between Forth and Clyde, and penetrated far up the Forth valley, it is somewhat strange to find that a corresponding increase has *not* made itself apparent in the counties adjoining the Firth of Forth along the north shore. My friend Mr. J. J. Dalgleish of Brankston Grange, near Alloa, in reply to my circular, says: "There has been no increase. No further information has been received beyond the fact of one killed on the estate on 2nd April 1878 [already recorded in my previous article]. I have heard of no others in the neighbourhood since." Among Wood-pigeons killed in the low Kerse of Falkirk, I received several Stock Doves, and have seen others at various times, but that was principally during the early springs of their first colonisation of the Denny foot-hills and Vale of Menteith. At first they appear to have been feeling their way, resting and feeding often. Now it would almost appear that the migrant birds rush up at once to their breeding zones, resting little, or not at all, among the low-

¹ "Royal Phys. Soc. Proc.," vol. vii. p. 254.

lying clay kerse lands, which are not adapted to their requirements. However this may be, inquiries made in the east of Fife and in Forfarshire have elicited but little account. Mr. W. Berry of Tayfield, near Tents Muir, knows of a few pairs breeding there among the sand-hills; but they are far from abundant. Mr. Berry further informed us that, according to the very careful observations of his gamekeeper, he feels assured that Stock Doves have only "obtruded themselves on his notice" within the last two or three years. They usually come in March; and he saw three on Friday, 1st April 1892. Wood-pigeons are killed by the hundreds by all the keepers, and also by the professional pigeon-killer James Duffus of Pickletillum, who, however, says he remembers sending one about eight or nine years ago to the British Museum. A return from Blairadam estate,—counties of Fife and Kinross,—filled in by Mr. David M'Diarmid, gives "none known (*i.e.* in 1892). One was killed last spring, that being the only one seen."

In Forfar there is a similar dearth of records. Several correspondents speak to their scarcity or complete absence. Mr. A. N. Simpson—"a reliable and experienced ornithologist here," as we are assured by Dr. Thomas F. Dewar, Arbroath—found it breeding some 7 miles inland. This is the only authentic record of its occurrence near this. "It may, of course, prove commoner; but only rarely noted or recognised, from its resemblance to the Ring Dove." The above sentence was written upon the 4th April 1892. Of the area around Montrose I have received the report: "I know of no occurrence of the Stock Dove in Forfarshire;" and in a later letter, dated 6th December 1893, he repeats: "I have no positive information regarding the presence of the Stock Dove in lowland Forfarshire," whilst "great numbers of Ring Doves are shot in this quarter."¹ A little higher up Strath Tay, in the Carse of Gowrie, at Seggieden, Col. Drummond-Hay writes "Nil" in reply to my circular. But farther inland we find them appearing up the Tay valley in Glen Almond, Lyndoch Hill, and about Blairgowrie (W. Berry). A correspondent speaks of them as appearing "from a

¹ In a still later letter, Dr. Dewar records two, decidedly the first from the district, brought in on 14th December 1893.

southerly direction, and when disturbed always flying back by the same route." At Blackpark, some 9 miles N.W.W. of Perth, they have been established for some years. Mr. Athole MacGregor, writing from Cardney, Perthshire, speaks of them as nesting commonly in rocky slopes and precipices on the open moors.

Returning to the east coast counties, we have been unable to obtain a single record from Kincardineshire, but we do not feel certain that this may not be owing to scarcity of observers. Meanwhile, so let it be. From Aberdeenshire I have abundant evidence, through our friend Mr. Geo. Sim, and may shortly state: their first appearance was upon the Links of St. Fergus to the north of Peterhead, where they have nested regularly for the past eight or nine years. At present there may be from 25 to 30 pairs there. They next appeared upon the "Black Bar," between the Loch of Strathbeg and the sea, where they have bred for several years back. Lastly, they appeared at Minnie Links, about 8 miles north of Aberdeen, in 1888—about 25 pairs. Thus the Stock Doves appear to have spread *southward* from their first residence in "Dee," or, at all events, populated areas south of their first known place upon St. Fergus Links; neither Mr. Geo. Sim nor I have succeeded in obtaining a single record from either Forfar or Kincardine south of the river Dee.

Coming to the Moray Basin, Stock Doves now swarm both along the low shores amongst the links, sand-hills, and rabbit-warrens, as far as Nairn, and penetrate far up the Findhorn, Spey, Lossie, even into the lower outspurs of the mountains, to an elevation of 2600 feet. It is needless to review in this place the more minute steps of advance. Suffice it to say, in 1883 I first heard of Stock Doves at Pitgaveny near Elgin. By 1887 I observed numbers there and near Findhorn (east side), and it is now increasing *west* of the River Findhorn rapidly, and reaching up the Findhorn valley. Curiously enough, however, there is no great appearance of them upon the River Deveron, although in 1893 we saw a few when fishing Laithers and Netherdale waters on that river. The records as yet to the north of Inverness are by no means full of detail. But in 1889 Buckley took eggs in the east of Sutherland for the first time, on 19th

May of that year ; and they had reached as far west as Glen Cassley ("Ann. Scot. Nat. Hist.," April 1892). And other records here and there have reached us from Sutherland and Caithness.

Last of all, and singularly interesting, is the record of a Stock Dove shot near Spiggie in Shetland by the Brothers Henderson, as recorded in the present number of the "Annals."

Shortly reviewing these known records, there is some study required to trace the lines of advance to the north. It would appear that both east and west coasts south of Forth and Clyde almost equally participated in the earlier invasions, and probably from pressure at a centre which appears to have been in existence for many years in Yorkshire, where Mr. Boyes informed Mr. Eagle Clarke that the old warreners on the wolds remembered them as abundant sixty years ago. Thence they seem to have overflowed to the north and west, followed both coasts as far as Forth and Clyde, and then trended north-westward, up the Forth valley. Somehow, Fife, Forfar, and Kincardine do not appear to have received any great quota of their numbers ; but the River Tay above Perth seems to have received them with open arms ; and on the Forth and Tay upper valleys they are now fairly abundant. Did they thereafter pass down over the watershed at, say, Dalwhinnie into Spey, and pass on down to the lower reaches of Spey, and the great sands of the south coast of the Moray Firth, and bend back down to the north-west coast of Aberdeenshire, populating or returning from the coast lines to the higher valleys later on? Or, How did they first reach into Moray by 1883? Why are the coast lines east of Speymouth still bare of birds, but a patch or two populated on the east coast of Aberdeen? Why were Fife, Forfar, and Kincardine passed by, if they came from south to north, and north-west Aberdeen and Moray densely populated? Has the invasion really come to these northern counties direct from the south, or from other natural increase at other centres of Continental origin? I ask the questions without at present attempting to give a satisfactory reply to any one of them. I think, however, the subject is one of great interest and of considerable importance to any careful student of distribution and migration,

and we would ask our readers to carefully collect and record further developments of the extension of range of this and of other species which are presenting, and have presented, phenomenal rapidity in their colonisation. Such observations cannot fail in time to yield interesting results.

THE PERSECUTION OF THE GREAT SKUA— *STERCORARIUS CATARRHACTES.*

By WM. EAGLE CLARKE, F.L.S.

THERE is one fact in the history of those birds which have become extinct within the present century which it is well should be remembered in connection with some of the rarer and decreasing forms among our indigenous species, namely that their extermination had, in all instances, become an accomplished fact for several, in some cases many, years before such was realised to be the case. This knowledge should assuredly impress upon us the necessity of calling attention to cases of undue persecution of any species, more especially of those which are alike limited in their numbers and in their distribution, rendering them peculiarly liable to extermination. The Great Skua affords a case in point. Whether the Great Skua is an increasing or a decreasing species in its Icelandic and North-western haunts, I know not; it is, however, high time we fully realised that it is both a much persecuted and rapidly decreasing bird in its European habitats. Indeed, unless some check be placed upon the wholesale egg-taking in the Shetlands, and its destruction in the Færoes, this fine species must soon cease to exist in the eastern area of its range. That such persecution not only prevails, but is rampant, is made clearly manifest by the following reports which have been most kindly furnished by my friends Mrs. Traill and Mr. Frank Traill for Shetland, and Colonel Feilden for Færoe.

FOULA.

Before proceeding to report upon the past year, it may be useful to remark that until the present decade, thanks to

the direct influence of the late Dr. Scott, the proprietor, this colony had greatly increased. During the breeding seasons of 1890 and 1891 the Foula colony, now the largest in Europe, suffered so severely through egg-taking, that practically no young birds were produced in those years. In 1892 a happy combination of circumstances fortunately prevented undue molestation.

Let us see how they fared in the summer of 1893. Mrs. Traill and her son report as follows :—

The year 1893 has been a particularly bad one for the Great Skuas in Foula. They arrived during the first week in April, a little earlier than usual, and began to lay about 12th May. It is known that the whole first and second layings and one or two eggs out of the third were taken, and this is to be attributed to several causes. In the first place, the poverty of the people made every penny of great consequence; and though there were few tourists this year, two sloops from Orkney, which had come for trading purposes, bought a great many eggs. Indeed, it was reported that one of these vessels had taken away between twelve and twenty dozen of Bonxie's eggs. An egg-dealer from Scalloway also came over and purchased a considerable number. The entire blame of this wholesale taking must not be ascribed to the people alone, as a gentleman from England who paid a short visit here made no secret of the specimens which he took. That the birds feel disturbed is evident from the fact that they are shifting their breeding ground from one part of the hills to another.

It is quite certain that if the Great Skua is not to entirely disappear from Foula, something must be done before next year to protect their eggs.

Mr. Traill also reports that during his many rambles over the island during the past summer he never came across a single nestling; and it seems highly probable that not a single young bird was reared by the colony. We have already stated that the same result happened in 1890, and again in 1891. How long can this state of affairs continue? If three out of four breeding seasons are to result in no progeny being reared, the end must surely come before many more years have elapsed.

FÆROES.

Colonel Feilden has kindly communicated the following :—

Swabo, writing his memoirs of the Færoes in 1782, which still remain in manuscript in the archives of the Royal Library at Copen-

hagen, records that in ancient days the island of Skuce, which probably derived its name from the bird, produced 6000 young of the Great Skua yearly. He mentions that they were very numerous at one time on the islands of Vaagø and Stromø. Svabo, observing the rapacious habits of the Great Skua, and the damage they did to the *Fuglebergs* by destroying both the eggs and young of the sea-fowl breeding in the rock-nurseries, suggested that they should be taxed as birds of prey, and his recommendations were acted on, and the Great Skua became incorporated in the "black-list," two bills of this species being adjudged the equivalent of one of the Raven. During recent years the laws relating to *Nabbetold* in the Færoes, which obliged every man entering a boat (the equivalent of every able-bodied man throughout the islands) to deliver yearly to the authorities the bills of a Raven, or one Raven's brood, the bills of two Crows, or two Great Black-backed Gulls, or two Great Skuas, have been repealed, and a small reward is paid to the bringer of the bills of birds in the "black-list" by the Sysselmand, on behalf of the community. In the year 1872 I visited the Færoes, and subsequently gave a list of the birds in the "Zoologist" for the same year. In that paper I referred to the diminution in the numbers of the Great Skua, and pointed out that before many years had elapsed that noble bird would be exterminated as a breeding species; I even hazarded the opinion that probably in the course of another ten years the Great Skua would no longer be found breeding in the Færoes. I am happy to say that my predictions have not yet been fulfilled to the letter, but I do not think the extermination of this grand species can be much longer delayed. In 1872 I attempted to make a list of the then breeding places and the number of pairs nesting in each locality. I enumerated seven breeding stations with about forty nesting pairs, but I think I rather under-estimated the number; I certainly overlooked one breeding station in Stromø, and probably if I had given the number of pairs nesting throughout the islands in 1872 as fifty, I should have been very near the mark. After a lapse of twenty years I revisited the Færoes, and passed the month of June 1892 there. I was struck by the general diminution in the bird-life from what I remembered twenty years before, but was pleased to learn that the local legislature had realised the fact, and stringent laws had been passed to protect the birds, eggs, and young of all the species, not included in the "black-list," which nest in the Færoes. These regulations are subsidiary to the old laws relating to the "Fuglebergs." In many instances both the Great and Richardson's Skua were shot down for bait by the fishermen. I again visited the Færoes in July and August of 1893, and passed four weeks amongst those islands. During the whole of my visit I did not see a single Great Skua on the wing. I was informed that they no longer bred on either the Great or Little Dimon; that

not more than one, or perhaps two pairs, had nested this year in Sandœ. On the 14th July I found a young Great Skua, half tame, in the village of Skaapen, in the island of Sandœ, which had been taken from the nest about a fortnight previously. I secured it, and sent it to Herr Müller in Thorshavn, for transmission to the Zoological Gardens in Copenhagen. Syssemand Winther of Sandœ was of opinion that this young bird represented the whole of the progeny of the species that had been hatched out this year in Sandœ. On the 25th July, I and my companion, Mr. Folmer Hansen of Copenhagen, found a healthy young Skua in captivity in the village of Saxen, which devoured small trout of six inches long without tearing them in pieces. The owner did not care to part with the bird. It had been brought from a spot in the neighbourhood called Eggen, where four pairs had bred. The same day we found in the kitchen of Mr. Jan David Olsen of Saxen two young Skuas which had been killed on Eggen in the morning. They were cooked as part of our supper, and Mr. Hansen and I ate them. On expressing to our host regret that these fine birds should be put to such ignoble use, and that we should have much preferred to see them alive, our kind host, without mentioning the matter to us, despatched the following day one of his shepherds to the fells. At nightfall the man returned with a single young bird. This we hoped to send also to Copenhagen, but unfortunately later on one of its legs got broken, and it died. In Bordœ we had no time to visit the spot where formerly a thriving colony existed, but we were informed that, if not exterminated altogether, certainly not more than one or two pairs nested there this year. I did not get any exact particulars about the colonies formerly existing in the north isles of Viderœ and Svinoœ, which twenty years ago consisted of five and seven pairs respectively, but I was led to believe that if not exterminated there they were reduced to one or two breeding pairs. The ultimate extinction of the Great Skua as a breeding species in the Færoes cannot be long delayed, as the slight protection given to the bird by the owners of the localities where it still breeds is entirely for the sake of the young as an addition to their food supply.

Thus we have the declared testimony of the highest authorities, based upon personal observation and experience, that unless some measure of protection is immediately afforded to the Great Skua, this fine bird must soon cease to exist in Europe. Should this be so, history will in all probability repeat itself, and then, like the Great Auk, which in its distribution it so closely resembles, the Great Skua will be hunted down to supply "the ruthless trade in its eggs and skins" in its north-western haunts.

Ornithologists generally are of opinion that some score of British birds are in great need of protection at all seasons, and that such protection should apply also to their eggs. Indeed, more than one measure has been promoted to effect these desirable ends within the past few years; and at the present time such an one is under consideration, which is only delayed because our authorities unfortunately differ as to *How* this protection should be applied. It is greatly to be hoped that such difficulties as these may be at once overcome, and that the Great Skua may receive that protection which all lovers of nature who are familiar with it in its native haunts are most desirous should be afforded to it.

A LIST OF THE MACRO-LEPIDOPTERA FOUND
IN THE PARISH OF ARDCLACH, NAIRN-
SHIRE.

By R. THOMSON.

THE parish of Ardcloch occupies the south-eastern portion of Nairnshire, and covers an area of about eighty square miles. It is almost equally intersected by the river Findhorn, along whose banks are to be found a rich and varied growth of both mountain and lowland vegetation. The surface generally overlies the geological formations of granite and gneiss, and slopes towards the Moray Firth. The average elevation is about six hundred feet; but, with a few unimportant exceptions it is, over all, well under a thousand. In addition to a considerable extent of highly cultivated arable ground, there are large tracts of moss, moor, and woodland. Along the water-courses the margins are skirted with alder, birch, and various species of willow, with here and there a few clumps of bird-cherry. But the forest trees are chiefly Scots fir, and larch, as well as a considerable sprinkling of oak, ash, and elm. Hitherto, in the interests of science, this field has seldom, if ever, been trodden by any practical entomologist. The Rev. Dr. Gordon's "List of Lepidoptera found within the Province of Moray," published in the "Zoologist" for August 1861, theoretically included the southern portion of Nairn-

shire; but hitherto, for this branch of natural history, the writer has had this district for many years all to himself. As the result of his labours, however, there are no rarities, no startling discoveries, in the following list, and its chief merit must therefore be only some additional aid in settling more accurately the northern distribution of several species. Ninety-nine per cent are personal local captures, there being scarcely one which is not now represented in the author's cabinet. It is possible that an individual or two may be misnamed, but they have all been identified with the greatest care. A few doubtful insects were submitted to an expert in London, and afterwards minutely compared with the special description in Newman's "Natural History of British Butterflies and Moths." So far there has been no desire on our part to possess a full series of the British Lepidoptera, but simply an earnest attempt to make the local collection as complete as possible.

Argynnis aglaia.—Occasional. On the hillsides and open woods partially covered with *Pteris aquilina*: only a few captures.

A. euphrosyne.—Occurs in considerable numbers in Ferness Woods and along the whole valley of the Findhorn.

Vanessa urtica.—As common as it is pretty. Bold enough to familiarly enter our houses, it sometimes hibernates in our rooms during the winter.

Pyrameis atalanta.—Variable in its appearance in Ardcloch, but usually scarce. Several good specimens were taken at Ferness in August 1893. *P. cardui*.—Took several insects in the garden of the Schoolhouse at Ardcloch in 1882 and 1884, but have not observed any since.

Erebia medea.—Appears in great numbers every year on the banks of the Findhorn. This season it was out on the 6th July.

Epinephele janira.—Generally abundant in every meadow.

Cænonympha davus.—Occurs on the moors, but not common.

C. pamphilus.—Frequent on our heaths and rough pastures, and ascends to the highest elevations in the parish.

Thecla rubi.—Never plentiful, but may usually be met with now and again in our woods and heaths all over the district.

Polyommatus phlæas.—Common in the lower reaches of Nairnshire, but crosses the Findhorn very sparingly towards the moors.

Lycæna icarus.—Frequent all over the parish.

Anthocharis cardamines.—Has been taken on the banks of the Findhorn, but rare.

Pieris napi.—Always abundant. *P. rapæ*.—Abundant. *P. brassica*.—Only too common every year.

Hesperia tages.—Occasional on the dry moors and hillsides.

Smerinthus populi.—Rare. Willie Scott, Glenferness, 5th July 1887.

[*Cossus ligniperda*.—Occurs pretty often in oak woods in Nairnshire, but no specimen has hitherto been taken in Ardcloch.]

Hepialus lupulinus.—Frequent. *H. vellela*.—Frequent. *H. humuli*.—For the most part the ravages of this insect are confined in Nairnshire to the roots of the nettle and burdock. Great numbers are annually caught and devoured on the wing during the fine summer evenings by the black-headed gulls (*Larus ridibundus*).

Chelonia plantaginis.—Frequent on the dry moors and hillsides.

C. caja.—The country people always look on this insect as a butterfly, and often send it to us as a great discovery.

Arctia fuliginosa.—The larvæ are oftener seen than the perfect insect, which, being rather sluggish, is frequently caught at rest. *A. menthastris*.—The larvæ show great diversity in their colouring, from pure black to light brown.

Orgyia fascelina.—Occasional on the heaths. *O. antiqua*.—Occasional.

Demas coryli.—Occasional.

Trichiura cratægi.—Occasional.

Bombyx rubi.—Frequent on the moors, but the imago is usually bred from the caterpillar. *B. quercus*.—Frequent on the heath, but the perfect insect has usually to be bred.

Saturnia carpini.—Frequent on the moors, but seldom caught on the wing. Both the insect and its larva are greatly admired when discovered by the country folk.

Rumia cratægata.—Appears in great numbers throughout the summer, and is esteemed a beautiful creature by every one.

Venilia maculata.—Occasional in Ferness woods and river side.

Metrocampa margaritaria.—Occurs in considerable numbers in our woods, among oak, birch, and elm.

Ellopija fasciaria.—Plentiful in the fir woods. The perfect insect soon becomes worn.

Selenia illunaria.—Rare. *S. lunaria*.—Rare, as its food plant, *Prunus spinosa*, is not plentiful.

Odontoptera bidentata.—Sometimes only too easily captured.

- Crocallis elinguaris*.—Rare, as its favourite food plant, *Lonicera periclymenum*, is scarce.
- Amphydasis betularia*.—One specimen taken by Mrs. Thomson at the river side, 15th June 1889.
- Boarmia repandata*.—Often rather too plentiful. *B. rhomboidaria*.—Not so common as the former.
- Dasydia obfuscata*.—In all I have only taken four specimens.
- Ephyra pendularia*.—Rare.
- Venusia cambricaria*.—Has occurred, but should be more plentiful.
- Acidalia rusticata*.—Rare. *A. remutata*.—Rare. *A. aversata* and var.—Rare.
- Cabera pusaria*.—Common along the banks of the Findhorn.
- Macaria liturata*.—Frequent in Ferness fir woods.
- Numeria pulveraria*.—One specimen in 1886.
- Fidonia carbonaria*.—Frequent among heath. *F. atomaria*.—Plentiful. *F. piniaria*.—The males are very common in the fir woods, but the females are very seldom seen.
- Hybernia defoliaria*.—One specimen by Mrs. Thomson at the Ferness Schoolhouse, 26th November 1892.
- Cheimatobia brumata*.—Very plentiful in December 1892.
- Oporabia dilutata*.—Frequent in a mild season. *O. filigrammaria*.—Occasional.
- Larentia didymata*.—Everywhere. *L. cæsiata*.—Very numerous, and usually good specimens. *L. olivata*.—Generally distributed, but not common. *L. pectinitaria*.—Its colour is very fugitive, but if the wing is completely covered up when drying it preserves much of its original beauty.
- Emmelesia alchemillata*.—Common.
- Lobophora lobulata*.—Occasional.
- Thera juniperata*.—Scarcely frequent. *T. simulata*.—Frequent. *T. obeliscata*.—Occurs in fir woods.
- Ypsipetes ruberata*.—Common. *Y. elutata*.—Common. *Y. impluviata*.—Not so frequent.
- Melanthia ocellata*.—Common, and usually in good condition.
- Melanippe subtristata*.—Frequent. *M. montanata*.—Very common. The normal type is not always constant. *M. fluctuata*.—Frequent throughout the summer.
- Anticlea badiata*.—Occasional. *A. derivata*.—Rare. Willie Scott, Glenferness—one, 3rd May 1887.
- Coremia munitata*.—Common. *C. ferrugata*.—Frequent.

Camptogramma bilineata.—Common everywhere. Considerable differences in markings.

Cidaria psittacata.—Occasional if the autumn be mild. *C. miata*.—A few specimens usually turn up every autumn. *C. corylata*.—Occasional. *C. albo-crenata*.¹—Rare. *C. centum-notata*.²—Very common. *C. comma-notata*.²—Rare. *C. immanata*.—Very common. *C. marmorata*.³—Occasional. *C. suffumata*.—Frequent. *C. silaceata*.—Occasional. *C. testata*.—Common on the moors. *C. populata*.—Common. *C. fulvata*.—Frequent.

Eubolia mensuraria.—Frequent. *E. palumbaria*.—Seldom found on the east side of the Findhorn.

Anaitis plagiata.—Frequent on the left bank of the Findhorn.

Chesias spartiata.—Plentiful where its food plant (*Spartium scoparium*) occurs on the west side of the river Findhorn. *C. obliquaria*.—Occasional in the same habitats as the former.

Tanagra charophyllata.—Common by the sides of the Findhorn.

Platypteryx lacertula.—A scarce insect, though the birch is general in the parish. *P. falcula*.—Occasional.

Dicranura vinula.—The caterpillars are sometimes very destructive to *Populus tremula*, but in Ardclach the perfect insects for the cabinet have usually to be reared.

Pygæra bucephala.—Occurs in Nairnshire, near the borders of Ardclach.

Thyatira batis.—Has been found sparingly in the sheltered hollows.

Cymatophora duplaris.—Occasional in the lower reaches of the parish. *C. flavicornis*.—Rare.

Acronycta psi.—Frequent. *A. leporina*.—One specimen in Dulsie Wood, by Mrs. Thomson, June 1884. *A. megacephala*.—Occasional. *A. myrica*.—Frequent.

Leucania conigera.—Frequent. *L. lithargyria*.—Frequent. *L. pallens*.—Frequent.

Hydrocia nictitans.—Common. A few specimens, with little or no trace of white in the reniform, have occurred. Comes freely to light. *H. micacea*.—Common throughout the autumn months. Easily attracted by light.

Xylophasia rurea.—Common. It may be often found visiting bramble flowers. *X. polyodon*.—The larvæ do not appear to do much harm in Nairnshire. A very dark variety is occasionally met with.

¹ A mere variety of *C. corylata*.—ED.

² Synonyms of *C. truncata*.—ED.

³ A variety of *C. immanata*.—ED.

- Charæas graminis*.—Although the perfect insect may be frequently enough seen on the flowers of *Senecio Jacobæa*, the caterpillars do not bear among us their usual reputation of incorrigible evil-doers.
- Luperina testacea*.—It appears to do little or no harm here.
- Mamestra brassicæ*.—The larvæ do less harm than the genus *Pieris*.
- Apamea basilinea*.—Not a destructive insect in Ardclach. *A. gemina*.—Frequent.
- Miana fasciuncula*.—Is usually found flying over the hay-fields, but never common.
- Caradrina cubicularis*.—A rather familiar inmate in most houses.
- Agrotis valligera*.—Occurs sparingly. *A. nigricans*.—Frequent. Comes to light. *A. tritici*.—Frequent on the blossoms of bramble. *A. porphyrea*.—Frequent on the heaths. *A. præcox*.—Not common. *A. pyrophila*.—Occasional.
- Tryphæna ianthina*.—Frequent. *T. orbona*.—Frequent. *T. pronuba*.—Frequent.
- Noctua glareosa*.—Frequent. It comes to light but may often be taken on the flowers of *Senecio Jacobæa* at night.
- N. augur*.—Frequent. *N. plecta*.—Common. *N. C-nigrum*.—Frequent, and may be taken on bramble flowers. *N. triangulum*.—Rare. *N. rubi*.—Common. *N. baja*.—Frequent. *N. xanthographa*.—Common.
- Tæniocampa gothica*.—Frequent. *T. instabilis*.—Rare.
- Anchocelis rufina*.—Occasional. Its food plant, oak, is not plentiful. *A. litura*.—Occasional.
- Scopelosoma satellitia*.—Rare. One specimen taken at Ferness.
- Xanthia cerago*.—Occasional. *X. silago*.—Rare.
- Euperia fulvago*.—One specimen found in the Schoolhouse at Ardclach, 16th August 1889.
- Dianthæcia cucubali*.—Occasional.
- Polia chi*.—Not common, but a season seldom passes without a few captures being made.
- Epunda lutulenta*.—Rare. *E. nigra*.—Frequent. Attracted by light. *E. viminalis*.—One specimen at the Schoolhouse, Ferness, 15th August 1893.
- Miselia oxyacanthæ*.—Occasional.
- Phlogophora meticulosa*.—Bred one specimen, 14th October 1883.
- Euplexia lucipara*.—Occasional.
- Aplecta nebulosa*.—Rare.

Hadena adusta.—Occasional.

H. glauca.—Rare. *H. dentina*.—Frequent. *H. oleracea*.—Common.

H. thalassina.—Occasional. *H. rectilinea*.—Occasional.

Calocampa exoleta.—One specimen taken by Mr. Ludovic M'Donald, Ferness, 24th October 1887.

Cucullia umbratica.—Half a dozen specimens taken in the dusk on the flowers of *Lychnis vespertina*.

Anarta cordigera.—One specimen taken on the moor of Aitnoch, Glenferness, by Willie Scott, Drummore, 26th May 1885. *A. myrtilli*.—Took one specimen in Ferness Wood, 20th June 1891, and another in the Schoolhouse Garden on the 9th May 1893.

Brephos parthenias.—Occasional in the early spring.¹

Abrostola urticae.—Common.

Plusia chrysitis.—Occasional. *P. bractea*.—Rare. *P. festucae*.—Rare. *P. iota*.—Rare. *P. gamma*.—This destructive insect seldom causes much injury here. It may be met with from spring to autumn. *P. interrogationis*.—Rare.

Amphipyra tragopogonis.—Common.

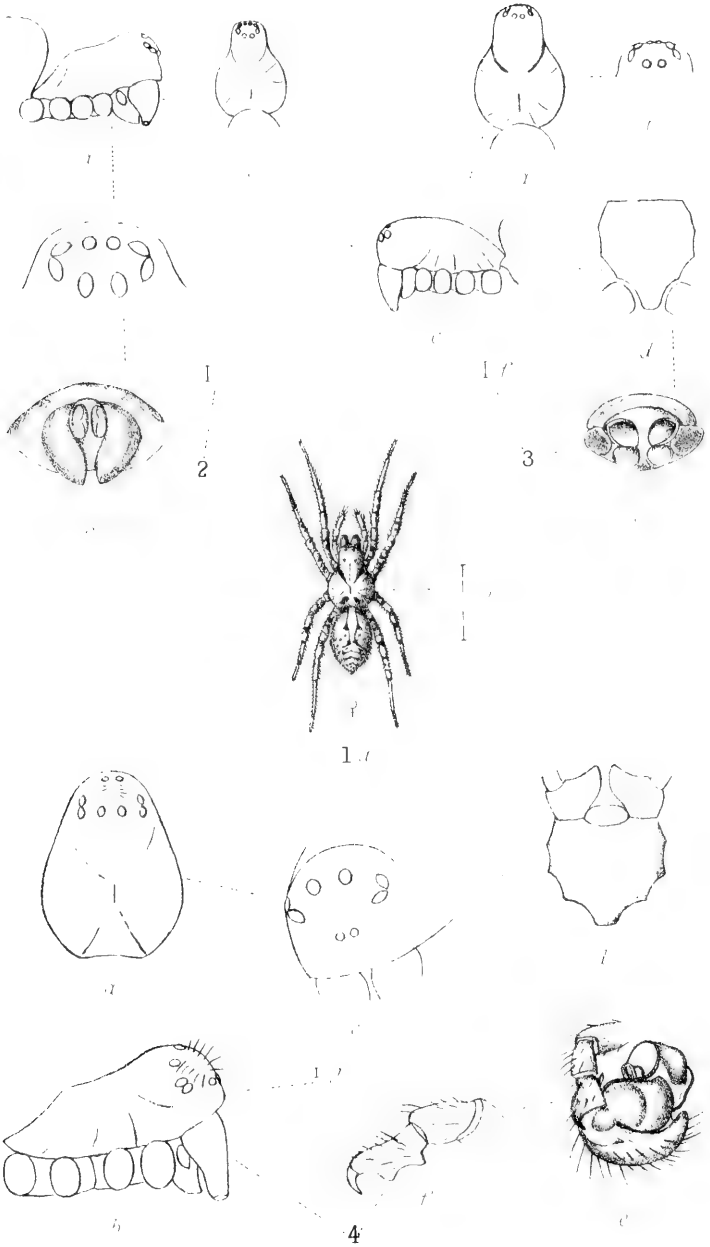
ON SOME NEW AND RARE SCOTCH SPIDERS.

By the Rev. O. P. CAMBRIDGE, M.A., F.R.S., etc.

PLATE I.

IT gives me great pleasure to comply with the suggestion of Mr. William Evans (to whose researches the capture of many rare and some new Scotch Spiders is due) that I should describe some which he has had the kindness to send to me, in the "Annals of Scottish Natural History"; and my thanks are due to the editors of that journal for their ready acquiescence in Mr. Evans's suggestion.

The List of Scotch Spiders has now reached a very respectable length, but there is reason to believe that numerous other species yet remain to reward the collector's work, not only on the higher mountain ranges but also in the valleys and lowlands, none of which localities can be said to have yet had any at all extensive areas thoroughly worked. In addition to those sent to me by Mr. Evans, I have described



NEW AND RARE SCOTTISH SPIDERS.

O.P. Cambridge del
A.T. Hollick hth

Edwin Wilson Cambridge

here also one species sent to me by my cousin, the late Colonel Pickard, R.A., V.C., etc., from the island of Colonsay, many years ago, but only just now determined to be new.

ARACHNIDA.¹

ARANEIDEA.

Fam. THERIDIIDÆ.

Gen. TYPHOCRESTUS, Sim. (*Neriene*, Bl., *ad partem*).

TYPHOCRESTUS DIGITATUS, Camb.

Erigone digitata, Camb., "Proc. Zool. Soc. Lond.," 1872, p. 758, Plate LXVI. Fig. 14.

Typhocrestus digitatus, Camb., Sim., Aran. de France, 1884, tome v. part 3, p. 584, Figs. 399-401.

ADULT MALE.—Length, $\frac{2}{3}$ rds of a line. *Cephalothorax*, oval, obtuse at each end, scarcely any lateral marginal constriction at the junction of the caput and thorax, rising gradually from the hinder margin to the occiput, which is a little, but not abruptly, gibbous; clypeus a little prominent, and equal in height to half that of the facial space. On each side, behind the lateral pairs of eyes, is a conspicuous, deep, longitudinal excavation or indentation running to a point backwards; the upper margin of this is marked (in the example under consideration) with a strong black line which runs round behind the occiput, forming there an obtuse point, and giving the impression, when looked at from above and behind, of the portion enclosed being divided horizontally from the thorax. This, however, is only apparent, as in fact there is no such division, though doubtless that would be at some period the result of an apparently progressive development. No such line as that above mentioned was visible in the German type of this species, nor is it in an example once received for examination from Holland; something, however, of the kind is represented in the figure given (*loc. cit. supra*) by M. Simon. The caput has a few short hairs on it; and the colour of the cephalothorax is a greenish olive brown, with black converging lateral markings and margin. *Eyes*, small, in two transverse, slightly curved or nearly parallel rows; the laterals are largest, the hind lateral eye largest of the eight; the posterior row, looked at from above and laterally, very nearly straight. The hind-central eyes are scarcely more than an eye's diameter apart, but are farther from the hind-laterals and a little closer to the fore-centrals, which last are smallest of the eight, and contiguous to each other.

¹ The arrangement of the Spiders included here is not intended to be rigidly systematic.

Legs, not very long, subequal, 4, 1, 2, 3, slender, furnished simply with fine hairs, and of a yellower brown hue than the cephalothorax. *Palpi*, similar to the legs in colour, excepting the radial joint, which is strongly suffused with dark yellow-brown. They are rather short, the cubital and radial joints about equal in length. The latter is strongest, and has its fore extremity on the upper side produced into a rather short, finger-like, tapering apophysis on the inner side, and a shorter but broader and squarely truncated one close to it on the outer side. The digital joint is small. The palpal organs are rather complex, prominent near the middle on the outer side, with a slender coiled black spine at their extremity; and within its coil is another prominent black spine, rather bent in the middle, and at first sight giving the appearance of a duplex termination to the coiled spine. *Falces*, moderately strong, about equal in length to the height of the facial space, and slightly divergent towards their extremity, where, on the inner side, they are furnished with a few very fine denticulations. *Maxillæ*, moderate in length, very strong at their base, and their extremities almost touching over the labium. *Labium*, small, rather broader than long, its apex somewhat rounded. *Sternum*, large, very convex and glossy, heart-shaped, with the posterior point rather broad and obtuse; it is of a sooty-olive hue, the falces, maxillæ, and labium being like the legs in colour. *Abdomen*, oval, sooty-black, shining, and furnished sparingly with short fine hairs.

The example above described was found at Aberlady, Scotland, by Mr. William Evans of Edinburgh, and kindly sent to me through Mr. G. H. Carpenter of the Museum of Science and Art, Dublin. Although differing in some slight respects from *T. digitatus*, Camb., I feel tolerably certain (in the unfortunate absence of the type for comparison) that it belongs to that species. The occurrence of this spider in Scotland is its first record in Great Britain.

Gen. nov. CALEDONIA.

Cephalothorax, broad-oval, obtusely rounded in front, lateral marginal constrictions at the caput scarcely perceptible. Caput broad, obtuse, well rounded, but not elevated; in profile the rise is gradual from behind to the occiput, where there is a slight dip, and which is roundly convex, but scarcely gibbous. The height of the clypeus, which is nearly vertical, is scarcely more than one-third that of the facial space. *Eyes*, of moderate size, sub-equal, excepting those of the fore-central pair, which are smallest. They occupy the whole width of the caput and form a large triangle whose base is much longer than its perpendicular height, and its apex (formed by the fore-central eyes) truncated. *Legs*, moderately long, 4, 1, 2, 3, slender, furnished with hairs and a few erect, slender, bristle-like spines—1 on the genua, and 1 to 2 on the tibiæ. *Falces*, not very strong, rather long, divergent, and furnished on the inner side near their

extremities with some fine sharp teeth. *Maxille*, rather long, strong at the base, somewhat narrowing to their extremities, which are strongly inclined, but do not meet over the labium. *Labium*, short, somewhat semicircular, with a transverse groove or impression. *Sternum*—broad, heart-shaped, and convex, its hinder extremity obtusely pointed.

CALEDONIA EVANSII, sp. nov.

Plate I. Fig. 4.

ADULT MALE (abdomen wanting).—Length of cephalothorax, $\frac{1}{2}$ of a line. The *cephalothorax* and *falces* are yellow-brown, the legs, *palpi*, and *falces* of a paler hue, and the sternum dark brown. The *eyes* are in two transverse rows, or four pairs, on small black spots; the posterior row (looked at from above and on the side) is straight, or if anything it has a very slight curve, whose convexity is directed forwards, the anterior row greatly curved forwards. Those of the hinder row are divided by equal intervals. The lateral pairs are placed on a very slight tubercle, quite on the side of the caput, and almost squarely to the line of the hind-central pair; and the fore-central pair is placed far below, its eyes being not quite contiguous to each other. The *palpi* are short, similar to the legs in colour; the radial and cubital joints are very short—the former has its fore extremity on the upper side produced into a tapering, rather hooked, sharp-pointed apophysis directed downwards. The digital joint is rather large. The palpal organs complex, with prominent lobes and processes, and a tolerably strong, coiled, prominent spine near their extremity.

Although strongly averse to the needless multiplication of the genera of these minute spiders, I cannot at present find a place for the one here described in any genus yet characterised. It appears to come nearest to *Tapinocyba*, Sim., but the position of the eyes is peculiar and very different from that genus, and there is no longitudinal groove or indentation running backwards from the lateral pairs of eyes, as in all known males of *Tapinocyba*. The fragment from which the above description has been made (destitute of several legs, one palpus, and the abdomen) was sent to me, through Mr. G. H. Carpenter, by Mr. William Evans, by whom the spider was found on the Pentlands in Scotland, and whose name I have great pleasure in connecting with it.

Gen. GONGYLIDIUM, Menge (*Neriene*, Bl., *ad partem*).

GONGYLIDIUM MORUM, sp. nov.

Plate I. Fig. 2.

ADULT FEMALE.—Length, $\frac{1}{15}$ th of an inch. *Cephalothorax*, oval, much longer than broad, obtuse, and narrowest in front; lateral

marginal constriction very slight, profile line very slightly hollow just behind the occiput, otherwise tolerably uniformly curved, occiput fairly convex and rounded; height of clypeus rather less than half that of the facial space. Colour, deep glossy blackish brown. *Eyes*, in two transverse rows, of moderate size, sub-equal, posterior row curved, the convexity of the curve directed backwards; anterior row nearly straight, the convexity of its slight curve directed forwards. The eyes of the hind-central pair are separated by a diameter's interval, and from the laterals by a very little more. The fore-centrals are near together, but not contiguous to each other, and each is a diameter's distance from the fore-lateral eye on its side. The four centrals form a trapezoid perceptibly longer than broad, and narrowest in front. Each lateral pair is placed slightly obliquely on a very small tubercle. *Legs*, moderate in length and strength, 4, 1, 2, 3, furnished with short hairs and a single slender, erect, bristle-like spine on the genua, and two or more still finer on the tibiæ. Their colour is orange yellow. The tarsi of the fourth pair are very slightly shorter than the metatarsi. *Falces*, tolerably long, strong, straight, dark olive brown. *Maxillæ*, *Labium*, and *Sternum*, blackish brown. *Abdomen*, oval, black, and clothed fairly with short fine hairs. Genital aperture not conspicuous, but of characteristic form.

Found at Aberlady, Scotland, by Mr. William Evans, and received from him through Mr. G. H. Carpenter.

Gen. TMETICUS, Menge (*Neriene* and *Linyphia*, Bl., *ad partem*).

? TMETICUS NEGLECTUS, sp. nov.

Plate I. Fig. 3.

ADULT FEMALE.—Length, 1 line. *Cephalothorax*, considerably longer than broad; the fore extremity tolerably broad, rounded; the lateral marginal impressions at the junction of the caput and thorax well marked, but not abrupt. The profile line follows a tolerably even curve from the hinder extremity to the eyes, a little flattened from the occiput to the hinder slope; colour, clear yellow brown. *Clypeus*, slightly impressed, its height being a little less than half that of the facial space. *Eyes*, on black spots, in two transverse curved rows forming a transverse oval figure, broader than long. The posterior row is much the most strongly curved, so that a line drawn to touch the anterior rims of the hind-central pair would run well above the upper rims of the hind-lateral eyes. The interval between the hind-centrals is equal to a diameter, and is considerably less than that between each and the hind-lateral eye next to it. The lateral eyes are placed rather obliquely, each pair on a tubercle; they are the largest of the eight, but are not quite contiguous to each other. The interval between the fore-centrals

is about half a diameter, and is rather greater than that between each and the fore-lateral eye next to it. The four central eyes form a trapezoid much longer than broad, its posterior side being shortest. *Legs*, rather short, 1, 4, 2, 3, tolerably robust; similar in colour to the cephalothorax. They are furnished with hairs and a few erect spiniform bristles—one on the genua, two on the tibiæ, and one or two near the extremity beneath the femora. The tarsi of the fourth pair are considerably shorter than the metatarsi. *Palpi*, similar in colour to the legs. *Falces*, long, strong, straight, similar to the cephalothorax in colour; armed with a row of 4 to 6 teeth near the inner extremity, the second and third from the inner side longest and strongest, and five very minute ones in a row a little behind them, also several small scattered tubercles above them, each surmounted by a fine bristle. *Maxilla*, moderate in length, strong, straight, obliquely truncate on the outer extremity, rather rounded on the inner side, inclined towards but not nearly touching over the labium; its colour is similar to that of the falces. *Labium*, of moderate size, broader than high, nearly semicircular, but rather flattened at the apex; yellow brown suffused with blackish. *Sternum*, heart-shaped, cut off in nearly a straight transverse line in front, and drawn out behind into a strong obtuse point between the coxæ of the fourth pair of legs. Colour, yellow-brown highly suffused with blackish brown. *Abdomen*, short-oval, olive brown, thickly covered, when seen under a lens in spirits of wine, with pale yellowish spots and markings disposed with some regularity in variously directed lines. Spinners, short, rather strong; and immediately in front of the inferior and strongest pair is a transverse angular slit with a distinctly free lip, and evidently the orifice to some tracheal organs. Genital aperture large, and rather complex; only a figure can give any adequate idea of it.

An example of this spider was received many years ago from my cousin, the late Colonel Pickard, R.A., by whom it was found in the island of Colonsay. I do not feel certain as to the exact generic position of this spider, but it seems to agree best with *Tmeticus*, Sim.

Fam. LYCOSIDÆ.

Gen. TROCHOSA, C. L. Koch.

TROCHOSA BIUNGUICULATA, Camb.

Plate I. Fig. 1.

Trochosa biunguiculata, Camb., "Trans. Linn. Soc.," xxvii. p. 526, Plate XIV. Fig. 2., and "Spid. Dors.," p. 544.

ADULT FEMALE.—Length, 5 lines; length of cephalothorax, $2\frac{1}{2}$ lines; breadth of cephalothorax, $1\frac{3}{4}$ lines. *Cephalothorax*, yellow-brown tinged with orange-brown, suffused on the sides of the thorax with

darker, clothed with short gray hairs and some strong bristles at the fore part of the caput; the two oblique lateral indentations at the junction of the caput and thorax are strong, and marked by a strong black stripe on each side, which is continued on the margin of the fore extremity of the caput, and there is a black patch on either side of the middle of the posterior slope. The thoracic indentation is indicated by a blackish longitudinal line, furcate at its fore extremity; the lateral converging indentations are also indicated by dark brown, dusky lines. *Eyes*, in normal position; the line formed by those of the posterior pair is rather the longest; the other two lines are nearly equal. The eyes of the middle line are largest. *Legs*, moderately long, strong, tapering, fairly but not densely clothed with gray and other hairs, and armed with spines; these are strongest on the legs of the third and fourth pairs. All the tibiæ and metatarsi have three pairs in two parallel rows beneath them, excepting the metatarsi of the fourth pair, beneath which the spines are stronger, rather more numerous, and not so symmetrically disposed as on the metatarsi of the first and second pairs. The colour of the legs is of an orange yellow hue; the coxal, exinguinal, and posterior half of the femoral joints are more or less suffused and marked with black and deep brown; the other joints are faintly and imperfectly annulated, or marked with brown or blackish. The hairs beneath the tarsi and metatarsi are blackish; beneath the former they almost amount to a scopula. The *Falces* are long and powerful, and of a black hue, with an orange-brown patch in front, and clothed with hairs and bristles. The *Maxillæ*, *Labium*, and *Sternum* are black, the two former slightly tipped with whitish. *Abdomen*, oval, of an orange-yellow-brown colour, brightest above, especially towards the fore extremity, clothed with short gray and, thinly, with longer dark hairs. Along the middle of the anterior half the position of the dorsal vessel is indicated by a longitudinal, tapering stripe densely clothed with short white hairs or pubescence, broadest and slightly angularly prominent near the middle, and obtusely pointed at its hinder extremity. The angular prominences and the hinder extremity of this stripe are rather strongly dashed or marked on the margins with black, and following it towards the spinners are 3 to 4 transverse angular lines or small chevrons ending in a black spot on each side; just above the spinners are two short, pale, whitish yellow, nearly parallel longitudinal lines. The anterior extremity of the abdomen is marked with a short curved black bar on each side of the central white stripe, and the sides have each two nearly straight rows of black spots directed obliquely backwards. The under side is dark brown with a broad, longitudinal, central black-brown band. The genital aperture is not conspicuous, but of characteristic form.

The example above described was found by Mr. William Evans at Aviemore in Scotland, and kindly sent to me through Mr.

G. H. Carpenter. This sex (female) is new to science, the male only having been previously met with at Braemar by Professor Trail (*loc. cit. supra*).

EXPLANATION OF PLATE I.

FIG.

1. *Trochosa biunguiculata*, Camb. ♀
a, Spider enlarged; *b*, do. natural length.
2. *Gongyliidium morum*, sp. nov. ♀
a, Profile of cephalothorax; *b*, cephalothorax from above and behind; *c*, eyes do.; *d*, genital aperture; *e*, length of spider.
3. *Tmeticus neglectus*, sp. nov. ♀
a, Cephalothorax from above and behind; *b*, eyes do.; *c*, cephalothorax in profile; *d*, sternum; *e*, genital aperture; *f*, length of spider.
4. *Caledonia Evansii*, sp. nov. ♂
a, Cephalothorax from above and behind; *b*, do. nearly in profile; *c*, eyes from in front; *d*, sternum, maxillæ, and labium; *e*, left palpus; *f*, radial and cubital joints of palpus in profile; *g*, length of cephalothorax.

CONTRIBUTIONS TOWARDS A FLORA OF EAST
SUTHERLAND (*continued*).

By ARTHUR BENNETT, F.L.S.

POTAMOGETON PERFOLIATUS.—*Syme*, sp., in Herb. Brit. Museum; near Invershin, *Dr. Craig*, l.c.

POTAMOGETON NATANS.—*Forsinard*, *Grant*, sp.

POTAMOGETON POLYGONIFOLIUS.—*Grant*, sp.

ZOSTERA MARINA.—Seashore, East Golspie, *Grant*, sp.

SPARGANIUM MINIMUM.—*Oliver*, sp.; *H. C. Watson*; near Invershin, *Dr. Craig*, l.c.

(SPARGANIUM SIMPLEX AND S. RAMOSUM.—Not recorded.)

JUNCUS CONGLOMERATUS.—Golspie Burn, *Grant*, sp.

JUNCUS EFFUSUS.—Between Kinbrace and Kildonan, *Grant*.

JUNCUS LAMPROCARPUS.—Golspie Tower, *Grant*, sp.

JUNCUS SUPINUS, *var. KOCHII*.—East side of Ben Clibrich, *Marshall*.

var. ULIGINOSUS.—Bealich Pass, below Ben Clibrich, on east side, *Marshall*.

JUNCUS GERARDI.—Ferry Wood, at Golspie, *Grant*.

JUNCUS BUFONIUS AND J. SQUARROSUS.—Between Kinbrace and Kildonan, *Grant*.

JUNCUS TRIFIDUS.—East side of Ben Clibrich, *Marshall*.

LUZULA SYLVATICA AND L. PILOSA.—Between Kinbrace and Kildonan.

- LUZULA CAMPESTRIS AND L. MULTIFLORA.—*H. C. Watson.*
- LUZULA SPICATA.—East side of Ben Clibrich, *Marshall.*
- SCHÆNUS NIGRICANS.—*C. Babington*, sp. ; *H. C. Watson* ; between Kinbracè and Kildonan, *Grant.*
- RHYNCHOSPORA ALBA.—*Campbell*, sp. ; *H. C. Watson* ; Loch Shin, *Murray's "Northern Flora."*
- BLYSMUS RUFUS.—Ferry Wood, at Golspie, *Grant.*
- ERIOPHORUM VAGINATUM.—Between Kinbrace and Kildonan, *Grant.*
- ERIOPHORUM ANGUSTIFOLIUM.—*H. C. Watson.*
- ERIOPHORUM LATIFOLIUM.—Near Invershin, *Dr. Craig*, l.c. ; Oykell Bridge, *Marshall* and *Hanbury*, l.c.
- CAREX DIOICA.—“*Stables*, sp.” ; *H. C. Watson.*
- CAREX PULICARIS.—Between Kildonan and Kinbrace, *Grant.*
- CAREX PAUCIFLORA.—“*Graham*, sp.” ; *H. C. Watson.*
- CAREX STELLULATA.—Between Kinbrace and Kildonan, *Grant.*
- CAREX OVALIS.—Between Kinbrace and Kildonan, Forsinard, *Grant.*
- CAREX REMOTA.—Side of burn, Dunrobin Nurseries, *Grant*, sp.
- CAREX ARENARIA.—Links west of Golspie, *Grant*, sp.
- CAREX VULGARIS.—Between Kinbrace and Kildonan, *Grant.*
- CAREX RIGIDA.—East side of Ben Clibrich, *Marshall.*
- CAREX FLAVA, *var* MINOR.—Between Invershin and Oykell Bridge, *Marshall* and *Hanbury.*
- CAREX CÆDERI, Ehrh. (non Auct.)—Golspie, *Grant*, sp.
- CAREX PALLESCENS.—Near Rosehall, *Marshall* and *Hanbury.*
- CAREX FULVA.—Oykell Bridge, *Marshall* and *Hanbury.*
- CAREX BINERVIS.—Between Kinbrace and Kildonan, *Grant* ; Lairg, *Miller*, sp.
- CAREX PANICEA.—*H. C. Watson.*
- CAREX GLAUCA.—Near Invershin, *Dr. Craig*, l.c. ; Burn near Golspie Tower, *Grant*, sp.
- (*CAREX PRÆCOX.*—Not recorded.)
- CAREX PILULIFERA.—Between Kinbrace and Kildonan, *Grant*, sp.
- CAREX FILIFORMIS.
- CAREX AMPULLACEA.—*Grant*, 1883 ? (West Sutherland ?) Record Club.
- PHALARIS ARUNDINACEA.—*H. C. Watson.*
- ANTHOXANTHUM ODORATUM.—Between Kinbrace and Kildonan, *Grant.*

PHLEUM PRATENSE, *var.* NODOSUM.—Golspie, *Grant*, sp.

ALOPECURUS PRATENSIS.—*H. C. Watson*.

ALOPECURUS GENICULATUS.—Near Free Church, Golspie, *Grant*, sp.

MILIUM EFFUSUM.—Dunrobin Glen, *Grant*, sp.

AGROSTIS CANINA.—Oykell Bridge, *Marshall* and *Hanbury*.

AGROSTIS VULGARIS, *var.* PUMILA.—Shores of Loch Brora, *Grant*, sp.

AGROSTIS VULGARIS	} all <i>H. C. Watson</i> .
PSAMMA ARENARIA	
PHRAGMITES COMMUNIS	

AIRA CÆSPITOSA, *var.* PSEUDO-ALPINA.—Kildonan, *Grant*; Ben Clibrich, *Marshall*.

AIRA FLEXUOSA.—East side of Ben Clibrich, *Marshall*.

AIRA CARYOPHYLLEA.—Roadside near Golspie Tower, *Grant*, sp.; Rosehall, *Marshall* and *Hanbury*.

AIRA PRÆCOX	} both <i>H. C. Watson</i> .
HOLCUS LANATUS	

(HOLCUS MOLLIS.—Not recorded.)

AVENA PUBESCENS.—Golspie Links, *Grant*, sp.

AVENA STRIGOSA.—Between Bonar Bridge and Loch Shin, *Murray's* "*Northern Flora*."

ARRHENATHERUM AVENACEUM.—*H. C. Watson*.

TRIODIA DECUMBENS.—Near Torbol, *Grant*, sp.

KÆLERIA CRISTATA.—Links west of Golspie, *Grant*, sp.

MELICA UNIFLORA.—"Extinct," *Journ. Bot.*, p. 363, 1889.

MELICA NUTANS.—Near Invershin, *Dr. Craig*, l.c.

CATABROSA AQUATICA.—The Mound, Golspie, *Grant*, sp.

GLYCERIA FLUITANS.—*H. C. Watson*.

POA ANNUA, *forma* CONGESTA.—Roadside at Golspie, *Grant*, sp.

POA PRATENSIS, *var.* SUBCÆRULEA.—Sea-shore at Golspie, *Grant*, sp.

(POA TRIVIALIS.—Not recorded.)

CYNOSURUS CRISTATUS.—*H. C. Watson*.

(DACTYLIS GLOMERATA.—Not recorded.)

(FESTUCA DURIUSCULA.—Not recorded.)

FESTUCA SCIUROIDES.—Pict's House, Dunrobin, *Grant*, sp.

FESTUCA OVINA.—Ferry Wood, Golspie, *Grant*, sp.

FESTUCA RUBRA.—Roadside at Golspie Tower, *Grant*, sp.

(FESTUCA PRATENSIS AND F. ARUNDINACEA.—Not recorded.)

BROMUS ASPER.—Near the Falls, Dunrobin Burn, *Grant*, sp.

BROMUS MOLLIS.—*H. C. Watson*.

BRACHYPODIUM SYLVATICUM.—Near Invershin, *Dr. Craig*, l.c.

TRITICUM REPENS.—Sea-shore near Golspie Burn, *Grant*, sp.

TRITICUM JUNCEUM.—*Marshall* and *Hanbury*.

LOLIUM PERENNE }
 ELYMUS ARENARIUS } all *H. C. Watson*.
 NARDUS STRICTA }

POLYPODIUM VULGARE.—Lairg, *Miller*.

POLYPODIUM PHEGOPTERIS.—*Johnston*, M. S. ; *H. C. Watson* ; Invershin, *Dr. Craig*, l.c.

POLYPODIUM DRYOPTERIS.—Gordonbush, near Golspie, *Grant*, sp. ; Invershin, *Dr. Craig*.

CYSTOPTERIS FRAGILIS.—Kildonan, *Grant*, R. C. 1883.

(POLYSTICHUM LOBATUM.—*Grant*, R. C. 1883 ; but from W. Sutherland.)

POLYSTICHUM LONCHITIS.—Ben Griam, *Henderson*.

LASTREA FILIX-MAS.—*H. C. Watson*.

LASTREA MONTANA.—Between Kinbrace and Kildonan, *Grant*.

ATHYRIUM FILIX-FÆMINA.—*H. C. Watson*.

ATHYRIUM ALPESTRE.—East side of Ben Clibrich, *Marshall*, sp.

ASPLENIVM TRICHOMANES.—Not recorded.

ASPLENIVM MARINUM.—Sandstone rocks, Strathstevan, *Grant*, sp.

ASPLENIVM ADIANTUM-NIGRUM.—Kildonan, *Grant*, R. C. 1883.

BLECHNUM BOREALE }
 PTERIS AQUILINA } both *H. C. Watson*.

BOTRYCHIUM LUNARIA.—Golspie Links, *Grant*, sp.

LYCOPODIVM SELAGO.—Hillside, Loch Brora, *Grant*, sp.

LYCOPODIVM ANNOTINUM.—Free Vater, 3rd August 1833, *W. A. Stables* (“Phytologist,” 147, 1842).

LYCOPODIVM SELAGINOIDES.—Invershin, *Dr. Craig* ; near the Mound, Golspie, *Grant*, sp.

ISOETES LACUSTRIS.—In the river Oyke, above Invershin, *Graham*, exs.

PILULARIA GLOBULIFERA.—Roadside above Invershin, *Graham*, exs. ; *Campbell*, sp. ; *H. C. Watson*.

EQUISETUM ARVENSE.—*H. C. Watson*.

EQUISETUM PALUSTRE.—Kildonan, *Grant*, R. C. 1883.

EQUISETUM LIMOSUM.—*Marshall and Hanbury.*

NITELLA OPACA.—“*Campbell 1833,*” *H. C. Watson.*

NITELLA TRANSLUCENS.—*Lochinver, O. Nordstedt, in 1885.*

CHARA FRAGILIS.—*O. Nordstedt, in 1885.*

A CONTRIBUTION TOWARDS THE MOSS-FLORA OF PERTHSHIRE.

By T. D. SADLER.

ALTHOUGH much has been written concerning the flora in general of Perthshire, yet very few papers have been specially devoted to its Moss-Flora. Many botanists have given, in accounts of their excursions to various places in Perthshire, the names of the interesting or rarer mosses with which they have met; and these accounts are to be found in several of our scientific periodicals.

The first, so far as I know, who wrote on the mosses of Perthshire was William Gardiner, jun., of Dundee. In 1839 he wrote a short paper entitled “A Catalogue of Mosses, collected in Forfarshire and Perthshire.” In this paper he embodies the results of two muscological excursions which he had made; and enumerates (including mosses of Forfarshire not found in Perthshire, at least in his time) 155 species and varieties, belonging to 26 genera. This paper was not, I think, ever published, and the manuscript is now in the Library of the Royal Botanic Garden, Edinburgh, having been presented to the Botanical Society by the author. Its present scientific value is not very great.

Among subsequent botanists who have given us lists of mosses which they have gathered in this county, may be mentioned Messrs. Holt, Sadler, and Sim, and Drs. Greville, Lauder Lindsay, Stirton, and, last but not least, F. Buchanan White. The publications in which their lists are chiefly to be found are the “*Scottish Naturalist,*” and the “*Proceedings and Transactions of the Botanical Society of Edinburgh,*” and of the “*Perthshire Society of Natural Science.*” I give a list of eight of these papers further on; so that any one

wishing it may obtain more information regarding the bryology of Perthshire.

The following list is largely taken from a reference manuscript book of what may be called a Moss-Flora of Britain by my father, the late Mr. John Sadler, Edinburgh. I have, however, added many species and localities, which I have found principally in books. Some mosses may be extinct in the localities given, as it is between 20 and 30 years since many of them were gathered. Still they will be of historical interest. The whole list must be looked upon as a "contribution" only to the Moss-Flora of Perthshire. There are about 260 species and varieties enumerated in this list, which I have arranged according to Hobkirk's "Synopsis," 1873, as probably being the book, after Wilson's "Bryologia Britannica," by which they were determined. There are found on Ben Lawers alone quite 200 species and varieties; and probably all the rest of Perthshire could not add another hundred to this number. Most of the mosses of Mr. Sadler's large collection are now in the Herbarium of the Royal Botanic Garden, Edinburgh, where they may be consulted.

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1. GREVILLE, Dr. R. K.—On Mosses collected at Bridge of Allan. Proc. Bot. Soc. Edin., 1856, p. 3.
2. GREVILLE, Dr.—Report on Musci of Ben Lawers. Proc. Bot. Soc. Edin., 1856, p. 4. See *Nichol*.
3. HUNT, G. E.—Notes on the Rarer Mosses of Perthshire and Braemar. Trans. Lit. and Phil. Soc. Manchester, 1871, p. 314.
4. NICHOL, W.—Additional List of Mosses. Proc. Bot. Soc. Edin., 1856, p. 5. See *Greville*.
5. SADLER, J.—Muscological Excursions to Ramsheugh and Glen Farg, Perthshire, and Habbie's Howe, Pentland Hills, in September last. Trans. Bot. Soc. Edin., 1857, p. 151.
6. STIRTON, Dr. JAMES.—New and Rare Mosses from Ben Lawers. Proc. Bot. Soc. Edin., 1870, p. 426.
7. WHITE, Dr. F. B.—Notice of two Mosses new to Science—*Hypnum rupestre*, Buchanan White's MS.; and *Hypnum Breadalbense*, Buchanan White's MS. Trans. Bot. Soc. Edin., ix. p. 198.

8. WHITE, Dr. F. B.—The Fungi, Mosses, and Ferns of Kinnoull Hill. Proc. Perth. Soc. Nat. Sci., i., 1886.

LIST OF ABBREVIATIONS EMPLOYED.

W. B. B. = W. B. Boyd, Esq., of Faldonside.
 Gard. = William Gardiner.
 A. M'K. = Alexander M'Kinlay.
 J. S. = John Sadler.
 hb. J. S. = In herbarium of J. Sadler.
 F. B. W. = Dr. F. Buchanan White.

The meanings of all other abbreviations are obvious.

ACROCARPI.

- ANDRÆA *petrophila*, Ehr. Common, Ben Lawers, etc.
A. alpestris, Schimp. "Perthshire."
A. alpina, Turn. Rocks on Ben Lawers above Loch-na-Cat, Ben Ledi, Killin (J. S.)
A. rupestris, Turn. (*A. Rothii*, W. and M.) Killin, Ben Lawers (hb. J. S.)
A. falcata, Schimp. Ben Lawers, Ben Voirlich.
 SPHAGNUM *cymbifolium*, Ehr. Shores of Loch Lomond, Ben Lawers (hb. J. S., 1866).
S. acutifolium, Ehr. Ben Lawers, Glen Turret, Crieff (J. S.)
S. cuspidatum, Ehr. Glen Turret, Almondbank Bog, Perth, Peat-holes, Braes of Doune (A. M'K.), Craig Chailleach (Dr. Nichol, in hb. J. S.)
S. contortum, Schultz. Glen Turret, Shores of Loch Lomond.
S. curvifolium, Wils. Glen Falloch (A. M'K., 1862).
S. squarrosum, Pers. Killin (J. S., 1871).
 PHASCUM *cuspidatum*, Schreb. Glen Farg.
 δ *piliferum*. Dunkeld (Gard., 1837), Kinnoull (F. B. W., 1866, in hb. J. S.)
P. subulatum, L. Bridge of Allan.
 GYMNSTOMUM *tenue*, Schrad. Den of Dupplin (Arnott).
G. rupestre, Schw.
 β *ramosissimum*. Ben Voirlich (A. M'K.)
 δ *compactum*. Glen Falloch (A. M'K.)
 WEISSIA *controversa*, Hedw.
 γ *densifolia*. Callander (A. M'K.)
W. crispula, Hedw. Ben Lawers, Ben Voirlich, by Loch Lomond.
W. verticillata, Brid. Glen Tilt.

- SELIGERIA *pusilla*, Br. and Sch. Blair-Athole (Miss M'Inroy).
S. tristicha, Brid. Blair-Athole, Glen Tilt, and Ben-y-Gloe (Rev. J. M. Crombie).
 ANODUS *Donianus*, B. and S. (*Gymnostomum Donianum*, Sm.) Den of Dupplin (G. Don), Blair-Athole (Miss M'Inroy).
 STYLOSTEGIUM *cæspiticium*, B. and S. Summit of Ben Lawers, very rare (G. Lyon). See Sir W. J. Hooker's "British Flora," vol. ii.
 BLINDIA *acuta*, B. and S. Ben Lawers, Ben Ledi, Trossachs (Mrs. Robertson).
 ARCTOA *fulvella*, B. and S. Ben More (Dicks.), Ben Lawers (Greville).
 DICRANUM *polycarpum*, Ehr. Trossachs, Ben Lawers, and Loch Achray (A. M'K.), Ben Ima (Dr. Stirton), Killin (J. S.)
 β strumiferum. Dalnaspidal (W. B. Boyd, 1870, in hb. J. S.)
D. virens, Hedw. Abundant on Ben Lawers.
D. pellucidum, Hedw. Dalnaspidal (W. B. B., 1870, in hb. J. S.)
D. Grevillianum, B. and S. (*D. Schreberianum*, H. and T.) Glen Tilt. Not found since 1823. See the "Bryologia Britannica."
D. squarrosum, Schrad. Wet rocks Ben Lawers (hb. J. S.)
D. cerviculatum, Hedw. Dalnaspidal (W. B. B., in hb. J. S., 1870).
D. heteromallum, Hedw.
 δ sericeum, Schp. Soccoth Hill, Arrochar (A. M'K.)
D. Starkii, W. and M. Ben Lawers, and all the Breadalbane range.
 β molle. Ben Lawers.
D. falcatum, Hedw. Summit of Ben Lawers, Ben More, etc.
D. glaciale, Berg. Ben-y-Gloe.
D. Scottianum, Turn. Killin (J. S., 1870), rocks by Loch Lomond (hb. J. S.)
D. longifolium, Hedw. Ben Lawers (Dr. Stirton, 1866), Ben Voirlich, Ben-y-Gloe.
D. circinnatum, Wils. Ben Voirlich.
D. scoparium, Hedw. Glen Tilt, Loch Tay, Ben Lawers (hb. J. S., 1866).
 var. *paludosum*, Schimp. Glen Ogle (Boswell, 1873).
D. palustre, Brid. Kinnoull (Croall, 1855), Doune and Blair-Drummond (A. M'K.)
 β juniperifolium, Sendt. Ben Lawers (Wils., 1855).
 LEUCOBRYUM *glaucum*, Hampe. Loch Lomond, Ben Lawers (hb. J. S., 1866).
 DICRANODONTIUM *longirostre*, B. and S. Ben Lawers, Ben Ledi, and Trossachs (A. M'K.)

- CAMPYLOPUS *brevipilus*, B. and S. Mael Ghyrddy (W. B. B., 1870, in hb. J. S.), Doune.
- C. flexuosus*, Brid. Ben Ledi.
- C. Swartzii*, Schpr. Ben Voirlich, Ben Ledi, Ben Arthur, Ben Ima, and Ben More (A. M'K.), hills behind Callander (Dr. Stirton).
- C. fragilis*, B. and S. Ben Lomond (Dr. Stirton), Ben Ledi (Dr. Braithwaite).
- C. Schimperii*, Milde. Ben Challum, Ben Lawers, Ben Ledi, Ben Lomond, Mael Ghyrddy.
- POTTIA *truncata*, B. and S. Abundant.
- ANACALYPTA *latifolia*, N. and H. Glen Tilt (Barker, 1871).
 β *pilifera*. Near Aberfeldy (Dicks.)
- DISTICHIUM *capillaceum*, B. and S. Ben Lawers (hb. J. S., 1870).
- D. inclinatum*, B. and S. Ben Lawers (Fergusson, 1868).
- DIDYMODON *cylindricus*, B. and S. Ben Voirlich (A. M'K.); Ben More, Ben Lawers, and Trossachs (Hunt); Ben Arthur (Stirton); Moy Laggan, Perth (Mrs. Farquharson).
- D. flexifolius*, Hook. and Tayl. Ben Ledi and adjacent mountains.
- D. recurvifolius*, Tayl. Ben Voirlich and Ben Lomond (A. M'K.).
- TRICHOSTOMUM *littorale*, Mitten. Rannoch (F. B. W.)
- T. tenue*, Hedw. Carn Lochan and Mael Ghyrddy (Crombie).
- T. flexicaule*, B. and S. Kinnoull (hb. J. S.), Dalnaspidal (W. B. B., 1870, in hb. J. S.)
 β *densum*, Ben Lawers (Stirton).
- T. homomallum*, B. and S. Dunkeld (Borrer), Abernethy (Howie).
- TORTULA *muralis*, Timm. Bridge of Allan.
 δ *rupestris*, Wall opposite Parish Church, Bridge of Allan, 1855 (in hb. J. S.)
- T. unguiculata*, Hedw. Bridge of Allan, 1855 (in hb. J. S.)
- T. fallax*, Hedw. Walls, Bridge of Allan.
- T. rufa*, Lorenz. Ben Lawers (Dr. Stirton).
- T. princeps*, De Not. (*T. Müllerii*, B. and S.) Blair-Athole (hb. J. S.)
- T. ruralis*, Hedw. Finlarig (Wils.)
- T. lævipila*, Brid. On wall opposite Parish Church, Bridge of Allan,
 "This species is usually found on trees, and is rare on walls; but near Bridge of Allan the *variety* is abundant on walls and rare on trees" (Grev.)
- T. intermedia*, Brid. Killin (A. M'K., 1862, in hb. J. S.), Kinnoull (F. B. W., 1865, in hb. J. S.)

- T. papillosa*, Wils. Killin (Hunt).
T. tortuosa, W. and M. Glen Farg, Killin (J. S.)
T. fragilis, Wils. Ben Lawers, Ben Laoigh (Ewing).
 ENCALYPTA *commutata*, N. and H. Ben Lawers and Breadalbane Mountains.
E. ciliata, Hedw. Killin (J. S., 1871).
E. rhabdocarpa, Schw. Ben Lawers and Breadalbane Mountains.
 HEDWIGIA *ciliata*, Hedw. Glen Farg, Ben Lawers.
 GRIMMIA *apocarpum*, B. and S. Bridge of Allan (in hb. J. S.)
G. subsquarrosa, Wils. Kinnoull Hill (F. B. W.), Moncreiffe Hill.
G. torquata, Grev. Ben Lawers, and other Breadalbane Mountains,
G. funalis, Schw. Ben Lawers.
G. ovata, W. and M. Breadalbane Mountains.
G. commutata, Hueb. Moncreiffe Hill (Stirton), Dunkeld (F. B. W.)
G. atrata, Mielich. Summit of Ben Lawers, rare (Gard., 1838).
 RACOMITRIUM *aciculare*, Brid. Ben Lawers (hb. J. S.)
R. lanuginosum, Brid. Ben Lawers (hb. J. S., 1866).
R. canescens, Brid. Walls by Allan Water, 1855 (in hb. J. S.)
 Frequent.
 γ *ericoides*. Pass of Killiecrankie (Gard.)
 GLYPHOMITRIUM *Daviesii*, Schw. New Kilpatrick, Killin (A. M'K.)
 PTYCHOMITRIUM *polyphyllum*, B. and S. Loch Tay, Glen Lyon,
 Banks of Teith above Callander.
 ORTHOTRICHUM *cupulatum*, Hoffm. Callander (A. M'K.)
O. affine, Schrad. Glen Tilt, etc.
O. anomalum, Hedw. Dalnaspidal (W. B. B., in hb. J. S.)
O. Ludwigii, Schw. Killin (W. B. B., in hb. J. S.)
O. crispum, Hedw. Ben Lawers (hb. J. S., 1866).
O. Drummondii, H. and G. Glen Tilt.
O. Hutchinsiae, Sm. Loch Lomond.
 ZYGODON *Lapponicus*, B. and S. Ben Lawers.
Z. Mougeotii, B. and S. Ben Lawers, Craig-na-Lochan, and Campsie
 Hills (Stirton); Glen Farg and Killin (J. S.)
 BUXBAUMIA *aphylla*, Haller. Ben Ledi.
 DIPHYSCIUM *foliosum*, W. and M. Ben Ledi.
 ATRICHUM *undulatum*, P. Beauv. Glen Tilt.
A. angustatum, Brid. Braes of Doune (A. M'K.)

A. tenellum, Roth. Killin.

OLIGOTRICHUM *hercynicum*, DC. Ben Ledi, Ben Lawers, Killin (J. S.)

var. *foliis secundis*. Ben Lawers [and Ben Nevis] (A. M'K., 1862).

POGONATUM *alpinum*, Brid. (*Polytrichum alpinum*, L.) Ben Ledi, Ben Lawers, Ben Lomond, Glen Tilt, Lady's Isle (Loch Katrine) (J. S.)

POLYTRICHUM *sexangulare*, Hoppe. Ben Lawers.

P. gracile, Menzies. Callander, Ardlui.

P. formosum, Hedw. (*P. commune*, L. β *attenuatum*).

"The var. β *attenuatum* I found on Craigiebarns Hill, Dunkeld, in September 1837, 15 in. in height" (Gardiner).

P. commune, L. Ben Lawers, etc. Common.

P. strictum, Menzies. Bridge of Allan.

TIMMIA *austriaca*, Hedw. Plentiful on summit of Ben Lawers (J. S.)

T. megapolitana, Hedw. Ben Lawers (Stirton).

AULACOMNION *palustre*, Schw. Ben Ledi and Ben Lawers (J. S.)

γ *fasciculare*. Ben Ledi.

BRYUM *acuminatum*, B. and S. Ben Chonzie, Craig Chailleach, Ben Cruachpen, Ben Lawers, Mael Ghyrddy, and near Callander (J. S.)

B. polymorphum, B. and S. Ben Lawers.

B. elongatum, Dicks. Loch Lubnaig and Ben Lawers (J. S.), Loch Tay.

B. crudum, Schreb. Ben Ledi, Craig Chailleach, and Ben Lawers (J. S.); Dalnaspidal (W. B. B., in hb. J. S.)

B. nutans, Schr. Glen Tilt (Balfour), Ben Lawers (hb. J. S.), Dalnaspidal (W. B. B., 1870, in hb. J. S.)

B. annotinum, Hedw. Ben More (J. S.)

B. Wahlenbergii, Schw. Craig Chailleach, Glen Farg, near Bridge of Earn (J. S.); Ochils.

B. Ludwigii, Spr. Ben Lawers.

β *gracile*. Ben Lawers, Ben Lomond.

B. pseudo-triquetrum, Schw. Glen Turret, Crieff, Strath Tummel (Grev.), Ben Lawers, Ben Ledi.

B. alpinum, L. Ben Lomond (Balfour), Ben Lawers and Killin (J. S.)

B. latifolium, Schl. Ben More.

- B. Duvalii*, Voigt. Ben Lawers. See "Trans. Bot. Soc. Edin.," vol. vii. p. 6.
- B. pallens*, Swartz. Ben Lawers, Glen Ogle (Grev.), Glen Turret and Killin (J. S.)
- B. barbatum*, Wils. Ben Ledi (Stirton).
- B. pallescens*, Schw. Lochearnhead, Dalnaspidal (W. B. B., in hb. J. S.)
β boreale. Ben Lawers (A. M'K.)
- B. bimum*, Schreb. Ben Lawers (Gard.)
- B. capillare*, Hedw. Glen Farg, Glen Tilt, Glen Ogle, Strath Tummel, Blairlogie, etc. (J. S.)
- B. caespiticium*, L. Ben Lawers, Ben Ledi, Glen Turret, and Doune (J. S.) "Common in wet situations."
- B. julaceum*, Sm. Ben Ledi, Ben Lawers, Mael Ghyrddy, Lochearnhead, Glen Turret, Glen Ogle, and Glen Queich (J. S.)
- B. Zierii*, Dicks. Ben Ledi, Ben Lawers, Mael Ghyrddy, Craig Chailleach, and Killin (J. S.)
- B. demissum*, Hook. Glen Ogle, Craig Chailleach, and Ben Lawers (J. S.)
- B. roseum*, Schreb. Aberfeldy (Macmillan).
- MNIUM cuspidatum*, Hedw. Glen Turret (Balfour).
- M. rostratum*, Schr. Ramsheugh.
- M. spinosum*, Voigt. Ben Lawers (A. M'K.)
- M. serratum*, Brid. Bridge of Allan.
- M. hornum*, L. Frequent.
- M. undulatum*, Hedw. Ramsheugh.
- M. cinclidioides*, Hueb. Craig Chailleach (Nichol, 1855, in hb. J. S.), Ben Challum (A. M'K., in hb. J. S.)
- M. punctatum*, Hedw. Ben Lawers, Ramsheugh, etc.
- M. subglobosum*, B. and S. Moness Woods (Bell), Upper Kilfauns (F. B. W., 1865, in hb. J. S.)
- CINCLIDIUM stygium*, Sw. Craig Chailleach (W. B. B., in hb. J. S.)
- MEESIA uliginosa*, Hedw. Craig Chailleach and Ben Cruachpen (Dr. Nichol, 1885, in hb. J. S.), Dunbarnie Links.
- AMBLYODON dealbatus*, P. Beauv. Killin (J. S.)
- FUNARIA hygrometrica*, Hedw. Common.
- BARTRAMIA arcuata*, Brid. Loch Lomond, Ben Lawers, Glen Falloch, Trossachs near Callander.
- B. fontana*, Brid. Ben Lawers, Bracklin Bridge, 1855 (in hb. J. S.)

- B. adpressa*, Fergusson. Glasmeal (Hunt).
B. calcarea, B. and S. Middle range of Ochils (T. Lyle, 1852).
B. pomiformis, Hedw. Glen Farg, Ben Lawers, Killin.
B. gracilis, Floerke. Ben Lawers, Larig-an-Lochan.
 CONOSTOMUM *boreale*, Sw. Ben Lawers (J. S.)
 CATOSCOPIUM *nigratum*, Brid. Plentiful on Ben-y-Gloe, near Blair-Athole, Dunbarnie Links (Howie).
 DISCELIUM *nudum*, Brid. (*Weissia nuda*, H. and T.) Perth (Don).
 SPLACHNUM *vasculosum*, L. Ben More, Ben Lawers above Loch-na-Cat, Strath Tummel.
S. sphaericum, Hedw. Ben Lawers.
 TETRAPLONDON *mnioides*, B. and S. Mael Ghyrdy (Nichol, in hb. J. S.)
 TAYLORIA *serrata*, B. and S.
 γ tenuis. Ben Lawers, Forest of Glen More.
 DISSODON *splachnoides*, Grev. Craig Chailleach (Wils.)
 ŒDIPODIUM *Griffithianum*, Schw. Ben Ledi, Mael Ghyrdy, and Killin (J. S.); Ben Lomond (G. Lyon); Ben Lawers.
 FISSIDENS *bryooides*, Hedw. Bridge of Allan.
F. adiantoides, Hedw. Glen Farg and Ben Lawers (J. S.), Ben Ledi. Wet rocks by Allan Water.
F. decipiens, De Not. Ben Voirlich (Shaw).

PLEUROCARPI.

- ANÆCTANGIUM *compactum*, Schw. Ben Lawers and Killin (hb. J. S.), Dalnaspidal (W. B. B. in hb. J. S.)
 LEUCODON *sciurooides*, Schw. Strageath (Grev.)
 ANTITRICHIA *curtipendula*, Brid. Ben Ledi (hb. J. S.)
 ANOMODON *viticulosus*, H. and T. Finlarig (J. S.)
A. longifolius, Hartm. Ben Lawers (Grev.)
 HABRODON *Notarisii*, Schpr. Killin (A. M'K., 1865; W. B. B., 1870); Ben Lawers (Hunt).
 PTEROGONIUM *filiforme*, Hedw. Ben Lawers. Common.
 CLIMACIUM *dendroides*, W. and M. Bridge of Earn. Frequent on Breadalbane Mountains.
 CYLINDROTHECIUM *Montagnei*, B. and S. Craig Chailleach (W. B. B., in hb. J. S.)
 LESKEA *moniliformis*, Wahl. Ben Lawers, etc., in Breadalbane.
L. apiculata, Hueb. Ben Lawers.

- L. polycarpa*, Ehr. Kinnoull (F. B. W., 1865, in hb. J. S.)
- L. rufescens*, Hall. Craig Chailleach (Nichol, in hb. J. S.); upper end of Finlarig Burn (Wils.)
- L. subrufa*, Wils. Trossachs (A. M'K., in hb. J. S.)
- HYPNUM abietinum*, Dill. Breadalbane Mountains, etc.
- H. Blandovii*, W. and M. Trossachs (Mrs. Robertson).
- H. decipiens*, De Not. Ben Lawers (Stirton), Glasmeal (Hunt).
- H. delicatulum*, L. Kinnoull (F. B. W., in hb. J. S.)
- H. plicatum*, Schl. Ben Lawers (G. Lyon).
- H. albicans*, Dill. Kinnoull (F. B. W., in hb. J. S.)
- H. reflexum*, Seliger. Ben Lawers.
var. "*fil. fol. acuneat.*" Ben Lawers (F. B. W., in hb. J. S.)
- H. rutabulum*, Dill. Blairlogie, (hb. J. S.)
- H. plumosum*, Swartz. Ben Lawers (J. S.)
- H. myosuroides*, L. Near the Hermitage, Dunkeld (Gard., 1837); Bracklin Bridge, Callander, and rocks by Loch Earn (Grev.)
- H. dimorphum*, Brid. Ben Lawers.
- H. catenulatum*, Schw. Ben Lawers, Loch-na-Hine.
- H. circinnatum*, Brid. Bracklin Bridge.
- H. striatum*, Hedw. Walls by Allan Water.
- H. piliferum*, Vaill. Keir near Bridge of Allan (J. S.)
- H. cirrhosum*, Schw. Ben Lawers.
- H. Swartzii*, Turn. Banks of the Forth, and Allan Water near Bridge of Allan (J. S.)
- H. depressum*, Bruch. Allan Water near Bridge of Allan, in fruit (J. S.); Trossachs (Lyle).
- H. murale*, Dill. Kinnoull (F. B. W., in hb. J. S.)
- H. ruscifolium*, Dill. Ben Lawers (hb. J. S.)
- H. alopecurum*, Dill. Ochils.
- H. pulchellum*, Dicks. Trossachs (A. M'K.), Den of Rechip.
- H. Mühlenbeckii*, B. and S. Ben Lawers and Ben Ledi (A. M'K.)
- H. Silesiacum*, Seliger. Ben Lawers.
- H. denticulatum*, Dill. Ben Ledi.
- H. elegans*, Hook. Kinnoull (F. B. W., in hb. J. S.)
- H. undulatum*, Dill. Ben Lawers (hb. J. S.)
- H. atro-virens*, Dicks. Ben Lawers.
- H. serpens*, Dill. Walls above Blairlogie.

- H. irriguum*, Hook. Callander (J. S.)
- H. Halleri*, L. jun. Ben Lawers, very rare.
- H. stellatum*, Dill. Dunkeld (Gard.)
- H. revolvens*, Swartz. Dunbarnie Links (Howie).
- H. uncinatum*, Hall. Dalnaspidal (W. B. B., in hb. J. S.)
- H. commutatum*, Dill. Banks of the Teith near Keir.
- H. sulcatum*, Schpr. Ben Lawers (Hunt).*
- H. falcatum*, Brid. Ben Lawers and Ben Ledi (A. M'K.), Loch Rannoch (Dicks.)
- H. filicinum*, Dill. Rocks by the Teith at Keir.
- H. rugosum*, Dill. Ben Lawers, etc., in Breadalbane range.
- H. Breadalbense*, Buchanan White. Ben Lawers and Breadalbane Mountains (F. B. W., 1865).
- H. hamulosum*, Frölich (?)
 β *micranthum*. Ben Lawers, Ben Voirlich, Craig-an-Lochan.
- H. callichroum*, Brid. Ben Voirlich [and Ben Nevis] (A. M'K.)
 [Marginal note in "Bry. Brit.," in Mr. Sadler's writing, as are most of the other localities with '(A. M'K.)' after them.]
- H. rupestre*, Buchanan White. Ben Lawers (F. B. W.)
- H. Bambergeri*, B. and S. Ben Lawers (Dr. Fraser).
- H. cupressiforme*, Dill. Blairlogie. A variety on trees on Ben Ledi.
- H. palustre*, Dill. Ben Lawers (Gard.)
- H. molle*, Dicks. Ben Challum, Dalnaspidal (W. B. B. in hb. J. S.)
- H. arcticum*, Sommerfelt (*H. alpestre*, Grev.) Ben Lawers, Ben Challum near Tyndrum.
- H. ochraceum*, Turn., var. Ben Lawers (F. B. W., in hb. J. S.)
- H. sarmentosum*, Wahl. Ben Ledi (A. M'K., 1867). Near Killin.
- H. Schreberi*, Dill. Trossachs and Ben Voirlich (A. M'K.), Ben Ledi (Stirton).
- H. stramineum*, Dicks. Abundant on the Breadalbane Mountains, but rare in fruit.
- H. trifarium*, W. and M. Ben Challum, Ben Lawers, Craig Chail-leach.
- H. scorpioides*, Dill. Killin, Dunkeld (Gard.)
- H. splendens*, Dill. Heaths and woods.
- H. umbratum*, Ehr. Trossachs near Loch Katrine, Ben Voirlich.
- H. Oakesii*, Sulliv. Ben Lawers.
- H. brevirostre*, Ehr. Frequent in Perthshire.

H. loreum, Dill. Common.

NECKERA *complanata*, B. and S. Walls by Allan Water.

N. crispa, Dill. Dunkeld (Gard.), Ben Lawers (hb. J. S.)

CRYPHŒA *heteromalla*, Dill. Bridge of Earn (J. S.)

FONTINALIS *antipyretica*, L. Ochil Glens (T. Lyle).

ADDITIONAL AND EXCLUDED SPECIES.

OREOWEISSIA *surrulata*, Funck. Ben Lawers (Dr. Stirton).

BRYUM *Schimperii*, Wils. Ben Lawers.

HYPNUM *chrysophyllum*, Brid. Dunbarnie Links (Howie).

H. polygamum, B. and S.

var. *stagnatum*. Dunbarnie Links (Howie).

H. aduncum, Dill. (*H. exannulatum*, Gümbr.) Dunbarnie Links (Howie).

H. Kneiffii, B. and S. (*H. aduncum*, Hedw.) Dunbarnie Links (Howie).

H. Sendtneri, Schpr.

β *Wilsoni*. Dunbarnie Links (Howie).

H. Starkii, W. and M. Ben Lawers (Hunt., 1865, in hb. J. S.)

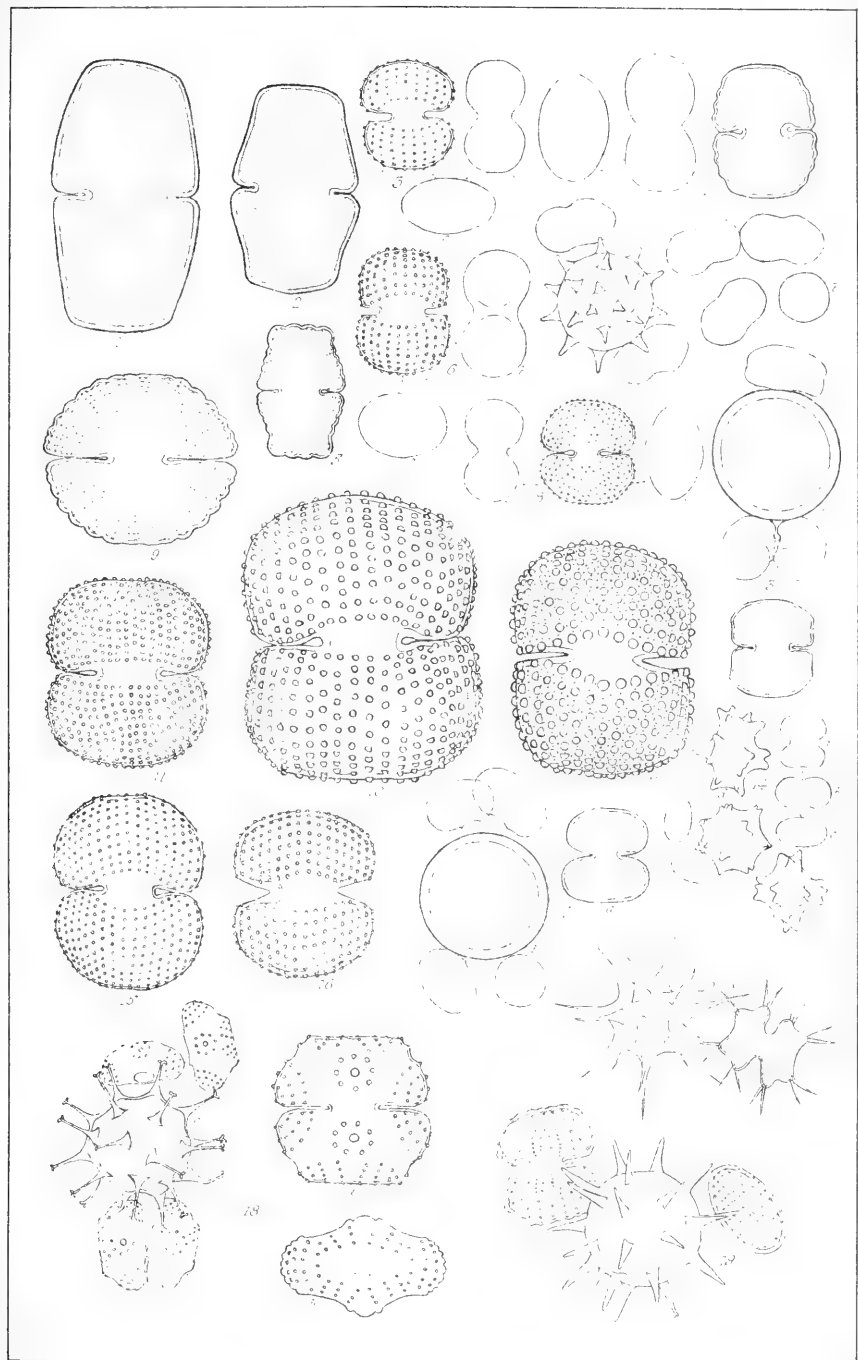
ON SCOTTISH DESMIDIEÆ.

By JOHN ROY, LL.D.

[Continued from page 245 (1893).]

PLATE II.

2. *A. convergens*, Ehr.—General.
3. *A. Incus* (Breb.), Hassall.—General. Abundant in one or other of its forms. *a* and *β* Ralfs are not uncommon; a small form of *a* is very abundant, and very frequently conjugated. The form given by Grunow from "Insel Banka" in Rabenh. "Beiträge," Heft II. p. 15, Taf. II. fig. 29, is rare, but has been gathered abundantly on the Clova Tableland, in Forfar, by Rev. J. Fergusson.
Var. *intermedius*, Wittr.—Widely diffused, but scarce.
4. *A. longicornis*, n. sp.—Rare. Like *A. Incus*, but differs in the very long, nearly parallel, or slightly diverging spines, and (in front view) triangular semi-cells. Length, 26 μ; breadth, with spines, 76 μ; isthmus, 8 μ. (*Our* Plate III. fig. 1.)



Inverness—in Skye, at the head of Glen Sligachan; Aberdeen—near Bridge of Potarch; Kincardine—at Dalbrake in Strachan.

5. *A. octocornis*, Ehr.—General. Conjugated: Aberdeen—Brimmond, and Powlair in Birse; Kincardine—Cammie, and Glen Dye in Strachan; Perth—near Buchanty in Fowlis. Zygospore globose, or ovoid, with long, slender, tapering, acute, simple spines.
- β major*, Ralfs.—Not common. Orkney, Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle. Conjugated: Aberdeen—old road near Aboyne. Zygospore similar to the common form, only larger and with longer spines. Diameter, without spines, $26\ \mu$; length of spine, $20\ \mu$. (*Our Plate II. fig. 20.*)
- γ impar*, Jacobs.—Very rare. Aberdeen—in a pool on Culblean, beside the old road from Tarland to Bal-later.
6. *A. subulatus*, Kg.—Rare. Aberdeen—at Slewdrum, Cambus O'May, and Glen Clunie.
7. *A. tenuissimus*, Archer.—Not common. Sutherland, Ross, Aberdeen, Forfar, Perth.

COSMARIUM (*Corda*), *Ralfs*.

1. *C. abbreviatum*, Racib.—Rare. Ross—Loch Kinellan; Inverness—Brin; Nairn; Aberdeen—Scotston, south side of Birsemore, Heugh-head, Milton Moor, Culblean, Lochnagar; Kincardine—Nigg, Cammie, Kerloch, Dalbrake; Forfar—Clova Table-land; Perth—Moncreiffe Hill.
2. *C. abruptum*, Lund.—Rare. Nairn; Aberdeen—Howford, Alford, Birsemore Loch, Bogwattle; Kincardine—Dalbrake; Forfar—Menmuir, Barrelwell near Brechin.
3. *C. alpestre*, n. sp. (*C. rotundatum*, R. and B.'s MSS.)

Species large, rounded oblong, a little longer than broad, constriction very slight^o; semi-cells smoothly rounded, from a very broad isthmus; side view circular, from a broad base; end view very broadly oval; membrane closely and finely punctate; isthmus very broad, with a row of rather larger punctæ on each side. Length, $90-105\ \mu$; breadth, $75-90\ \mu$; isthmus, $79\ \mu$; thickness, $60\ \mu$. (*Our Plate I. fig. 6.*) This species seems sufficiently distinct to render it unnecessary to compare with other species. Delponte has a species closely resembling it in size and shape, but his species is roughly granulated, while this is finely punctate.

It is very rare, and has not hitherto been found under 2000 feet. Aberdeen—Press Whin on the north side of Morven; Perth—north-west side of Glas Mhoel, above the Cairnwell.

4. *C. amenum*, Breb.—Not common. Shetland—Unst; Sutherland, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle.
 β *Lundellii*, n. var. (Forma *major*, Lundell, "De Desmid.," p. 46. Not common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth.
 γ *mediolæve*, Nord.—Very rare. Kincardine—Dalbrake in Strachan.
5. *C. anceps*, Lund.—Not common. Ross, Inverness, Banff, Aberdeen, Kincardine, Forfar, Perth, Stirling.
6. *C. angulosum*, Breb.—General. Conjugated near Blackhall in Kincardine. Zygosporangia globose-octahedral, with eight subacute undulations round the margin; found once only.
7. *C. angustatum* (Wittr.), Nord.—Not common. Ross, Inverness, Banff, Aberdeen, Kincardine, Forfar, Perth, Stirling.
8. *C. anisochondrium*, Nord.—Very rare. Kincardine—pool near Crathes station.
9. *C. annulatum* (Näg.), De Bary.—Not common. Ross, Aberdeen, Kincardine, Perth.
 β *elegans*, Nord.—Not common. Aberdeen, Kincardine, Forfar, Perth, Kirkcudbright.
10. *C. Archerii*, n. sp.

Species large, somewhat irregularly oval, truncate, about a fourth part longer than broad; semi-cells from slightly reniform base, with close constriction, opening out widely into the broadly rounded sides, which converge upwards, gradually becoming slightly undulated to the sharply and somewhat irregularly drawn-out truncate ends; side view circular, with a narrower rounded part upwards; end view, smoothly oval. Constriction deep, close. Isthmus, moderate. Membrane, finely punctate. Length, 107-112 μ ; breadth, 80-87 μ ; isthmus, 32-35 μ ; truncate end, 33 μ ; length of drawn-out end, 10 μ . (*Our* Plate I. fig. 5.)

This species bears much resemblance to *C. cymatopleurum*, Nordst., but it differs so completely in the peculiarly drawn-out ends, which is a constant feature from all the localities where we have seen it, that we feel compelled to give it a separate place; and as Mr. Archer was the first to discover it in this country, we have associated his name with it.

Aberdeen—in Glen Callater, beside the "Break Neck" Waterfall; Forfar—in Canloch; Perth—north shore of Loch Tay, where it was found by Mr. Archer.

11. *C. arctoum*, Nordst.—Very rare. Aberdeen—Braes of Gight ; Kincardine—Muchalls ; Forfar—Clova Table-land.
12. *C. attenuatum*, Breb.—Extremely rare. Inverness—Brin (Mrs. Farquharson).
13. *C. bicardia*, Reinsch.—Rare. Aberdeen—near Old Mill, Birse-more Loch, near Craigendinnie Farm, Birkhill, and Bogwattle in Cromar, Cambus O'May, Dalbagie, Ballochbuie ; Kincardine—Crathes, Bishop's Dam.
14. *C. bioculatum*, Breb.—Not common. Orkney, Sutherland, Inverness, Aberdeen, Kincardine, Forfar, Perth.
15. *C. bireme*, Nordst.—Extremely rare. Perth, Spital of Glen Shee (Mr. W. West). Length, 12 μ ; breadth, 10 μ ; isthmus, 6 μ .
16. *C. biretum*, Breb.—Rare. Aberdeen—Bridge of Don ; Kincardine—Garrol.
 β *supernumeraria*, Nordst.—Extremely rare. Perth—Keithick, near Coupar-Angus (Mrs. Farquharson).
17. *C. Blytii*, Wille.—Not common. Ross, Aberdeen, Kincardine, Dumbarton, Argyle (Mull), Fife, Kirkcudbright.
18. *C. Boeckii*, Wille.—Pretty common. Sutherland, Ross, Inverness (in Skye), Banff, Aberdeen, Kincardine, Forfar, Perth, Stirling.
19. *C. Botrytis* (Bory), Menegh.—General. With zygospores, Loch Kinellan, Ross (Mrs. Farquharson).
 β *subtumidum*, Wittr.—Rare. Aberdeen, Kincardine, Perth (Lake of Monteith).
 γ *emarginatum*, Hansg.—Is not uncommon on wet rocks.
20. *C. Brebissonii*, Menegh.—General.
21. *C. Broomei*, Thwait.—Rare. Inverness—near Brin ; Aberdeen—near Alford ; Kincardine—a few localities in Strachan.
22. *C. calcareum*, Wittr.—Not common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling, Argyle (Mull).
23. *C. circulare*, Reinsch.—Very rare. Inverness—Loch Ruthven (Mrs. Farquharson) ; Perth—near Loch Mharc, in Athole.
24. *C. colatum*, Ralfs.—Common, especially on wet rocks.
 β *spectabile*, De Not.—Is nearly as common, and occurs in similar localities.
25. *C. commissurale*, Breb.—Rare. Aberdeen, Kincardine, Forfar (in Glen Clova).
 β *acutum*, Breb.—Very rare. Aberdeen—near Bishop's Loch, and near Aboyne ; Kincardine—formerly at Mavis Bank, Loch of Lumgair, near Stonehaven, and Dalbrake in Strachan.

26. *C. concinnum*, Rabenh.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle.
27. *C. confusum*, Cooke.
 Var. *regularius*, Nordst.—Perth—Ben Lawers; Kirkcudbright—New Galloway.
28. *C. connatum*, Breb.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Perth, Argyle, Stirling.
29. *C. conspersum*, Ralfs.—Very rare. Perth—Glen Tilt and Ben Laoigh (Mr. W. West).
 β *rotundatum*, Wittr.—Not common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling.
30. *C. contractum*, Kirch.—Very rare. Aberdeen—near Alford, south of Birsemore; Perth—Buchanty.
 Forma *cracowiense*, Racib.—Very rare. Aberdeen—Dinnet.
31. *C. corbula*, Breb.—Not common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth. Conjugated near Crathes, Kincardine. Zygospore globose, with about nine rather slender, slightly trifurcate spines round the margin. (*Our* Plate III. fig. 18.)
32. *C. Corriense*, Bisset, n. sp.
 Species moderate sized; oblong, rounded, a half longer than broad; surface finely granulated; perpendicular rows of granules, about 11 to 12. Horizontal rows, about 6 to 7. The semi-cell somewhat semicircular, with an open, acute constriction, lower angles acute, upper rounded; side view globular, end view very broadly oval. Length, 43 μ ; breadth 32 μ ; isthmus 15 μ . (*Our* Plate II. fig. 6.)
 This species may be compared with *Cos. Portianum*, Archer, and *C. orbiculatum*, Ralfs. From the former it differs in having the lower angles acute, and from the latter it differs in the arrangement of the granules.
 Extremely rare. Arran, in a quarry at Corrie, where it was detected by Mr. Bisset.
33. *C. costatum*, Nordst.—Very rare. Banff—Iron Hill; Aberdeen; Argyle—in Mull (Dr. F. B. White).
34. *C. crenatum*, Ralfs.—Common in one or other of its forms. The form figured by Ralfs, "Brit. Desmid." Tab. XV. fig. 7a, is scarce; fig. 7b is abundant, especially on wet rocks. This form has been found conjugated on Caerloch, near Muchalls, in Kincardine, and in Rannoch in Perth.
 The forms *bicrenatum* and *tricrenatum*, Nordst., are scarce, but occur in all the counties examined.

35. *C. cristatum*, Ralfs.—Very rare. Aberdeen—Steps, Glen Tanner; Kincardine—Cammie; Perth—Ben Lawers.
36. *C. cruciatum*, Breb.—Not common. Aberdeen—Alford; Kincardine—Cammie, Cowie, etc.
37. *C. cruciferum*, De Bary.—Not common. Aberdeen—Lochnagar, etc.; Kincardine—Durriss, etc.; Perth—in Rannoch.
38. *C. cucumis*, Corda.—General.
 Forma *major*, Nordst.—Pretty common.
 β *helveticum*, Nordst.—Not common. Inverness, Aberdeen, Kincardine.
39. *C. cucurbita*, Breb.—General.
40. *C. cyclicum*, Lundell.
 β *arcticum*, Nordst.—Rare. Aberdeen, Kincardine, Forfar, Renfrew.
41. *C. cylindricum*, Ralfs.—Not common. Aberdeen, Kincardine, Forfar, Perth, Arran.
42. *C. cymatopleurum*, Nordst.
 β *tyrolicum*, Nordst.—Very rare. Aberdeen—near Aboyne, Corry of Loch Kandor; Forfar—in Canlochan, where it is associated with *C. Archerii*.
43. *C. Danicum*, Boerg.—Very rare. Aberdeen—near Alford.
44. *C. Davidsonii*, n. sp.—Medium sized, hexagonal, sides and ends undulated, the undulations increasing in size upwards, and having the crenate, truncate end produced; constriction, straight, narrow, not deep; lower angles acute; sides nearly straight, converging upwards, with about four undulations; upper angles rounded; ends broad, straight, with two undulations; from all the undulations, rows of minute granules, about three in a row, extend inwards, radially, a very short distance; centre of semi-cell smooth; isthmus broad; starch granules single. Length, 37-40 μ ; breadth, 25-26 μ ; isthmus, 15-16 μ . (Plate I. fig. 8.)
 Rare. Aberdeen—at Press Whin, on Morven, and near Aboyne; Kincardine—near Gillan in Strachan; Forfar—near Balquhadly in Fern, and in Canlochan.
45. *C. De Baryi*, Archer.—Not common. Inverness, Aberdeen, Kincardine, Perth, Kirkcudbright.
46. *C. dentiferum*, Corda.—Very rare. Has been passed over as a form of *C. latum*. It occurs both in Aberdeen and Kincardine. At present localities are doubtful,
47. *C. depressum*, Näg.—Not common. Sutherland, Ross, Inverness, Aberdeen, Perth.

48. *C. didymochondrum*, Nordst. and Wittr.—Very rare. Ross—near Tain; Inverness—Glen Urquhart.

DESCRIPTION OF SCOTTISH DESMIDIÆ, PLATE II.—Fig. 1. *Cosmarium plicatum*, Reinsch, $\times 400$. Fig. 2. *C. plicatum*, Reinsch, var. *Scoticum*, Roy and Bisset, $\times 400$. Fig. 3. *G. nephroideum* (Witt.), R. and B.: *a*, front; *b*, side; *c*, end; $\times 600$. Fig. 4. *C. Garroense*, R. and B.: *a*, front; *b*, side; *c*, end; $\times 600$. Fig. 5. *C. elegans*, R. and B., $\times 400$. Fig. 6. *C. Corriense*, Bisset: *a*, front; *b*, side; *c*, end; $\times 400$. Fig. 7. *Cosmocladium constrictum*, Archer: *a*, front; *b*, end; *c*, zygospore; $\times 600$. Fig. 8. *Cosmarium granulunculum*, R. and B.: *a*, front; *b*, side; *c*, end; $\times 400$. Fig. 9. *C. cyclicum*, Lund., **arcticum*, Nord., $\times 400$. Fig. 10. *C. latum*, Breb., $\times 400$. Fig. 11. *C. latum*, Breb., var. *minor*, R. and B., $\times 400$. Fig. 12. *C. margaritatum* (Lund.), R. and B., $\times 400$. Fig. 13. *C. odontopleurum*, Archer: *a*, front; *b*, zygospore; $\times 600$. Fig. 14. *Cosmocladium perissum*, R. and B.: *a*, front; *b*, side; *c*, end; *d*, zygospores; $\times 600$. Fig. 15. *C. Logiense*, Bisset, $\times 400$. Fig. 16. *C. Simii*, R. and B., $\times 400$. Fig. 17. *C. flavum*, R. and B.: *a*, front; *b*, zygospore; $\times 400$. Fig. 18. *C. Corbula* (Breb.), Archer: *a*, front; *b*, end; $\times 600$; *c*, zygospore; $\times 400$. Fig. 19. *C. Sewardrumense*, Roy: *a*, front; *b*, zygospore; $\times 600$. Fig. 20. *Arthrodesmus octocornis*, Ehrb., β *major*, Ralfs: zygospore, $\times 400$.

ARCTIC PLANTS IN THE OLD LAKE DEPOSITS OF SCOTLAND.

By JAMES BENNIE

(H.M. Geological Survey of Scotland).

IN a report of the Royal Society's Soiree, published in "Nature" (14th May 1891), Arctic plants from Hailes, near Edinburgh, were noticed as exhibited by the Director-General of the Geological Survey; and a list of species was given by Mr. Clement Reid. At the meeting of the British Association in 1892 a paper "On Fossil Arctic Plants found near Edinburgh" was read by Mr. Reid; and an abstract was published in the Report for that year, page 716. Besides Hailes, it included Corstorphine, and the list enumerates the plants found at both places. A list of mosses is also given. As the abstract is short, it may be quoted in full as the best introduction to those who are as yet unacquainted with the facts it proves, and as being also the best means to enforce the lesson or moral to which we wish to draw the attention of Scottish Naturalists, namely the probability that at the bottom of almost all our lake deposits Arctic plants may be found. Much knowledge of the climate to which they testify may be learned from similar deposits in other places besides those near Edinburgh.

Mr. Reid's abstract is as follows :—

“FOSSIL ARCTIC PLANTS FOUND NEAR EDINBURGH.

By CLEMENT REID, F.L.S., F.G.S.

Recent discoveries by Mr. Bennie, of the Geological Survey, have brought to light a series of silted-up tarns or small lochs in the neighbourhood of Edinburgh. These tarns seem to have lain in irregular hollows left on the retreat of the ice, for the lowest deposits usually yield remains of Arctic plants. The principal localities for these plants are Corstorphine and Hailes. Trees, except perhaps the alder, are entirely missing in the lower deposits, and the vegetation consists mainly of dwarf willow and birch, with a few herbaceous plants, of species still living within the Arctic Circle. The list now includes the following plants, those marked with an asterisk being Arctic species no longer living in the lowlands of Scotland :—

Ranunculus aquatilis, Linn.	*Oxyria digyna, Hill.
” repens, Linn.	*Betula nana, Linn.
Viola (?).	Alnus (?).
Stellaria media, Cyr.	Salix repens, Linn.
Rubus sp.	* ” herbacea, Linn.
*Dryas octopetala, Linn.	* ” polaris, Wahlb.
Potentilla sp.	* ” reticulata, Linn.
Poterium sp.	Empetrum nigrum, Linn.
Hippuris vulgaris, Linn.	Potamogeton sp.
Myriophyllum spicatum, Linn.	Eleocharis palustris, R. Br.
Taraxacum officinale, Web.	Scirpus pauciflorus, Lightf.
Andromeda polifolia, Linn.	” lacustris, Linn.
Menyanthes trifoliata, Linn.	Carex, 2 sp.

MOSSES (determined by ANTONY GEPP, F.L.S.)

Barbula fallax, Hedwig.	Hypnum polygamum, Schimp.
” fragilis, Bruchand Sch.	” fluitans, Linn.
Grimmia sp.	” revolvens, Swartz.
Racomitrium sp.	” rugosum, Ehrh.
Philonotis fontana, Brid.	” cupressiforme, Linn.
Aulacomnion palustre, Schw.	” sarmentosum, Wahl.
Webera sp.	” cuspidatum, Linn.
Bryum sp.	” trifarium, Web. and
Pogonatum sp.	Mohr.
Polytrichum sp.	” scorpioides, Linn.”
Camptothecium nitens, Schimp.	

As in Mr. Reid's abstract no details are given of the circumstances of the deposits in which the Arctic plants

occurred, it has been suggested that, in order to enforce the moral of the story these plants tell, some of the details might be of advantage in leading to searches for the same plants in similar deposits.

I. Arctic plant-bed at Hailes Quarry, four miles west of Edinburgh.

The bed was found at the bottom of a series of deposits which proved the existence of a lake in a hollow space between boulder hillocks in the north-east corner of Hailes Quarry.

The section exposed was as follows:—

1. Boulder clay, lying in a hollow of the sandstone rock. Its apparent thickness in 1886 was only about 2 or 3 feet; but this increased to 12 or 14 feet as the rock was quarried farther into the hollow trough. This boulder clay was hard, stiff, almost rock-like, and crowded with stones of all sizes, from a pebble to a boulder. It was doubtless genuine ground-moraine matter.

2. Immediately overlying the boulder clay was a layer of large stones, which had evidently been washed out of the boulder clay by the first water which filled the hollow after the ice had melted off the land.

3. Next occurred an Arctic plant-bed of fine sandy mud or silt 1 or 2 feet in thickness, with many rootlets of plants. In this silt the Arctic plants occurred, generally as thin layers, and sometimes scattered through the silt as single leaves, sometimes along with fruits and twigs. By careful washing they could be easily separated from the silt. Along with the Arctic plants there were found numerous remains of a freshwater crustacean, including body segments, tail segments, and supposed feet, and the more characteristic mandibles with tooth-like processes resembling combs. These have been recognised as those of *Apus glacialis* (or a kindred species), now found only in freshwater lakes in Greenland and Spitzbergen.

4. Immediately above the Arctic plant-bed other silts occurred, with seeds of *Potamogeton* in great numbers, and many sprigs of light feathery mosses, and occasionally patches of solid peat with other seeds of *Potamogeton*, *Menyanthes* (Bogbean), and *Carices*. There were found also little round

circular bodies, supposed to be statoblasts of a freshwater Polyzoon, also much of the chitine of *Daphnia*, like mica scales, and many black shining bodies, like black diamond dust, said to be water-mites.

5. A series of coarse sands, gravels, and silts, 8 or 10 feet in thickness, in which hazel nuts, acorns, alder seed-cones, and stones of fruits abounded, with much drift-wood in the shape of twigs, pieces of bark of trees, and in two or three cases tree trunks 8 or 10 inches in diameter.

6. Five or six feet of ochrey sand with only holes formed by rootlets in it, but containing no actual organic remains.

7. Vegetable soil, 2 feet or so in thickness.

Such is a rough account of the section at Hailes, which shows deposits made in a lake extending from the times of the boulder drift up to recent times.

Ere I pass from it I may note that in a fine silt or mud near the bottom several species of freshwater mollusca, one or two land shells, and several species of Ostracoda were found in 1886, as recorded in the "Ancient Lakes of Edinburgh" (*Proc. Roy. Phys. Soc.*, vol. x. pp. 135-145). It is there also stated that two large boulders, 4 or 5 feet in diameter, occurred in the lake deposits in such a way as proved that they must have been deposited in it after the lake had been for some time in existence. Lately some of the vegetable drift which is stated to have been found in the cleft between the two boulders has been re-examined, and *Apus* remains have proved to be abundant in it, as well as fragments of the Arctic leaves. This further confirms the view as to the period of their deposition.

The extent of the lake at Hailes cannot be given with any precision, as we cannot say how far it extended over the rock which has been quarried away. But it cannot have been extensive, and must have been a tarn, or lochan, as Mr. Reid has described it.

The course of events in Hailes is simple and easily read. First existed a small pool or tarn in which water-plants grew, and into which Arctic land-plants were drifted, and in which some few freshwater shells lived and the *Apus* crawled in great numbers. Into this a current of water flowed, bringing the drift-wood, the hazel nuts and fruit-stones,

and the very coarse sand and gravel with which they are associated; and then followed the vegetable soil, and now the quarry.

II. The Arctic plant-beds and other beds in Corstorphine Lake.

This lake lay in the hollow that stretches along the south side of Corstorphine Hill, from Coltbridge to west of Corstorphine village, a distance of 3 miles or more. The deposits in it were exposed in 1890-93 by a cutting for a sewer in connection with the Water of Leith Purification Scheme. This cutting was about 20 feet in depth, and 5 feet in width; and all the beds that lay in its course were exposed to that depth. The cutting may be treated in three parts or divisions.

1. From Coltbridge to Ballgreen Road, about a mile. This was the lowest level, and the beds in it were wholly mud or sand, with intercalated beds of vegetable drift or compressed peats. All the organic remains from it were recent, such as hazel nuts, acorns, seeds, pieces of driftwood of pine or oak, and bones of the pig or ox, etc.

2. From Ballgreen Road westward to the Corstorphine Station Road, nearly two miles in length, the chief beds were lake-marls full of freshwater shells. The thickness of these beds was sometimes only 2 or 3 feet, but at other places it reached 20 feet or more. Next came the Arctic plant-bed, in fine lake-mud of varying thickness, sometimes only one inch in thickness, sometimes a foot or more. In some places it lay within six or seven feet of the surface, at others it went down to the bottom of the cutting. It lay in some places on laminated clay, in others on a coarse gray sand.

3. Above the Station Road, as far as South Gyle, for about a mile the marl alone was cut into, as the cutting was there only 12 or 14 feet in depth. The marl was the same as in section 2,—full of freshwater shells and flat stems of water-plants, evidently representing the later stage of the lake's history. Probably if the cutting had been deeper the Arctic plant-bed would have been found below the marl here likewise.

The course of deposits in Corstorphine Lake from first to last would be :—

1. Boulder clay of unknown thickness, but irregular ; as it sometimes comes to the surface, and at other times sinks out of reach of the sewer cutting.

2. A coarse gray sand, with occasional stones, evidently the residue of the boulder clay, from which the finer silt had been washed away. It was always wet, and doubtless acted as an underground drain to carry off the surplus rain-water, which sank down through the upper lake marl, etc., but could not go through the impervious boulder clay, and flowed along the top of it to lower levels.

3. Fine laminated clay, red like tile or brick clay. This is evidently the finer silt washed out from the boulder clay of the grounds surrounding the hollow in which the lake lay. It was free from peat and marl, and had nothing organic in it except shreds of vegetable tissue,—the remains of rootlets of water-plants.

4. *The Arctic Plant Drift-beds.*—Sometimes of pure drift, with no clay or mud, but oftenest as layers of fine clay, mud, or silt, with the leaves in thin layers ; at other times with the leaves scattered singly through the deposits, sometimes with much debris, consisting of vegetable fibres, dried rootlets, or epidermis of water-plants of which the soft tissue had decayed and only the coriaceous rind had been left, sometimes with quantities of twigs an inch or so in length, stripped of bark, rounded at the ends, and water-worn,—evidently the shore wrack of the lake. Fruits of the Arctic Willows are frequent, sometimes with the cottony wool still inside them, and sometimes with the stigmas projecting. As Arctic Willows are land-plants, these must have grown on the slopes of Corstorphine Hill, or on the knowes on the south side of the lake ; and been wafted by the wind, or drifted by water, into the middle of the lake, and finally have sunk in its waters.

5. These Arctic plants are regarded as a proof of the climate of Corstorphine having been 20° Fahr. colder than at present, and that the glacial period was still in session in this latitude. But the best things got in these Arctic plant-beds were the remains of *Apus glacialis*, the crustacean

already mentioned as now living only in the lakes of Greenland and Spitzbergen. They were exceedingly plentiful in Corstorphine lake, since many hundreds of the different parts have been obtained there. In some parts freshwater shells were got in company with the Arctic plants, showing that these plants still flourished in Midlothian while the Mollusca that distinguish the marl came in to possess it.

6. *The Lake Marl*.—This consisted of calcareous mud, crowded with the ordinary lake-shells, and felted with long ribbon-like stems of water-plants, betokening a long period during which these shells lived and died in millions in the quiet water of the lake.

7. The upper bed of ochrey sand and gravel, 6 or 7 feet in thickness, often laminated, and sometimes very beautifully false-bedded, but with little or nothing organic preserved in it.

Such is a rude sketch of the deposits of these old lakes of Hailes and Corstorphine, which seem to suggest that in most of the old lake deposits of Scotland, Arctic plants may be found if sought for, and that much knowledge might be got from them of the condition of the land in the times succeeding the Glacial Period, or even, it may be, in the latter portions of that period. As warrant for this, I may quote the fact that at Faskine, near Airdrie, Mr. Peter Jack has found nests of lake silt, about 14 feet down in boulder clay, from which leaves of Arctic plants have been obtained, identical with those from Hailes and Corstorphine. These nests must be considered as vestiges of some old glacial lake which existed near Faskine ere yet the ice had finally disappeared, and over which the ice had been driven, carrying portions of the leaf-charged mud with it, and burying them under the above thickness of boulder clay.

OBITUARY.

Alexander Stephen Wilson, C.E.—On the 16th November there died in Aberdeen, in his sixty-seventh year, after brain disease of several months' duration, one who combined a keen interest in botanical science, more especially in its practical application to

agriculture, with literary ability, and also with a wide knowledge in curious and little-known antiquarian lore.

Mr. Wilson was the son of a farmer in the parish of Rayne, in Aberdeenshire, and was educated in the parish school there. He was trained in Aberdeen as a land surveyor and civil engineer; and in 1861 he acted as resident engineer during the construction of the section of the Buchan branch of the G. N. S. Railway on the section between Dyce and Ellon. Having married Miss Stephen of North Kinmundy, Newmachar, he turned his attention chiefly to agriculture as a profession during the rest of his life, studying it as a science, and carrying on many and varied experiments. Among the subjects of his experiments may be noted the growth of various cereals and other plants with a view to obtaining evidence on the alleged transmutation of species in cultivation; the singling of turnips so as to secure the heaviest yield; the pollination of grasses and other plants; and the ascertaining by volume and weight the true value of the crops of various cereals, and of the best commercial measure for these. He also made very careful observations and experiments on the growth of various fungi parasitic on agricultural plants. Nor did he refrain from experimenting upon himself, trying the effects of ergot in food, fortunately without ill effects. Even at the age of eighteen his literary tastes were manifested in a magazine, called the "Rural Echo," which he edited, and in great part wrote, but which continued only about half a year. While resident at North Kinmundy he published the results of his scientific studies in several books, as contributions to various societies of which he was a member, and in agricultural journals. Other results were published by correspondents to whom they were communicated for the purpose, *e.g.* by Mr. W. G. Smith, in his little work on "Diseases of Plants." "The Botany of Three Historical Periods," published in 1878, and "A Bushel of Corn," published in 1883 (which gained him the gold medal of the Highland Society), are excellent examples of Mr. Wilson's method of work in this field, of the wide range of topics that the subjects as treated by him suggest, and of the curious and interesting information from many sources that he brings to bear upon them. More speculative are his "Unity of Matter" and "Creation the Work of To-day." His shorter scientific papers will repay perusal, such as "Experiments with Turnip Seeds" (*Trans. Edin. Bot. Soc.* 1877) and on "Ergot," as all are based on acute and careful experiments and observation.

He also published works in the widely different realm of poetry. The first of these appeared upwards of twenty years ago under the name "A Creed of To-morrow." In 1884 appeared a volume of "Songs and Poems," of short pieces, several of them being *jeux d'esprit* of a botanical nature, such as "Fungus Hunting," and "A Mycological Serenade." A longer work, "The Lyric of a Hopeless

Love," was issued in 1886, and was followed a few years later by another volume of "Songs and Poems."

Mr. Wilson was for many years a member of several societies such as the Botanical Society of Edinburgh, the Cryptogamic Society of Scotland, and the Highland and Agricultural Society. His sensitive and retiring disposition made it necessary to know him for some time before his merits could be appreciated; but by all those who had the pleasure of sufficiently intimate acquaintance he was much esteemed and is greatly missed. He was indeed one of the best type of the union of the field-naturalist and scientific agriculturist, combined with a strong bent to poetry and philosophical speculation.

Rev. George Gordon, M.A., LL.D.—We have to record, with the deepest regret, the death of this venerable and distinguished naturalist, at the advanced age of 92 years, on the 12th of December last. Dr. Gordon has been inseparably associated with the promotion of the Natural History of the North of Scotland for nearly three-quarters of a century, and we hope to give some account of his great worth and labours in the cause of science in the April number of the 'Annals.'

ZOOLOGICAL NOTES.

Early appearance of the Fieldfare (*Turdus pilaris*).—On the 24th of September last, Mr. Eagle Clarke and I saw a specimen of this bird, the earliest that it has ever been our fortune to come across in the autumn. It was in company with Missel Thrushes and Blackbirds in a meadow adjoining a plantation near the base of the Pentland Hills, about five miles west of Edinburgh.—T. G. LAIDLAW, Edinburgh.

Kingfisher (*Alcedo ispida*) in Mull.—On the 17th of November last, while shooting with Maclaine of Loch Buie at the west end of Loch Uisk, a Kingfisher was observed to flit by and pass down the stream that flows out of the loch and into the sea near to the Castle. As I never saw or heard of a Kingfisher in Mull before, I venture to place the occurrence on record in the "Annals."—C. A. M'VEAN, Isle of Mull.

The Roller (*Coracias garrula*) in East Ross-shire.—When in Ross-shire recently, I saw a specimen of this rare visitor to Scotland in the house of Mr. Brotherston, Swordale, by whom it was shot. The bird, an adult female, was obtained on Swordale Hill on the 30th September 1892. It frequented a piece of broken ground of whin and heather, and often alighted on an upright post. No sign of shyness was exhibited, nor did it appear to be in the company of any birds in particular. When shot at, being allowed well out in

order to preserve the plumage, it was only wounded; and as Mr. Brotherston was in the act of picking it up, it seized his hand with its beak, and speedily drew blood. The bird had been observed in the neighbourhood for some days before being shot.—ROBERT B. BELL, Edinburgh.

Stock Dove (*Columba oenas*) in Shetland.—The first specimen of this species that is known to have occurred in Shetland was shot on the 14th of November last, at Dunrossness, by Messrs. R. and T. Henderson, who kindly forwarded its skin to me for identification.—J. A. HARVIE-BROWN.

Quail (*Coturnix communis*) in Elginshire.—Mr. James Brown of Forres informs me that an unusual number of Quail made their appearance in that district during the months of September and October. Mr. Brown examined two shot near Forres, and several more were seen. Specimens have also been obtained in the parishes of Kinloss and Alves.—J. A. HARVIE-BROWN.

Little Auk (*Alca alle*) in the Outer Hebrides in Summer.—On the 24th of June 1893 a Little Auk was captured at the Monach Islands, and its skin kindly forwarded to us by Mr. Wm. A. Tulloch, one of the keepers at the lighthouse there. Mr. Tulloch informs us that he observed the bird in the vicinity of the lighthouse for several days before its capture was effected, and that on skinning the specimen he found "a hard substance on the back of the head, growing from the bone, and about the size of a sparrow's egg." This diseased condition may account for its occurrence in the Outer Hebrides at this unusual season of the year. This specimen is in a phase of plumage which we do not find described in the standard works devoted to our birds. It may be described generally as being in winter plumage, with the addition of a broad dusky band across the breast. This band is quite black at the sides, but becomes admixed with white in the centre, where the proportions of the two colours are equal. That this particular phase of plumage is not abnormal is borne out by the fact that a specimen in the Edinburgh Museum of Science and Art, and procured at Port Seaton on the 18th November 1861, is in identical dress.—J. A. HARVIE-BROWN and WM. EAGLE CLARKE.

Buffon's Skua (*Stercorarius parasiticus*) in Orkney.—While my brother-in-law Mr. Hebden of Eday was driving over his estate on the 4th September last, he informed me that he had seen a strange bird in company with a large flock of gulls on a grass field. This bird appeared to be feeding, and was so tame as to allow of its being approached to within about five yards; and from the description given to me I concluded it must be either Richardson's or Buffon's Skua. On the day following the bird was sent to me, and proved to be a male specimen of Buffon's Skua. It is the only specimen I

have seen in Orkney. I was told that another was seen in Eday at the same time, and I saw in a Caithness paper a few days after the date mentioned that a bird of this species had been obtained in the parish of Rendall, Orkney, and was in the hands of Mr. Dunbar, naturalist, of Thurso.—T. W. RANKEN, Kirkwall.

Bird Notes from Barra.—BLACKCAP (*Sylvia atricapilla*).—On the 13th of October I noticed a Blackcap (a female) flitting about among the bushes in my garden. It remained for about a week, and was very tame. This is the first of the species ever noticed by me in the Outer Hebrides. WILLOW WREN (*Phylloscopus trochilus*).—A specimen of this pretty little warbler was caught by Mr. William Macgillivray in the garden at Eoligary, on the 13th November, which he showed to me. And in about a week after this he noticed another one, which remained only for a day. These were late migrants, but, from what Mr. Macgillivray tells me, it seems that a pair of these birds used to nest in their garden for several years in succession, up till about two years ago, when they failed to put in an appearance, although they were never interfered with during their visits. GRAY WAGTAIL (*Motacilla melanope*).—On the 6th of October 1893, Mr. Murdo MacDonald, gamekeeper, brought me a Gray Wagtail which he had got on the east side of the island. The White Wagtail (*M. alba*) visits us regularly during the spring and autumn migrations, but I think this is the first record of the occurrence of the Gray Wagtail in the Outer Hebrides. JACKDAW (*Corvus monedula*).—Every winter we are visited by a few Rooks, but this season, about the end of October, large flocks arrived, and more than a hundred can be counted here and there all over the island. On the 2nd of November I observed three Jackdaws with one of these flocks, and since then I have observed several others. I believe the Jackdaw has been seen in Barra on previous occasions, but I never met with it in the Outer Hebrides before, and I think its visits are not common.—JOHN MACRURY, Barra.

Sesia culiciformis, L., in Strathspey.—As this is a scarce insect in any part of Scotland, and is not entered for “Moray” in Dr. Buchanan White’s “Lepidoptera of Scotland,” it may be well to place on record the fact that I saw two examples in Strathspey in May last—one (which I captured) at Loch Alvie; the other at Aviemore Station.—WILLIAM EVANS, Edinburgh.

Perthshire Heteroptera.—I am able to add four species to the list of Perthshire Heteroptera which appeared in the last number of the “Annals.” I took at Pitlochry, at the end of August 1892, *Dicyphus globifer*, *Campyloncura virgula*, *Macrocoleus tanacetii*, *Psallus alnicola*.—ALFRED BEAUMONT, Lewisham.

Some further Scotch Localities for Arachnids.—In connection with Mr. G. H. Carpenter’s article on “Some New Scotch Localities

for Arachnids" in the "Annals of Scottish Natural History" for October last, I should like to put on record the following captures made by myself, mainly in the neighbourhood of Corrie, Arran; and about Dalry, Ayrshire. The specimens have been shown at the Andersonian Naturalists' Society and the Glasgow Natural History Society. I must mention my indebtedness to the Rev. O. P. Cambridge, to whom the specimens have been submitted for identification.

- Clubiona holosericca*, De Geer.—Corrie.
Amaurobius fenestralis, Str.—Corrie and Dalry.
Tetrax denticulata, Oliv.—Ailsa Craig.
Tegenaria derhamii, Scop.—Corrie and Dalry.
Phyllonethis lineata, Clk.—Corrie.
Erigone atra, Bl.—Corrie.
E. dentipalpes, Wid.—Corrie.
Bathypantes concolor, Wid.—Dalry.
Linyphia thoracica, Wid.—Corrie.
Meta segmentata, Clk.—Dalry.
M. merianæ, Scop.—Corrie.
Zilla x-notata, Clk.—Corrie and Dalry.
Z. atrica, C. L. K.—Corrie and Stepps.
Epeira diademata, Clk.—Corrie.
E. quadrata, Clk.—Corrie.
Xysticus pini, Hahn.—Ailsa Craig.
Trochosa pulverulenta, Clk.—Corrie.
Lycosa amentata, Clk.—Dalry
L. annulata, Thor.—Corrie.
L. pullata, Clk.—Dalry.
L. riparia, C. L. K.—Corrie.
L. monticola, C. L. K.—Corrie.

FRANK L. GRANT, Glasgow.

[Mr. Wm. Evans informs us that, as far as he can discover, *Lycosa riparia* and *L. annulata* have not hitherto been recorded for Scotland.—EDS.]

BOTANICAL NOTES AND NEWS.

First Records of Scottish Plants.—In the continuation in the "Journal of Botany" (October) of "First Records of British Flowering Plants," compiled by Wm. A. Clarke, F.L.S., the following species are recorded as having been first noted from Scotland as British:—

Campanula rapunculoides, "1800.—At Blair in Scotland; Fenwick Skrimshire, M.D. Sm. 'Fl. Brit.,' i. 238."

Arctostaphylos alpina, "1777.—Upon many of the Highland

mountains, particularly on those to the south of Little Loch Broom in Ross-shire, etc. Lightfoot, 'Fl. Scot.,' i. 215."

Loisleuria procumbens, "1777.—Upon dry barren ground near the summits of the Highland mountains, in many places, as in Benmor, etc. Lightfoot, 'Fl. Scot.,' i. 140. See Pennant, 'Voy.,' ii. 245 (1774)."

Phyllodoce taxifolia, "1812.—Discovered at Aviemore, in Strath-spey, and in the western isles of Shiant. 'E. B.,' 2469. First noticed near Aviemore by Mr. Brown of Perth. Sm. 'E. Fl.,' ii. 222."

Pyrola rotundifolia, "1640.—In Yorkshire, Lancashire, and farther North, yea, even in Scotland in the woods everywhere. Park, 'Theatr.' 510."

Moneses grandiflora, "1793.—Found in 1792 near Brodie House, Scotland, by James Brodie and Mr. James Hoy, near Gordon Castle in Moray. Both these gentlemen, we believe, are equally entitled to the honour of its first discovery. 'E. B.,' 146."

Primula scotica, "1819.—Found by Mr. Gibb of Inverness on Holborn Head, near Thurso in Caithness. Hooker in Curtis, 'Fl. Lond.,' i. 133."

Trientalis europæa, "1620.—In betuletis Scotiæ natans, D. Cargillus ex Scotia misit. C. Bauhin, 'Prod. Th. Bot.,' p. 100."

Some unexpected "Aliens" in the flora of Aberdeen.—Owing to somewhat extensive alterations on the surface of the ground in and near Aberdeen, a very considerable number of "aliens" have sprung up during the last two or three years. This has been especially marked on ground made up of rubbish of all kinds carted into a former portion of the channel of the river Dee. In 1892 part of this ground was enclosed within a high paling; and, thus protected from passers by, aliens in surprising variety have grown more or less vigorously on the rubbish-heaps. I have endeavoured to secure examples of all the species; but a full statement of these must be deferred meantime. A curious proof of the uncommon warmth of the summer of 1893 is afforded by the growth on this ground, in considerable numbers, of such unexpected aliens as Tomatoes (flowering freely, and producing fruits an inch or more in diameter), Oranges, and Date Palms. The two last also sprang up as accidental introductions in my garden. The Oranges reached a height of about four or five inches, and formed as many as four leaves before being nipped by frost in November. The Palms bore a leaf from four to eight inches long, and resisted two slight snowstorms with rather sharp frost. Of course our winter is too severe for all three species named.—JAMES W. H. TRAIL.

Botanical Exchange Club of the British Isles, Report for 1892 by G. Claridge Druce, M.A., F.L.S.—Among the numerous notes on forms of British plants, a number relate to examples from Scot-

land. The more interesting are noted below. *Ranunculus acris*, L., var. *pumilus*, Wahl., "Corrie Sneachda, Cairngorm" (G. C. D.) *Arabis petraea*, Lamk., var. *grandifolia*, Druce, on Ben Laoigh, differs from the form (or ? sub-species) on the Cairngorms. "It may be known from *A. petraea*" (restricted) "by its broadly ovate, nearly entire dark green leaves, thickly covered with bifid and trifid hairs, and by its flowers, which are twice the size of ordinary *A. petraea*" (G. C. D.) *Erythraea littoralis*, Fr., var. *minor*, Hartm., "Inver Bay, near Tain, E. Ross" (E. S. Marshall); "Munlochy, in the Black Isle of Cromarty" (G. C. D.), with a reference to "English Botany," pl. 2305, where this form is figured from Elginshire coast. *Euphorbia dulcis*, L., "Conan River, in Brahan Castle grounds, E. Ross; quite naturalised, August 1892" (E. S. Marshall). *Scirpus Tabernæmontani*, Gmel., "Between Forres and the Culbin Sands, Elgin, August 1889" (G. C. D.) *Carex vaginata*, Tausch, f. *borealis*, "Bræriach, Easterness, August 1888" (G. C. D.) *C. binervis*, Sm., f. or var. *nigrescens*, Druce, "Ben Eay, W. Ross, August 1889. Some of the specimens closely approach the plant from Corrie Ceander called *C. frigida*" (G. C. D.) *C. xanthocarpa*, Deseg., "Glen Spean, Westernness" (G. C. D.) *Agrostis canina*, L., var. *scotica*, Hackel., "Ben Eay, W. Ross, August 1889. Still in cultivation at Oxford, and now scarcely differing from type" (G. C. D.) "*Poa laxa*" of British botanists, from Lochnagar, is stated by Prof. Hackel to belong undoubtedly to *P. alpina*, L.

CURRENT LITERATURE.

The Titles and Purport of Papers and Notes relating to Scottish Natural History which have appeared during the Quarter—October-December 1893.

The Editors desire assistance to enable them to make this Section as complete as possible. Contributions on the lines indicated will be most acceptable and will bear the initials of the Contributor. The Editors will have access to the sources of information undermentioned.]

ZOOLOGY.

WHITE MOLES. Robert Service. *Zoologist* (3), xvii. p. 425 (November 1893).—Specimens from S.W. Scotland described.

DECADENCE OF THE VOLE PLAGUE IN SCOTLAND. Robert Service. *Zoologist* (3), xvii. p. 426 (November 1893).

A REMARKABLE SCOTTISH DEER'S HEAD. *The Field*, 30th September 1893, p. 527.—One with seven points on the top on either side, or twenty points in all, shot in the Glenquoich Forest, Invernessshire, by Lord Burton.

GOLDFINCH AND TREE-SPARROW IN NORTH UIST. Sir John Campbell Ord, Bart. *The Ibis* (6), v. p. 592 (October 1893).

HOOPOE IN ORKNEY. G. M. Mackay. *The Field*, 7th October 1893, p. 553.—One shot on the Calf of Eday Island.

LATE STAY OF TURTLE DOVE IN SCOTLAND. J. M. D. *The Field*, 18th November 1893, p. 792.—One shot in Wigtownshire on 25th October 1893.

CAPERCAILLIE IN STRATHSPEY.—A female shot on the Rothiemurchus estate, Aviemore, was considered to be the last of a brood brought up under a hen at Pitcroy Lodge. See *The Field*, 4th November 1893, p. 712, and 18th November 1893, p. 791.

QUAILS IN PERTHSHIRE. G. D. Clayhills Henderson. *The Field*, 23rd September 1893, p. 491.—Several near Meikle.

QUAILS IN ROSS-SHIRE. Bryan Cookson. *The Field*, 7th October 1893, p. 554.—Several shot and others observed during the past week at Strathpeffer, where they had been all the summer.

QUAILS IN DUMFRIESSHIRE. C. H. S. *The Field*, 14th October 1893.—One shot at Brocklehurst on the 3rd October.

QUAILS IN LINLITHGOWSHIRE. H. *The Field*, 18th November 1893, p. 792.—Seen and heard at Preston in September.

BLACK GUILLEMOT IN THE SOLWAY FIRTH. J. J. Armistead. *Zoologist* (3), xvii. p. 395 (October 1893).—Shot on 1st August.

ON THE REPTILIA OF THE BRITISH TRIAS. By E. T. Newton, F.R.S., F.G.S. *Geol. Mag.* (3), vol. x. p. 555 (December 1893).—Deals with Scottish species from the Elgin Sandstone.

CONTRIBUTIONS TO THE LIFE-HISTORIES AND DEVELOPMENT OF THE FOOD AND OTHER FISHES. By Prof. M'Intosh. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part. iii. pp. 239-248 (plates viii.-xii.)

AN EXPERIMENTAL INVESTIGATION ON THE MIGRATION AND RATE OF GROWTH OF THE FOOD FISHES. By Dr. T. Wemyss Fulton. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part. iii. pp. 176-196.

ON THE RATE OF GROWTH OF CERTAIN MARINE FOOD FISHES. By H. Charles Williamson. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part. iii. pp. 265-273.

GENERAL REPORT ON THE PELAGIC EGGS, LARVÆ, AND YOUNG FISHES PROCURED BY THE 'GARLAND' IN 1892 AND 1893. By Arthur T. Masterman. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part. iii. pp. 250-264.

OCCURRENCE OF STRIPED WRASSE OFF SUTHERLAND. James Grahame. *The Field*, 11th November 1893, p. 715.—Several captured between Lochinver and Stoer Point in 1892.

ON THE DEVELOPMENT OF THE PLAICE (*Pleuronectes platessa*). By Dr. J. H. Fullerton. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part iii. pp. 274-283 (plates xiii-xvi.)

WEST COAST EXPEDITION OF THE 'GARLAND' DURING JULY AND AUGUST 1892. REPORT ON MOLLUSCA. By Alfred Brown. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part iii pp. 172-175.

LAND AND FRESHWATER MOLLUSCA OF OBAN AND THE ISLAND OF LISMORE. R. Standen and J. R. Hardy. *Journ. of Conch.*, vol. vii. No. 8 (October 1893), pp. 266-274.—Thirty-five land and ten fresh-water species.—W. D. R.

MARINE MOLLUSCA OF THE UPPER PART OF LOCH LINNHE, ARGYLESHIRE. G. A. Frank Knight, M.A. *Journ. of Conch.*, vol. vii. No. 8 (October 1893), pp. 232-237.—Includes a list of one hundred and four species dredged in 1891. Special attention drawn to discovery of *Rissoa abyssicola*, Forb., in great numbers.—W. D. R.

COLEOPTERA IN MORAYSHIRE. A. J. Chitty. *Ent. Mo. Mag.* (2), iv. pp. 258-260 (November 1893). Four hundred and fifty species taken in the autumn near Forres, the more important of which are mentioned.

NOTES ON NEUROPTERA. By Kenneth J. Morton, F.E.S. *Ent. Mo. Mag.* (2), iv. p. 249 (November 1893).—One ♂ and two ♀ of *Agapetus delicatulus*, M'L. (new to Scotland), taken last July in Arran, and *Drepanopteryx phalænoides*, L., taken at Cleghorn. Notes also given on two species of *Tæniopteryx*.

DREpanOPTERYX PHALÆNOIDES AT PITLOCHRY. Alfred Beaumont. *Ent. Mo. Mag.* (2), iv. p. 263 (November 1893).—A single specimen taken on 29th August 1892.

A FEW DAYS' COLLECTING IN THE WESTERN HIGHLANDS. By J. W. Tutt, F.E.S. *Ent. Record*, vol. iv. pp. 285-288 (November 1893).—Records of Lepidoptera captured.

NOTES ON COLLECTING, ETC.—LANARK. (Rev.) J. A. Mackonochie. *Ent. Record*, vol. iv. p. 277 (October 1893).—Thirty species of Lepidoptera recorded.

ON VARIATION IN VANESSA URTICÆ AND EREBIA BLANDINA IN SCOTLAND. By Kenneth J. Morton, F.E.S. *Ent. Mo. Mag.* (2), iv. p. 223 (October 1893).

NOCTUÆ IN FORFARSHIRE. M. S. W. Gunning. *Entomologist*, vol. xxvi. p. 362 (December 1893).—Fifty-two species taken near Montrose, between 27th July and 3rd October 1893.

THE PELAGIC FAUNA OF THE BAY OF ST. ANDREWS. By Prof.

M'Intosh, M.D., LL.D., F.R.S. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part iii. pp. 284-389.—A series of tables given, showing in detail the contents of tow-nets put down from November 1887 to December 1888.

ON SOME NEW OR RARE CRUSTACEA FROM SCOTLAND. By Thomas Scott, F.L.S. *Ann. Mag. Nat. Hist.* (6), vol. xii. pp. 237-246, plates xi.-xiii. (October 1893).—Includes descriptions of five species new to science, one of which forms the type of a new genus.

THE INVERTEBRATE FAUNA OF THE INLAND WATERS OF SCOTLAND. PART III. By Thomas Scott, F.L.S. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part iii. pp. 220-238 (plates vi. and vii). Deals with the Crustacea (Copepoda, Ostracoda, Cladocera, and Gymnomera) of Loch Morar, Inverness-shire.

ADDITIONS TO THE FAUNA OF THE FIRTH OF FORTH. By Thomas Scott, F.L.S. *Eleventh Ann. Rep. Fishery Board for Scotland* (1892), part iii. pp. 197-219 (plates ii.-v.)—Records fourteen species of Copepoda, ten Amphipoda, and one Cumacean as new to the Firth, of which four of the Copepoda are new to science.

BOTANY.

FIRST RECORDS OF BRITISH FLOWERING PLANTS (*continued*). Compiled by William A. Clarke, F.L.S. *Journ. Bot.*, October.—Enumerates several species first recorded as British from Scotland.

DURATION OF COCHLEARIA GRÆNLANDICA, L. By Rev. Edward S. Marshall, M.A. *Journ. Bot.*, October.—Specimens taken from East Ross to a garden in Surrey, in 1891, have flowered in 1892 and 1893, and have retained their distinctive characters.

PYROLA ROTUNDIFOLIA AND ITS EUROPEAN FORMS. By Arthur Bennett, F.L.S. *Journ. Bot.*, November.—Referring to Nyman's unconfirmed record for var. *arenaria* of "Scotia," Mr. Bennett asks for examples of *P. rotundifolia* from any seaside locality in Scotland.

NEW OR CRITICAL BRITISH ALGÆ. By E. A. L. Batters, B.A., etc. *Grevillea*, December.—Quotes from Dr. Nordstedt, as found by him at Ballachulish in Scotland, *Phormidium uncinatum*, Gomont.

BIBLIOGRAPHY OF ALGÆ. By E. A. L. Batters. *Grevillea*, December.—In an analysis of three recent papers on Norwegian Algæ (one being by M. Foslie, and two by H. H. Gran.), Mr. Batters quotes the description of species and varieties that will probably be found on the coast of Scotland.

ON THE FOSSIL PLANTS OF THE KILMARNOCK, GULSTA, AND KILWINNING COAL-FIELDS, AYRSHIRE. By R. Kidston. *Trans. Roy. Soc. Edin.*, vol. xxxvii. part ii.

REVIEWS.

THE BIRDS OF DERBYSHIRE. By F. B. Whitlock. Annotated, with numerous additions, by A. S. Hutchinson. (London: Bemross and Sons, 1893.)

Mr. Whitlock's book treats of a comparatively small district, not exceeding 1030 square miles, yet considering the limited area possessing a more diversified surface than any other English county: from fruitful plain to high barren moorlands over 2000 feet above the sea level; river valleys also like the Derwent and Trent. These two, but especially the latter, as lines of migration followed in the spring and autumn, have added many species both of shore and sea-bird to the county list, and undoubtedly have been the main factor in enriching the avifauna in number of species.

The total of various birds occurring, or reputed to occur, in Derbyshire, is 241, which includes 84 residents, 72 migrants, and the unusually large number of 85 casual visitors. Of the migrants, however, the pied-flycatcher, blue-headed wagtail, and stone curlew must be considered to hold a very doubtful place in the list.

No less than 8 terns, 7 gulls, and 3 skuas are recognised as occurring, and the list of waders and shore-birds is remarkable for so inland a county. It is pleasant to learn that the red-shank is now thoroughly established as a breeding species in the Trent valley, and this holds good, as we can certify, in the neighbouring county of Nottinghamshire.

The volume contains a good map of the county, and the illustrations of Derbyshire scenery add much to the interest of the work. Mr. Whitlock has long been recognised as an accurate and painstaking observer, and his book is full of interesting local information in connection with the haunts and habits of birds, the result of years of careful research and inquiry by himself and his colleague Mr. A. S. Hutchinson.

BRITISH FUNGUS FLORA. By George Masee. Vols. II. and III. (George Bell and Sons.)

In this Journal (vol. ii. p. 62) we have already noticed, with the commendation it deserves, the first volume of the "British Fungus Flora." In the later volumes, issued in 1893, the same plan is adhered to as in Vol. I., in respect to the descriptions and illustrations. Vol. II. is devoted to a portion of the *Agaricini*, including *Ochrosporæ*, *Rhodosporæ*, and *Leucosporæ*, down to *Laccaria*. Of Vol II. more than half is occupied with the remaining *Leucosporæ*. The remainder of the volume contains the *Hyphomycetes*: a group that may be looked on as composed almost entirely of forms or stages of reproduction of species that belong chiefly to the *Ascomycetes*, though in our present lack of information it is not possible in more than a small proportion of cases to refer these forms with certainty

to the perfect types of their respective species. It is necessary therefore to retain them as provisional species in the meantime. Mr. Masee's book will prove useful to students of Fungi beyond, as well as within, the British Isles, especially if (as it may be anticipated will be done) an appendix at the close of the work adds species and forms omitted, or that may be published too late for inclusion in their proper situation.

We observe a note in Vol. III., that the Flora will be concluded in another volume ; but this we venture strongly to doubt, in view of the great groups that yet remain to be dealt with. We hope that the author will find himself able to carry his enterprise to a successful conclusion.

A DICTIONARY OF BIRDS. By Alfred Newton, assisted by Hans Gadow, with contributions from Richard Lydekker, B.A.F.G.S., Charles S. Roy, M.A., F.R.S., and Robert W. Shufeldt, M.D. Parts I. and II. (London: Adam and Charles Black, 1893.)

Parts I. and II. of the very excellent "Dictionary of Birds" have been issued ; and it is intended by the authors to complete the work in two more parts, and with the concluding portion, an introduction containing a comprehensive account of the rise and progress of ornithology from the earliest period to the time of going to press.

The series of articles in the present parts are based on Professor Newton's contributions to the Ninth Edition of the *Encyclopædia Britannica*, but now with larger additions from himself and the others named on the title page, and of those perhaps the most important are the anatomical papers contributed by Dr. Gadow, and for the first time made available in a handy form for students and general readers wishing to acquire a sound and practical knowledge of ornithotomy.

Of the character of this work it is impossible to speak too highly. We recognise in it a splendid and learned production,—the accumulated knowledge of a lifetime,—representing in a condensed form the available information connected with the most fascinating study of birds ; each separate subject being treated so that, without detracting in any degree from its scientific value, it will be found available both for the inquiring student as well as those numerous readers who wish to obtain information on some special point.

In a short notice like the present it is not easy to point out the chief attractions. The articles by Professor Newton on Eggs, Extinction, Geographical Distribution, and Migration, the excellent notices of various family groups, and the exhaustive papers of the other learned contributors, are each admirable in their special fields, display an amount of erudition not to be found elsewhere, and will bear reading again and again. The work should have a place in every good library, and we think also a spare corner in the portmanteau of wandering ornithologists at home and abroad.

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[APRIL

THE LATE REV. GEORGE GORDON, M.A., LL.D.

THE Rev. GEORGE GORDON, M.A., LL.D., was born in July 1801, in the Manse of Urquhart, of which parish his father was minister for many years. His mother was a daughter of the Rev. Joseph Anderson, minister, during forty-two years, of the parish of Birnie, near Elgin.

In the autumn of 1815 George Gordon entered as a student of Arts in the Marischal College and University in Aberdeen; but, owing to the meagre records of under-graduates then kept in the University, there is no indication of his progress as a student, beyond that implied in his graduating M.A. in 1819. He thereafter studied Divinity in the universities in old Aberdeen and in Edinburgh, was licensed by the Presbytery of Elgin in 1825, and in 1832 received a presentation to the parish of Birnie, no doubt already a very familiar locality to him. Here he spent the long period of fifty-seven years, amid the esteem and veneration alike of his parishioners and colleagues, and of a large circle of friends, with many of whom he had become acquainted through his wide scientific tastes.

During the stormy period that preceded the Disruption of the Church of Scotland in 1843, he took a conspicuous part, being recognised as a leader in the district of Moray of those that adhered to the Church; but such controversy was

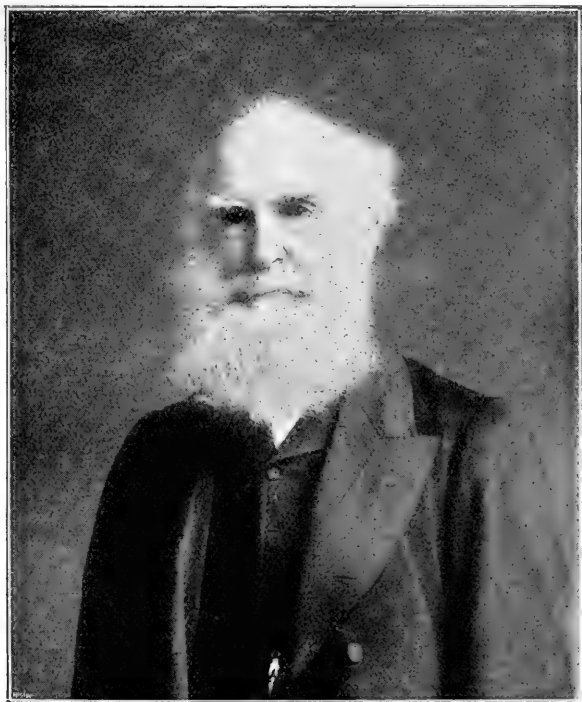
distasteful to him, and when the call for his services became less urgent he gladly retired from this field. His life affords an admirable example of exemplary devotion to his duties as a clergyman, combined with keen enthusiasm and great ability as a naturalist, in the truest sense of the term. To him no part of natural science was without interest; but most of all did he delight in its study in the field. Few parts of Scotland, if any, have been investigated with such loving devotion by any single observer as he bestowed on his native district of Moray, alike as regards the native animals and plants, and the most interesting but perplexing Red Sandstone geological formations, with their very remarkable assemblages of fossil fishes and reptiles.

Dr. Gordon's physical energy was very great. Indeed, in his later years he looked much younger than his real age; and he retained his love and his fitness for outdoor exercise till almost the close of his well-spent life. Even when over eighty years of age he enjoyed boating among the Shetland Islands. He explored Moray thoroughly; and extended his excursions, usually with some definite investigation in view, to various parts of the Highlands of Scotland. He noted what he observed; and his published papers, as will be more fully noticed below, relate to a wide range of topics, though mostly connected with the natural history of Morayshire.

This width of interests prevented the narrowness of view into which specialists are sometimes apt to fall, and rendered him a delightful companion. No one that ever enjoyed the pleasure of spending a little time in his company in Birnie or Elgin can forget the pleasure, or the thoroughness of his knowledge of Morayshire. He delighted alike in showing hospitality, and in giving freely of the fruits of his wide experience to all students of natural history who visited the district, attracted not seldom by the desire to learn from him. His scientific investigation of Morayshire began with the plants, which he sought out most diligently, often in company with the late Mr. Stables of Cawdor, who fully shared his love for Botany, and whose name is very frequently quoted in A. Murray's "Northern Flora," published in 1836. In this work the author refers also to "Mr. Gordon, minister of Birnie," in connection with the discovery of *Pinguicula alpina*

as a British plant on Rosehaugh, in the Black Isle, near Inverness. His name occurs as early as 1827, in Jameson's "Edinburgh New Philosophical Journal," as an authority on the plants of the North of Scotland.

Dr. Gordon, in 1839, published the results of his labours in the "Collectanea to the Flora of Moray," a work the value of which has been heartily recognised by H. C. Watson in



his great "Topographical Botany." Mr. Watson states further that he had had the advantage of a copy of the "Collectanea" checked at a later date by Dr. Gordon, and also of a catalogue of British plants checked by him for the county of Ross in 1834; and he adds: "Without the valued assistance of Dr. Gordon, with his friend and fellow-worker in Natural Science, Mr. W. A. Stables, my own writings would have been sadly deficient in the botany of Moray and Ross."

He gave much attention to the archæology of Morayshire,

collecting objects of antiquarian interest, including coins ; and many years ago he published a paper on the subject.

He extended his studies to the Zoology and Geology of the north of Scotland. The results in Zoology he published at intervals in the "Zoologist," in which, besides numerous short notes, we meet with the following longer articles on the fauna of Moray from his pen,—the volume, and the number of pages in each of which papers are indicated in the brackets :—"Mammalia" (ii. pp. 421-428) ; "Birds" (ii. pp. 502-515, 551) ; "Reptiles" (ii. p. 551) ; "A List of Fishes that have been found in the Moray Firth and in the Fresh Waters of the Province of Moray" (x. pp. 3454-62, 3480-89) ; "List of the Crustaceans of the Moray Firth" (x. pp. 3678-87) ; "List of the Echinodermata hitherto met with in the Moray Firth" (xi. pp. 3781-85) ; "List of the Mollusca hitherto found in the Province of Moray and in the Moray Firth" (xii. pp. 4300-18, 4421-35, 4453-62) ; "List of Lepidoptera hitherto found within the Province of Moray" (xix. pp. 7663-75).

He also took a great interest in the success of the "Scottish Naturalist," and contributed to its pages, usually on zoological subjects. In the "Lepidoptera of Scotland," compiled by Dr. White, and in the "Coleoptera of Scotland," compiled by Dr. D. Sharp (both commenced in 1872, and continued during several years), Dr. Gordon's name appears as having contributed information from Moray. In October 1887 appeared a paper by him on the Hymenoptera (but chiefly the genus *Bombus*) of the province of Moray.

But valuable as were Dr. Gordon's researches in throwing light on the flora and fauna of the north of Scotland, his interest in the Geology of his native land was no less strong ; and the results of his labours were even more striking, and are probably more widely known.

Not long after he settled in Birnie, he was drawn into the study by Dr. John Malcolmson, then home from India, where he had studied Geology in the field. Dr. Malcolmson was shown by Hugh Miller the bed at Cromarty in which occur the fossil remains of the Old Red Sandstone fishes. It had been assumed that the sandstones of Moray were not fossiliferous ; but after his visit to Cromarty Dr. Malcolmson

resolved to test this, and, with the aid of Dr. (then Mr.) Gordon and Mr. Stables, the sandstone beds from Buckie to Culloden were searched where sections could be found, and fossils similar to those of Cromarty were found at Altyre and in other localities.

Dr. Malcolmson in 1839 laid the result of this work before the Geological Society of London. He also induced his friends to join him in the search for traces of ice-action among the Scottish Highlands similar to those pointed out not long before by Agassiz in Switzerland. They made a careful exploration of several of the valleys and mountains of Inverness-shire and Ross-shire, especially around Mam Soul, finding abundant evidence of the former existence of glaciers on a great scale.

The publication of "The Old Red Sandstone," by Hugh Miller, in 1841, served to stimulate Dr. Gordon's zeal in the investigation of the Morayshire deposits, and led to subsequent discoveries of an unexpected and even perplexing nature. In 1844 a quarry at Lossiemouth yielded fossils that were regarded by Agassiz as scales of a fish, to which he gave the name *Stagonolepis Robertsoni*. A fossil found in 1851 at Spynie was examined by Mantell, and was determined by him to be a reptile, named by him *Telcrpeton Elginense*. The *Stagonolepis* was subjected in 1855 to a careful examination by Huxley, with the aid of better specimens than had been within the reach of Agassiz, and was proved to be a reptile related in structure to crocodiles. In 1858 Dr. Gordon procured portions of another reptile, named by Huxley *Hyperodapedon Gordoni*, which showed a close relationship to a genus found in Triassic rocks elsewhere. He published in the "Edinburgh New Philosophical Journal" in January 1859, pp. 14-56, a very valuable paper "On the Geology of the Lower or Northern Part of the Province of Moray: its History, Present State of Inquiry, and Points for Future Examination." The title indicates the scope of the paper (which sums up all that was then known of the geological deposits of the lower part of Moray), and calls attention to the value of Malcolmson's work. The physical characteristics of the sandstones of the district, he therein maintains, give no indication that the lower and upper beds belong to

widely different periods ; nor is there any evident break between those beds that contain fossils of typical Old Red Sandstone fishes and those that enclose the reptilian remains, which show strong affinities to Triassic forms. Dr. Gordon's labours were continued with unflagging interest ; and from specimens forwarded by him in 1891, Mr. E. T. Newton has described, in the "Transactions of the Royal Society," two previously unknown types of the very peculiar group of Dicynodont reptiles, one of which he has named *Gordonia* ; and in December 1893 he described a third, provisionally referred to Dinosauria, and named *Ornithosuchus*. These new types also show strong Triassic affinities. The apparent absence of unconformability in these beds, along with their identity in composition, caused Dr. Gordon to hesitate about accepting the conclusion that geologists for the most part have arrived at as to the age of the upper and of the lower beds of the Elgin sandstones ; and in 1892 he published a short paper in the "Transactions of the Edinburgh Geological Society" calling attention to these facts.

He had continued to acquire information regarding local antiquities ; and in 1862 he published a description of shell-mounds on the southern shore of the Moray Firth, which induced Sir John Lubbock to visit these relics of the past. Dr. Gordon pointed out the value of such investigations in showing changes in the distribution of species ; and mentions the curious fact that in the mounds examined by him the shells of *Tapes decussata* are abundant, though this species does not now live in the neighbouring seas ; it having retreated considerably southwards, contrary to the direction of retreat of most of the Mollusca that have abandoned our coasts since the Tertiary period.

About sixty years ago he took an active part in forming the Elgin and Morayshire Literary and Scientific Association, and in originating the Elgin Museum. From the commencement of the Museum he laboured unceasingly and earnestly to promote its usefulness—alike with gifts of specimens, with advice, and with personal assistance in the work of naming and arranging the collections. His influence has been most valuable in shaping its growth and development, and it is now one of the most successful

provincial museums in Scotland. He frequently visited the Museum, and till almost the close of his life he was ever on the outlook for additions to its collections.

In 1859 the University of Marischal College in Aberdeen conferred on him the degree of LL.D., in recognition of his scientific merits. His jubilee as minister of Birnie was celebrated in 1882 by his parishioners, by his colleagues in the Presbytery of Elgin, and by the members of the Elgin Literary and Scientific Association, amid conspicuous proofs of the high respect and love in which he was held.

In 1889 he retired from the parish of Birnie on account of his great age, and took a house (Bræbirnie) in Elgin, where he resided to the time of his death. Mrs. Gordon died in 1889, at Bræbirnie. Dr. Gordon possessed excellent health, and showed little sign of loss of strength till about a fortnight before his death, when he was attacked by influenza. Congestion of the lungs followed, and he sank peacefully to rest on the 12th December 1893. He is survived by four sons and two daughters.

Dr. Gordon's life was almost wholly spent in the province of Moray, except for occasional visits to Shetland or to other parts of Scotland; and his work was so largely done in Moray that one is apt to overlook such of it as related to other districts; but a good many notes and short papers pass beyond Moray. It may be said that there are few books or important papers on the natural history of Scotland, published in the latter part of this century, that have not profited by information contributed by him. We understand that there is some probability of the copious manuscripts left by him being revised with a view to the selection and publication of such material as may seem to be of most interest and value; but as yet it is difficult to estimate aright in what form this may best be done. There can be but one opinion as to the desirability of preserving from oblivion, and of making useful to his fellow-workers, whatever can be gathered of the matured wisdom of one, the recollection of whom will remain with those who had the privilege of his friendship as that of no ordinary man, but of a leader in all that doth become the truest and best type of manhood.

J. W. H. T.

THE LATE JOHN ROY, LL.D.

THE death of Dr. Roy has left a gap in the ranks of Scottish botanists that will not easily be filled ; while his researches among the freshwater Algæ, and especially among the *Desmidiæ*, brought him into wide correspondence with students of these groups in foreign lands. He was born on 24th February 1828 at Ardoch, in the Parish of Fowlis Wester in Perthshire. He received his education in the parish school there, and afterwards in the Normal College of the Church of

Scotland, in Edinburgh, with the view to becoming a teacher. He taught for five or six years in the school of Brackmuirhill in Kincardineshire. Thereafter he was appointed teacher in a school at the Old Bridge of Don, near Aberdeen, where he remained for three or four years. In 1863 he received the charge of Dr. Brown's school in Skene Square, Aberdeen, which was afterwards taken over by the School Board, and is now known as Skene Square Public School.



He remained in this position till last year, when he retired because of ill health, on a retiring allowance, after long and honourable public service. Of robust nature, not readily fatigued, he took great pleasure in long rambles in search of plants. Probably few persons were better acquainted with Mid and Northern Scotland, from the sea-level to the corries and summits of the highest mountains. In such rambles he was a most agreeable companion ; and his accurate knowledge of the plants themselves, and of the habitats of the

rarest species, and his readiness to communicate his knowledge to any one in want of it, rendered his companionship no less helpful than agreeable. It was, indeed, only his more intimate friends of similar tastes that were in any way in a position to estimate aright his ability and intellectual power, and the extent of his varied acquirements. Whatever work he undertook was done without thought of personal interest. The love of truth, as such, made him refrain from publishing anything of the accuracy of which he was not absolutely convinced; and the drudgery of school routine prevented him from having the time at his command to reach the completeness that he aimed at before making public the results of much labour. Several important pieces of work were only waiting their final revision when he should have leisure to give it after demitting public duties; but when the time of demission arrived, his health was such as to put the possibility of any work, save the lightest, out of his power. There is reason to hope, however, that part at least of the work prepared by him, and now in manuscript, is in such a state as to be ready for publication as it stands. Having made himself familiar with the flowering-plants, ferns, and mosses of this country, alike in their native habitats and in the herbarium, Dr. Roy devoted his attention more especially to the freshwater Algæ of Scotland, his knowledge of which was, we believe, unequalled. After a time, he concentrated his labours chiefly on the Desmids, a group of unicellular algæ very rich in species, of which many are singularly beautiful. He extended his study of these plants to material from all parts of the world from which he could procure it; and with this object, as well as to procure the literature of the subject, he entered into wide correspondence with botanists beyond the limits of Great Britain. He became a recognised authority in this group, the determination of the species in which demands long-continued and minute research. His labours and merits as a botanist are very inadequately represented by his published papers, a list of which, so far as known to the writer, is appended to this notice.

He was engaged for a number of years in collaboration with the Rev. John Fergusson of Fearn, in Forfarshire, in the preparation of a flora of the north-east of Scotland, from

Forfar to Elgin, a prospectus of which was issued several years ago. His share in the work was, he informed us, practically completed about five years ago. It is hoped that the valuable information contained therein will yet be published. He had also in hand an account of the Desmids of the Amazon valley and of Demerara, in which he proposed to describe and figure a large number of new species. In the course of correspondence with Mr. Hewett C. Watson and with Dr. Boswell Syme he supplied these gentlemen with numerous data, embodied in the well-known "Cybele Britannica," "Topographical Botany," and "English Botany."

Dr. Roy was also an excellent mathematician; and he did not a little valuable work in the calculation of astronomical results, *e.g.* reduction of double-star measures, construction of tables for latitude and longitude of astronomical stations at Dunecht, in Mauritius, in connection with the transit of Venus in 1874, etc. Most of these researches were made in connection with the reports of the Dunecht Observatory.

Dr. Roy took a warm interest in the local societies devoted to the encouragement of scientific studies. Among these may be mentioned especially the Aberdeen Natural History Society, of which he was for many years secretary and treasurer, and for some years president. He was also a president of the East of Scotland Union of Naturalists' Societies, and was one of the founders and office-bearers of the Scottish Cryptogamic Society. He frequently communicated papers to these bodies, and also to the Aberdeen Philosophical Society.

In March 1889 the Senate of the University of Aberdeen conferred on him the honorary degree of LL.D., in recognition of his scientific merits. About five years ago he contracted, (it was supposed from impure water in summer lodgings), what appeared to be a form of typhoid fever. With no very acute symptoms, it left permanent injury in the lower intestine and impaired general health. His condition became gradually worse. His lungs were affected; and death ensued very suddenly, from rupture of a lung, on Monday, 18th December 1893.

LIST OF PAPERS BY DR. ROY.

- “Recent Additions to the Flora of the North-East of Scotland” (*Scot. Nat.*, 1872, i. p. 272). A short note enumerating twenty-five species and varieties new to the district.
- “*Anacalypta latifolia* in Perthshire,” *l.c.* (Glen Tilt, found by Prof. Barker).
- “Double Flowers,” *l.c.* (of *Cardam. pratensis*, *Lep. Smithii*, and *Veron. saxatilis*).
- “Contributions to the Desmid Flora of Perthshire” (*Scot. Nat.*, 1877, iv. pp. 68-74). A brief introduction on mode of collecting material, followed by a list of all known species from Perthshire, including *P. rufopellitum*, n. sp., described.
- “List of the Desmids hitherto found in Mull” (*Scot. Nat.*, 1883, New Ser. I., pp. 37-40). With a supplementary list of twenty-six species from Ben Blaven, in Skye.
- “Additions and Corrections to *Topographical Botany*, Ed. II., for the Counties from Forfar to Elgin, inclusive,” by Professor Trail and John Roy (*Trans. Aber. Nat. Hist. Soc.*, 1885, pp. 13-20). Many new county records.
- “The Fauna and Flora of Snow and Ice” (*Scot. Nat.*, 1885, New Ser. II., pp. 122-127). This is based on Prof. Wittrock’s paper on the same subject.
- “Notes on Japanese Desmids, No. I.,” by John Roy and J. P. Bisset (*Journ. Bot.*, 1886, pp. 193-196, 237-242, Plate CCLXVIII).
- “Historical Sketch of the Freshwater Algæ of the East of Scotland” (*Scot. Nat.*, 1887, New Ser. III., pp. 148-159). Some marine Algæ also are referred to.
- “*Sciadium Arbuscula*, Braun, at Alford in Aberdeenshire” (*Scot. Nat.*, 1890, New Ser. IV., p. 198).
- “The Desmids of the Alford District” (*l.c.*, pp. 199-210). Descriptions are given of *Closterium pseudodiana*, n. sp., *Cosmarium gradatum*, n. sp., and *C. Slewdrumense*, n. sp.
- “The Desmidiæ of East Fife” (*Ann. Scot. Nat. Hist.*, 1892, vol. i. pp. 193-197).
- “On Scottish Desmidiæ” (*l.c.*, 1893-94, vol. ii. pp. 106-111, 170-180, 237-245; vol. iii. pp. 40-6, 100-5). This paper is at present appearing in our pages, is the most complete yet treating of British Desmids, and is likely to remain so for some time.

J. W. H. T.

NOTES ON "A BILL TO AMEND THE WILD BIRDS' PROTECTION ACT, 1880."

By ALFRED NEWTON, M.A., F.R.S., etc.

[As the question of the Protection of Birds' Eggs is likely to again occupy the attention of Parliament and the public, we have pleasure in making known some of the views held by Professor Newton upon this important and admittedly very difficult question. While refraining from expressing any opinions of our own upon the subject, we may remark that Professor Newton brings into the discussion of this matter an amount of experience which is unequalled and renders his opinions and criticism of unusual value and worthy of the most careful consideration. We have to express to Professor Newton our thanks for acceding to our request to be allowed to publish his Notes.

It should be explained that these Notes were written concerning the Bill introduced into Parliament last year, by Sir Herbert Maxwell, Bart., to amend the Wild Birds' Protection Act, 1880; and copies of them were privately circulated among influential members of both Houses. The aim of the new Bill was to enable County Councils to prohibit the taking of the eggs of such species of birds as it might seem desirable to name in different localities. Those who followed the course of this proposed measure are aware that the Bill duly passed the House of Commons; that it was amended in the House of Lords, chiefly at the instance of Lord Walsingham, somewhat in accordance with the views expressed by Professor Newton; that it was, unfortunately we think, reconstructed by the Chancellor in the Standing Committee; and, finally, the Bill was dropped because in its altered form it was not acceptable to its original promoter.—Eds.]

THE question of protecting Birds' Eggs was several times carefully considered by what was known as the "Close Time" Committee (of which I was for a long while chairman) appointed by the British Association for the Advancement of Science, with which body originated modern legislation in Bird Protection in this country. That Committee consisted of some well-informed ornithologists and others, who had especially paid attention to the subject. In their Report for 1874 they stated that they "take this opportunity of declaring their belief that the practice of birds'-nesting is, and has been, so much followed in England, that no Act of Parliament,

except one of the most severe character, could stop it; while any enactment of that kind would, by filling the gaols with boys (often of a tender age), excite a strong and uniform hostility against all measures for the protection of indigenous animals, even among many of those who are at present favourably disposed to it.” They proceed to say: “Your committee believe that the effect of birds’-nesting on such kinds of birds as are known to be diminishing in numbers is altogether inappreciable, while its effect on those whose numbers are not decreasing may be safely disregarded; and consequently that there is no need of any legislative interference with the practice. They again repeat their conviction that the only practicable mode of checking the diminution of such birds as have been proved to be decreasing is the effectual protection of the adults from destruction during the breeding-season.”

In their preceding Report (for 1873) they had submitted for consideration, among other remarks as to future legislation for the Protection of Birds, the following:—

“A Law protecting birds which cannot be shewn to want protection is a mistake. The crucial test of whether a bird wants protection or not, is whether its numbers are decreasing or on the contrary. With some very few exceptions (nearly each of which can be satisfactorily explained), none of what are commonly known as ‘Small Birds’ are decreasing throughout the United Kingdom generally. Most ‘Small Birds’ are generally increasing in numbers; some remarkably so.”

Now it seems to be admitted that the chief object of the introducers of the present Bill is the protection of “Small Birds,” which the “Close Time” Committee found was not in a general way needed.

Nevertheless, since that Committee ceased to exist, the question has been revived; and in 1891, as well as in 1892, the British Association appointed a Committee “to consider proposals for the Legislative Protection of Wild Birds’ Eggs.” It undoubtedly appears that it might be advisable to some extent to give effect to the desire expressed by many people, that some restrictions on what, for brevity’s sake, may be called “egging,” should be enacted. The question then arises of what nature these restrictions should be. It seems

very simple to those who have not fully considered it ; but those who have seriously reflected upon it find it beset by many complications, and very difficult of solution. Most people, however, will admit that birds' eggs are much more exposed to depredation in certain places than in others, and this only at certain times.

Proof of this, if wanted, is supplied by the fact that in several parts of England private persons have formed small local associations to pay watchers, during a few weeks in the breeding time, for the protection of the birds frequenting particular localities,—such as the Farne Islands, the sandhills near Wells in Norfolk, Breydon Water between Norfolk and Suffolk,—which I mention because I myself subscribe to them. It may be that there are others.

To me one way of treating the question seems preferable to any other that has been suggested, and indeed after many years' consideration the only one practicable. This is to give the local authority (County Council or Justices in Quarter Sessions), subject to the assent of a central authority, power to prohibit all egging in certain definite places for a certain definite time. Such prohibition would probably be confined to comparatively small bounds—an island, a sea-beach, cliffs or sandhills adjoining the shore, a heath, common, wood, or forest, a public park, a mere or broad with the surrounding land, or so on, and would be locally known, so that the risk of boys being sent to gaol would be greatly lessened. Moreover, all egging being prohibited within the prescribed limits during the inhibited period, there would be no need of attempting to prove that an egg found in the captor's possession was that of a protected species, such proof being in many, if not in most cases, as every practical ornithologist knows, absolutely impossible, if the defendant were advised by an ingenious counsel ; for, in the greater number of cases, an egg could not be proved to be that of any particular kind of bird, unless a witness could swear that he saw the bird lay it.

Egging may be considered to be carried on chiefly by three classes of persons :—

First, there is the man who for years has gathered the eggs of Plovers and certain marsh- or sea-birds for edible

purposes, whereby, if he be an adept, he is able by their sale in the open market to add considerably to his own livelihood. This man, I believe, would rejoice at a “close time” being enforced, after the first, second, or third laying of the birds, for the places where he plies his calling, so as to allow the hatching of the second, third, or fourth laying (as the case may be),—and most of the birds with which he is concerned lay twice, thrice, or four times in the season,—and so ensure the unimpaired continuation of the breed.

Secondly, there is the ordinary school-boy, whose depredations are at times extremely annoying to the owners or occupiers of gardens, plantations, and the like, but declared by the “Close Time” Committee to have little or no effect in reducing the number of birds in general, though their continuance year after year in particular districts may locally produce that effect. Now it is to be remarked that the ordinary school-boy, as a rule, is quite indifferent as to the kind of bird whose nest he may rob, and any restriction as to protected or unprotected species would be wholly lost upon him. To this rule there are some exceptions, and the exceptions often grow up to be fair naturalists.

Thirdly, there is the “collector,” who is only sometimes a naturalist in the true sense of the word. When he is one, he may be safely trusted to do no harm; but more often he is a dealer, and his influence on the whole is destructive to the less common kinds of birds, though even to this there are exceptions—as for instance the notable case of the Golden Eagle, which in Scotland would have become extinct, as the Sea Eagle has, were it not that the price the “collector” pays for its egg ensures its preservation at the hands of shepherds, foresters, and gillies—but these exceptions are not numerous, and it cannot be doubted that the *dealing* “collector” is in these days an evil, so that no true naturalist could object to see obstacles put in his way. Whether he would not be astute enough to escape the meshes of any Act of Parliament could only be ascertained after trial; but certainly an Act to check his proceedings must be very different from the present Bill, which, I feel sure, would hardly touch him. He is well enough off to employ counsel if charged, and of his own knowledge would be able to indicate

a line of defence that would ensure his acquittal perhaps in 19 cases out of 20, whatever might be the evidence of the prosecution.

On the other hand, the ordinary school-boy could not afford counsel ; and, being ignorant of the mode of escape, would be almost invariably convicted. If the Bench before whom he was brought let him off with a reprimand and a nominal penalty, a few cases of the kind would render the Act ridiculous. If the Bench inflicted a serious fine, and in default of payment, as would commonly happen, he went to gaol, the country would very properly ring with an outcry against an Act which brought that fate upon him for doing what an ancient authority—still respected by some people—held to be irreprehensible (see Deuteronomy xxii. 6, 7).

But, as already hinted, there are places in which the school-boy may do real harm, and I see no injustice in limiting him to some extent, while the "collector" is generally baneful ; and, as I have tried to shew, the man who gathers eggs to eke out a living would be content, if not pleased, with restrictions that would tend to multiply the birds which produce them—just as professional gunners now admit that, since the passing (in 1876) of the Wild-Fowl Preservation Act, there are more wild-fowl to shoot. I therefore strongly urge that the present Bill be amended so as to enable *places* and not species to be protected. It is an historical fact that old laws, which certainly did not err on the side of leniency, prohibiting the taking of the eggs of the Bustard, Crane, Spoonbill, and Wild Goose, have not saved those species from extirpation in England, and a naturalist may well doubt whether any law of that kind would have a beneficial effect on any species whose numbers are now dwindling ; but no one can doubt that if certain localities, judiciously chosen, were reserved as breeding-places by inhibiting in them for a longer or shorter time, as may seem advisable, the molestation of *all* birds frequenting them, a considerable number of species, the numbers of which are surely decreasing, would thereby take benefit, and this with proper precautions, without much risk of mischief, which I believe the Bill in its present shape will inevitably produce.

Of these precautions, I would remark that it appears to

me a very important part of the business. Places should not be protected indiscriminately, or merely to indulge a sentiment ; but only where need of protection is shewn, and the local authority, with whom the initiatory steps rest, would do well to consult local naturalists before applying for leave to put the Act in operation within its jurisdiction. But, most of all, I would urge that the very fullest notice should in each year be given concerning the reserved places. Few school-boys read newspapers ; and, if they do, they scarcely glance at the advertisements. The notice required by the Bill seems therefore ludicrously inadequate. It should be peremptory that notice be given at the door of every place of worship in the district, and more especially *in every school-room*, and should be repeated year after year at the proper season. Still further, I would urge for it to be at least suggested that the local authority should give warning by placards, or the like, at the boundaries of every reserved spot. The conditions under which this is possible must necessarily vary so greatly that all could not be specified in an Act ; but the principle of the Act should be prevention, and not punishment. Great as is the interest I take in the welfare of the British Bird, I take still greater in that of the British boy.

I would therefore suggest that Clause 2 (1) of the Bill should run as follows :¹

“ One of Her Majesty’s principal Secretaries of State as to England and Wales, the Secretary for Scotland as to Scotland, and the Lord Lieutenant as to Ireland, may, after passing of this Act, upon application by any County Council as to any county in Great Britain, and the Justices in Quarter

¹ Clause 2 (1) of the Bill ran as follows :

“ One of Her Majesty’s principal Secretaries of State as to England and Wales, the Secretary for Scotland as to Scotland, and the Lord Lieutenant as to Ireland, may, after the passing of this Act, upon application by any County Council as to any county in Great Britain, and the Justices in Quarter Sessions as to any county in Ireland (which bodies are hereinafter respectively referred to as ‘ the Authority ’), by order prohibit the taking or destroying any species of wild bird, or the eggs of any species of wild bird, in any place or places within the county ; and any person who shall take or destroy, or incite any other person to take or destroy, any species of wild bird, or the eggs of any species included in such order, in any place specified therein, shall, on conviction before any two Justices of the Peace in England, Wales, or Ireland, or before the Sheriff in Scotland, forfeit and pay for every bird or egg so taken or destroyed a sum not exceeding one pound.”

Sessions as to any county in Ireland (which bodies are hereinafter respectively referred to as 'the Authority'), by order wholly prohibit the taking or destroying of Wild Birds' Eggs for a certain period in any year or years, in any place or places within the jurisdiction of the Authority; and any person who shall take or destroy, or incite or procure any person to take or destroy any egg of any wild bird within such period in any such place or places, or convey or aid any person by land or water with the intent to contravene this Act, shall on conviction before any two Justices of the Peace in England, Wales, or Ireland, or before the Sheriff in Scotland, forfeit and pay for every egg so taken or destroyed a sum not exceeding one pound (£1), provided that such period and such place or places be adequately defined in the order setting forth the prohibition, and printed notice thereof be exhibited at the door of every school-house, church, and chapel within the jurisdiction of the Authority, not less than *twenty-one* days before the commencement of the period in each year, together with placards at the boundaries of such place or places, and such other notice as the Authority may determine."

9th May 1893.

SOME FURTHER BIRD NOTES FROM NORTH RONALDSHAY.

By ALLAN BRIGGS.

1893.

SONG THRUSH (*Turdus musicus*).—No nests here this season, as far as I could find out. A few birds came in along with Redwings about the middle of October.

REDWING (*Turdus iliacus*).—First for the season 4th October, when I saw a single bird. By the 10th there were numbers about the garden and fields near the house; after this date, and until the end of the month, every turnip-field was full of them.

FIELDFARE (*Turdus pilaris*).—Single bird near house 2nd October. On the 16th I saw a flock of perhaps one hundred and fifty; after this date there were always a few to be seen about the island.

BLACKBIRD (*Turdus merula*).—Increasing as a breeding species, three pairs having their nests in Holland garden. A few migrants came in along with Redwings about the middle of October.

WHEATEAR (*Saxicola oenanthe*).—First seen, four or five, on 7th April. Last seen, a single bird, on 17th October.

REDSTART (*Ruticilla phoenicurus*).—On the 4th October there were three in Holland garden; from this date until the 9th there were always a few about. On the latter date I counted five at one time. Most of those seen appeared to be females.

REDBREAST (*Erithacus rubecula*).—Two or three Robins in garden on the 9th October.

WHITETHROAT (*Sylvia rufa*).—I shot the only one seen, in Holland garden, 4th October.

BLACKCAP (*Sylvia atricapilla*).—I shot one on 4th October. Three in garden on the 9th October.

GARDEN WARBLER (*Sylvia salicaria*).—I shot one on the 4th, and another on the 5th October. The first time I have seen this bird in North Ronaldshay.

GOLDEN-CRESTED WREN (*Regulus cristatus*).—A few seen in the garden or in turnip-fields from the 4th to the 11th October. About six or eight all told.

CHIFFCHAFF (*Phylloscopus collybita*).—I shot one on the 16th, and another on the 23rd October, both in Holland garden.

WILLOW WREN (*Phylloscopus trochilus*).—One seen 27th April, and another on the 11th August. One shot on 4th October.

HEDGE SPARROW (*Accentor modularis*).—I saw one in garden on 4th October. Rarely seen in North Ronaldshay.

PIED WAGTAIL (*Motacilla lugubris*).—Small flocks among the rotting seaweed along the shore on the 22nd August. They remained only a few days.

MEADOW PIPIT (*Anthus pratensis*).—A few about the Mill Loch during September and the early part of October. This bird does not breed here.

PIED FLYCATCHER (*Muscicapa atricapilla*).—One seen 16th May, another along with Redstarts 4th October.

MARTIN (*Chelidon urbica*).—I saw two 4th June; and again on the 9th a pair, very possibly the same birds. In the evening of the 17th June five were circling about the house. On the 18th I counted six.

GREENFINCH (*Ligurinus chloris*).—I shot a Greenfinch cock from a flock of about a dozen on the 11th of October. Another

small flock in Holland garden on the 25th. I have not seen this bird in North Ronaldshay before.

CHAFFINCH (*Fringilla cœlebs*).—First seen for the season on 4th October, when large flights were about the garden and stack-yard; a few Bramblings accompanied them. I shot two of the latter, and saw three or four more. The wind during the night had been strong from the S.E., as also the day before. Fresh flocks of Chaffinches came in during this month; large numbers on the 9th, but no Bramblings along with them.

BRAMBLING (*Fringilla montifringilla*).—A few of these birds in large flocks of Chaffinches on 4th October. None seen after that date.

SNOW-BUNTING (*Plectrophanes nivalis*).—The last I saw in Spring was on the 1st of May, when I saw a single bird in full breeding plumage. The first of the autumn migration was on the 19th September, when I again saw a single bird. On the 22nd September a flock of eight; after this they came in rapidly in small lots. On the 9th October I saw a flock of, I should think, one thousand birds. Nothing like the numbers that were here at the same time last year.

STARLING (*Sturnus vulgaris*).—A flock of several thousand starlings visited this island in the evening of the 10th October; by the next morning all had disappeared. Whether these were actual migrants from farther north, or just a collection of the birds from the neighbouring islands, is difficult to determine.

CROW (*Corvus cornix*).—Three seen 7th October, and six on the 31st.

ROOK (*Corvus frugilegus*).—Numbers seen during the latter half of February and the first fortnight of March; as many as thirty in a flock.

RAVEN (*Corvus corax*).—Only a single Raven seen up to November; this was on the 11th October in a fearful gale of wind and rain from the S.W.

COMMON NIGHTJAR (*Caprimulgus europæus*).—On Sunday, the 4th June, when taking a walk along the west rocks, I flushed a Nightjar from a bunch of nettles; it settled again among the boulders about fifty yards ahead; I flushed it a second, and again a third time, after which it disappeared. This is the first Nightjar I have seen here.

SHORT-EARED OWL (*Asio accipitrinus*).—I shot a female on the 9th October. On the 13th of same month, six were seen in a turnip-field at the north end, near the lighthouse. It had been blowing a gale from the west or S.W. for several days previously.

SNOWY OWL (*Nyctea scandiaca*).—A bird of this species was shot on the 27th of February, while sitting on a ruined building. It was still alive when brought to me. On dissection it proved to be a female, and weighed $5\frac{1}{2}$ lbs., with a spread of wing of 5 feet 3 inches. Some time after this, another was seen near the lighthouse, but it did not stay any time.

FALCON (*Falco*).—On the 8th September, when standing at the house door, I saw a large Falcon soaring in circles at a considerable distance from where I was ; I went towards it, but it sailed away towards the north, and I did not follow. Next day, when out after Snipe, I again saw the bird sitting on the sheep-dyke, about one hundred yards distant ; he was facing towards me, and there was no means of getting nearer. I saw the bird well through my binocular ; he was nearly pure white on the breast and under parts, and when it rose and went gliding along the dyke—which it presently did—I noticed that it was rather darker on the upper portion of the plumage. The bird remained about the island for several days, and I saw it on several occasions, but I could never approach nearer than 100 or 150 yards. I was informed that it killed several tame ducks during its stay.

MERLIN (*Falco aesalon*).—Very plentiful this autumn ; much more so than usual. On one occasion I saw a pied bird.

BRENT GOOSE (*Bernicla brenta*).—On the 23rd October I saw two Brent at the north end, near the lighthouse. I was informed that four Geese of a larger size had been seen there about ten days before. While Snipe-shooting on the 27th October, my firing roused three Geese off the sea, close to which I was shooting ; these were large birds, but being a good distance out and the day being dull, I did not identify them.

SHOVELLER (*Spatula clypeata*).—Numbers of Shovellers seen during the breeding season, but scarce after shooting began ; indeed I only saw four after 1st August. During the month of June I have counted as many as nine Shoveller drakes on the Mill Loch at one time. In all likelihood the ducks were sitting in the marshes of Sanday, where Meiklejohn and myself found four nests one day in May.

PINTAIL (*Dafila acuta*).—A pair of these birds remained about a week on the Mill Loch during the latter half of May. I first saw them on the 15th of the month, and after seeing them for several consecutive days, had hopes of their remaining to breed ; however, they eventually took their departure. On the 23rd October I shot a young male on Garso Loch.

WIGEON (*Mareca penelope*).—During May and June there were always pairs, or odd drakes about the Mill Loch ; we searched

well, but could find no nests; I fancy they, like the Shovellers, bred in Sanday, where Meiklejohn and myself took eggs about the end of May. On the 2nd of October I noticed numerous small flocks of Wigeon frequenting the lochs in North Ronaldshay.

TUFTED DUCK (*Fuligula cristata*).—On the 24th of April I noticed a Tufted Drake on the Mill Loch; he remained a few days.

LONG-TAILED DUCK (*Harelda glacialis*).—On the 26th September I shot a male on the Mill Loch; it was a single bird, and the first seen for the season.

RING-DOVE (*Columba palumbus*).—Two seen near Holland farm towards the end of October.

WATER-RAIL (*Rallus aquaticus*).—Two shot on 4th October; one in Holland garden. After this I saw one or two single birds before I left in November.

LAND-RAIL (*Crex pratensis*).—Abundant, as usual, during the breeding season; I saw six nests in one rushy field. Last bird seen 14th October.

GOLDEN PLOVER (*Charadrius plumbealis*).—Very abundant during the first ten days of August; scarcer than usual after that. They put in an appearance very early this season, small flocks occurring towards the end of June.

GREY PLOVER (*Squatarola helvetica*).—I shot one on the 12th October; it was along with Turnstones, and proved to be a bird of the year.

TURNSTONE (*Streptilas interpres*).—I have seen this bird in small numbers during every month of the year in North Ronaldshay.

WOODCOCK (*Scolopax rusticola*).—Two seen 10th October.

COMMON SNIPE (*Gallinago caelestis*).—Up to the beginning of November one of the worst seasons I have known for Snipe here. Most plentiful during August.

JACK SNIPE (*Gallinago gallinula*).—First seen for this season two on the 16th September. Very numerous in October; during that month I shot seventy. Most plentiful on the 2nd, the 9th, and the 24th October.

LITTLE STINT (*Tringa minuta*).—On the 8th September I saw six Little Stints at a small loch near the house. On the 9th, two at the Mill Loch. On the 14th October one, and on the 16th five.

PURPLE SANDPIPER (*Tringa striata*).—Comparatively scarce up to the time of my departure. From my own observations, I think that a few of these birds remain here all the year round.

KNOT (*Tringa canutus*).—On the 15th August I saw two. On the 22nd August I saw a flock of about forty, and again on the 11th September I saw four.

- RUFF (*Machetes pugnax*).—The best year I ever remember for Ruffs. Four occurred on the 24th August, which were the first seen; during the remainder of August, and up to the 22nd September, there were numbers about. On one occasion I saw as many as eleven in a flock. On the 22nd September a single bird, the last seen.
- SANDERLING (*Calidris arenaria*).—First seen for the season 21st August.
- GREENSHANK (*Totanus canescens*).—I shot one on the 18th of August; during this month I saw several, single birds, four or five all told. Last seen 29th August.
- BAR-TAILED GODWIT (*Limosa lapponica*).—A few odd birds about this season, always singly. I shot three: the first on the 4th of August, the last on the 20th of September.
- WHIMBREL (*Numenius phaeopus*).—Often seen from May till end of August. I saw eleven on the 14th, and two on 19th May; three on the 4th June. A single bird remained the most of July in a corn-field close to the house. During August they were plentiful.
- SANDWICH TERN (*Sterna cantiaca*).—This season (1893) a small colony of Sandwich Terns bred among the Black-headed Gulls in the Mill Loch here. They chose a clear space among the reed-beds, where a short thick grass grows, and where a few Arctic Terns also place their nests. There were sixteen pairs in all; and so close were the nests placed together that an ordinary table-cloth would have covered the lot. By the 16th May most of the nests contained two eggs; in three, however, there were three eggs, which, I believe, is an unusual number. It seems a most curious spot for birds of this species to nest; but the loch had very little water in it, owing to the protracted drought, and the place where they nested was quite dry. This is the first record I have of the Sandwich Tern breeding in North Ronaldshay.
- GLAUCOUS GULL (*Larus glaucus*).—I saw a mature bird on the 23rd October.
- RICHARDSON'S SKUA (*Stercorarius crepidatus*).—Appeared earlier than usual this summer, many being seen during the month of July; seldom observed later in the season.
- GREAT NORTHERN DIVER (*Colymbus glacialis*).—A single bird close to the rocks on the south shore on the 9th of April. Some ten days after I again saw a single bird in Otterswick Bay, Sanday, when crossing over to that island.
- LITTLE GREBE (*Podiceps fluviatilis*).—On the 23rd October I saw a Little Grebe on Garso Loch: on the same loch I had shot one the previous winter.

ON MR. E. T. NEWTON'S MEMOIR "ON SOME NEW
REPTILES FROM THE ELGIN SANDSTONES."¹

By R. H. TRAQUAIR, M.D., LL.D., F.R.S.

OWING to its more northerly situation and consequently colder climate, Scotland cannot in a general way compete with England as a hunting-ground for the ordinary collector of natural history objects. We do not find with us that profusion of insect life, or that abundance of lovely flowering plants, with which the southern naturalist may fill his cabinet or his herbarium. Geologically too, Scotland consists almost entirely of crystalline and Palæozoic rocks, with only a few very small and isolated patches of secondary or tertiary strata, so that the collector of pretty fossils need not come to us if he wishes to load himself with those beautiful Jurassic ammonites, Cretaceous echini, and Eocene volutes, which he can obtain in abundance in those newer rocks which cover so much of the surface of the southern part of our island.

But it is precisely in the field of palæontology where lies the distinguishing feature of Scottish natural history. It is the peculiar richness of its Old Red Sandstone and Lower Carboniferous fish-fauna which has hitherto invested Scotland with a peculiar interest in the eye of the investigator of ancient vertebrate life. Now another and newer formation, the Triassic of the neighbourhood of Elgin, has been coming to the front, and we have here to deal with vertebrates of a higher grade than fishes, namely with Reptilia of Mesozoic type. And the above-quoted paper by Mr. E. T. Newton, F.R.S., of the Museum of Practical Geology, London, dealing as it does with recent discoveries in the Reptiliferous Sandstones of Morayshire, may be considered to be the most important contribution to Scottish palæontology which has appeared for many years, and one on which the author may most heartily be congratulated.

In a short introduction Mr. Newton tells the well-known tale of the history of these Morayshire fossil reptiles: how the earliest known of them, the crocodylian *Stagonolepis*, was first,

¹ "Philosophical Transactions," vol. 184 (1893) B. pp. 431-503, Plates XXVI-XLI. By E. T. Newton, F.R.S.

from its bony scutes, described by Agassiz as an Old Red Sandstone ganoid fish; and how, after the description by Mantell of the little lizard-like *Telerpeton Elginense*, the Scottish Upper Old Red became credited with a reptilian fauna. It was afterwards that Huxley determined *Stagonolepis* to be a crocodilian of Mesozoic type, and that he described two additional genera, *Hyperodapedon* and *Dasygnathus*, from the same beds; and as the former of these, *Hyperodapedon*, also turned up in Triassic strata in England and in India, the faith of geologists in the Palæozoic age of the Reptiliferous Sandstone was completely shaken, and the necessary inference of a long break in time between it and the undoubted Upper Old Red *Holoptychius*-bearing beds of the same district came to be acknowledged. Finally, in 1885, an imperfect skeleton from the same region was determined by Professor Judd and the present writer to belong to the Dicynodontia: a group of reptiles previously unknown in Europe, but occurring in Triassic rocks in India and Africa. All doubt as to the Mesozoic age of these reptiliferous beds may now be said to have disappeared from the minds of the overwhelming majority of geologists.

The last-mentioned skeleton, from Cuttie's Hillock, near Elgin, along with other reptilian remains subsequently collected in the same locality, has furnished Mr. Newton with the material which, after much pains and labour, he has worked up into the present elaborate memoir. In these fossils the osseous substance itself has entirely disappeared, leaving the bones represented only by hollow cavities in the rock. To gain an accurate conception of their original shape is therefore a matter of some difficulty, especially when we have to deal with objects of such complicated configuration as the skull of a reptile. This difficulty Mr. Newton has surmounted by making casts of these cavities in gutta percha; and in many cases these casts had to be made in separate pieces, which were afterwards fitted together.

The whole of these reptiles from Cuttie's Hillock are new to science, generically and specifically, and have been referred by Mr. Newton to three genera and six species, belonging to the extinct groups of Dicynodontia and Pareiosauria, as follows:—

A.—DICYNODONTIA.

Gordonia Traquairi. *Gordonia Duffiana.*
 „ *Huxleyana* „ *Juddiana.*
 Geikia Elginensis.

B.—PAREIOSAURIA.

Elginia mirabilis.

Of the Dicynodontia, the new genus *Gordonia* is closely allied to the type genus *Dicynodon* in having the jaws edentulous, with the exception of two large, pointed tusks, one in the

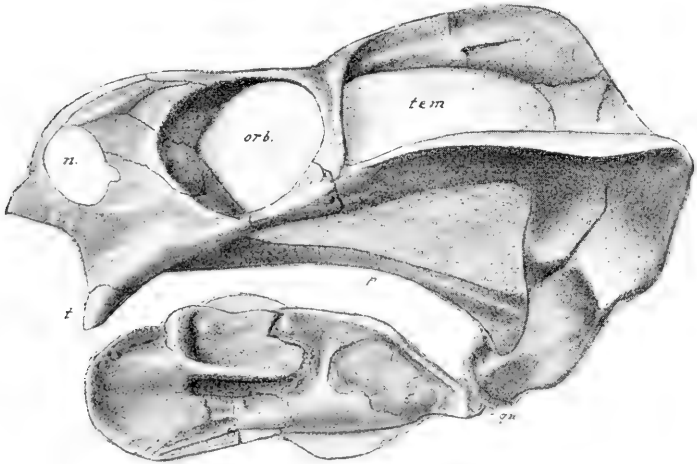


FIG. 1.—Skull of *Gordonia Traquairi*, Newton, one-half natural size, taken from a cast in gutta percha. Reduced from E. T. Newton's figure, Plate XXVI. *t*, Tooth; *n*, nasal opening; *orb*, orbit; *tem*, temporal fossa; *p*, palate; *qu*, quadrate.

maxilla of each side, and growing from permanent pulps like the tusk of a boar or the incisor of a rabbit, but specially characterised by the presence of two post-temporal fossæ on each side of the occiput and the comparative slenderness of all the bones of the skull. Four species, characterised by slight differences in the shape of the cranial bones, are recognised, viz. *G. Traquairi*, *G. Huxleyana*, *G. Duffiana*, and *G. Juddiana*. The first of these is the original Elgin Dicynodont noticed by Professor Judd and myself at the British Association Meeting at Aberdeen in 1885; and in Fig. 1, Mr. New-

ton's figure of its skull, seen from the side, is reproduced, about one-half less than the natural size.

The other Dicynodont genus *Geikia* is, like the South African *Oudenodon*, entirely edentulous; but, according to Mr. Newton, its affinities are more with *Ptychognathus* (*Ptychosiagum* Lydekker), a genus occurring both in Africa and India. *Ptychognathus*, however, has, like *Dicynodon* and *Gordonia*, a pair of large tusks, and the maxillary and pre-maxillary bones are much produced, whereas *Geikia* has not only no teeth, but

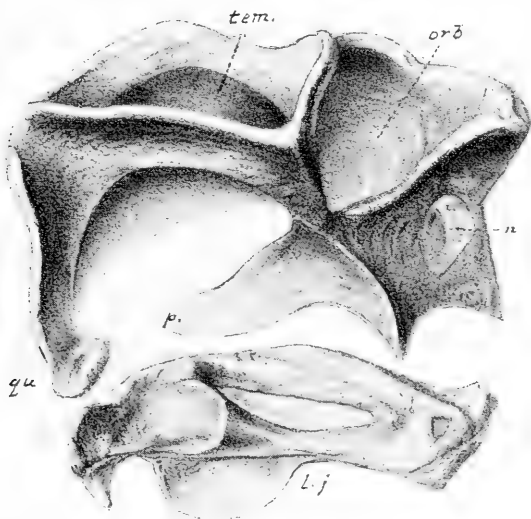


FIG. 2.—Side view of the skull of *Geikia Elginensis*, Newton, two-thirds natural size, from a cast in gutta percha. Reduced from E. T. Newton's figure, Plate XXXVI. Fig. 2. Lettering as in Fig. 1. *lj*, Lower jaw.

the skull in front of the orbits is extremely short, as is shown in the accompanying Fig. 2. One species is recognised: *Geikia Elginensis*.

The Pareiosauria are a group of extinct reptiles, considered by Seeley to be most nearly related to the Anomodontia, and which in many respects bear a remarkable resemblance to the Labyrinthodont Amphibia; as, for instance, in the roofing over of the temporal fossæ, the pitted sculpture of the external cranial bones, and the presence in *Pareiosaurus*, at least, of the so-called mucous canals. The pelvis is also described as being of Labyrinthodont type. To

the Pareiosauria Mr. Newton refers the last genus and species of the present series of Elgin fossil reptiles under the name of *Elginia mirabilis*.

Nothing of this creature is known as yet but the skull; and, as the accompanying figures will show, a most bizarre-looking skull it is, reminding us, as Mr. Newton observes, of the head of the American Horned "Toad" (*Phrynosoma*) on a large scale. The extreme development of "horns" on the skull also recalls to us Professor Marsh's American Dinosaurian genus *Triceratops*. The figures here given show, besides the

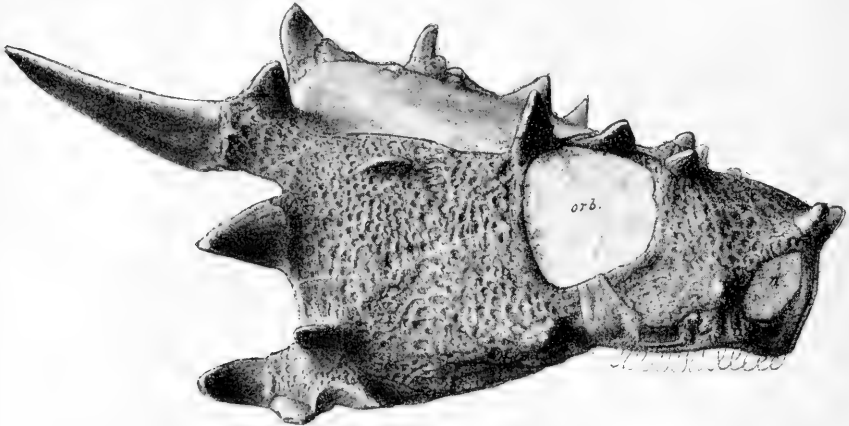


FIG. 3.—Side view of the skull of *Elginia mirabilis*, Newton, rather less than one-half natural size, from a cast in gutta percha. Reduced from E. T. Newton's figure, Plate XXXVII. Fig. 1. Lettering as in Figs. 1 and 2. The lower jaw is absent.

extraordinary arrangement of horns, the covering in of the temporal fossæ, the pitted sculpture of the surfaces of the external bones as in Labyrinthodontia and Crocodilia, and the comparatively small teeth with their spatulate and serrated crowns; these teeth, also pleurodont in their arrangement, strongly resembling those of the Lacertilian *Iguana*. Mr. Newton considers that *Elginia* finds its nearest ally in the South African *Pareiosaurus*, from which it also obviously differs in the possession of largely developed horns, and in the dentition; the teeth of *Pareiosaurus* being said to be implanted in sockets. The skull of *Pareiosaurus* is also proportionally broader and more depressed, and there are "mucous canals," which do not exist in *Elginia*.

The descriptive part of Mr. Newton's paper concludes with the consideration of a sacrum and some vertebræ, the exact determination of which he leaves over for the present.

One remarkable circumstance brought out by Mr. Newton's paper is that the fossil reptiles of Cuttie's Hillock, though doubtless belonging to the same great geological epoch, are all generically and specifically different from those found in the Reptiliferous Sandstone of other localities near Elgin. Both geologically and zoologically, there must still be an

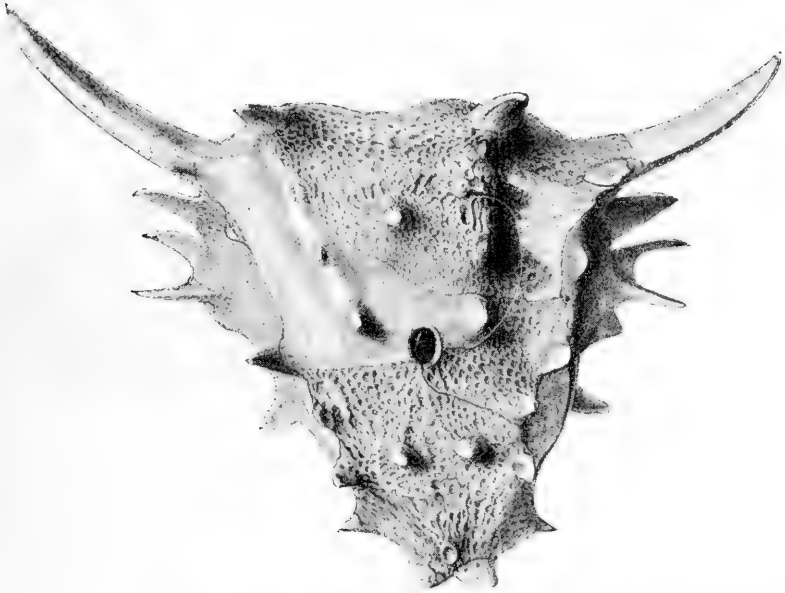


FIG. 4.—View of the top of the skull of *Elginia mirabilis*, Newton, also from a gutta-percha cast, rather less than one-half natural size. Reduced from E. T. Newton's figure, Plate XXXVIII. In the middle line is seen the large oval pineal opening.

immense hidden treasure lying below the surface in the Elgin district; and the wealth of material is further indicated by the fact that, since the publication of the present memoir, Mr. Newton has presented another to the Royal Society in which he describes two additional new reptiles from the district: one from Lossiemouth, a small parasuchian crocodile which he names *Erpetosuchus Granti*, and another which he refers to the Theropodous Dinosauria under the name of *Ornithosuchus Woodwardi*. This memoir will be noticed in detail

when it appears in full in the "Philosophical Transactions." Hopes of future material are, however, for the present very low, as I hear that the working of the quarries at Cuttie's Hillock has been abandoned, and that elsewhere in the district builders are finding it more profitable to work the sandstones of the Upper Old Red than of the Reptiliferous horizon.

In naming one of his new genera after the late Rev. Dr. Gordon, Mr. Newton has paid a fitting tribute to the worth of that indefatigable minister of religion, and worker in science, who has just passed away after a long life unselfishly devoted to his professional calling and to the pursuit of knowledge. Dr. Gordon's merits are fully set forth in another part of the present number of this journal; here, I need only say that all, who are interested in the Elgin Reptiles, know well the active part which he took in bringing their remains to light, and in consigning these to the care of experts for description and illustration.

The specimens described in Mr. Newton's memoir are to be found partly in the collection of the Geological Survey of Scotland, partly in the Elgin Museum. The memoir itself extends to 72 quarto pages, and is illustrated by 16 plates, the execution of which by Mr. A. T. Hollick leaves nothing to be desired.

PALÆOSPONDYLUS GUNNI, TRAQ., FROM THE
CAITHNESS FLAGSTONES.

By R. H. TRAQUAIR, M.D., LL.D., F.R.S.

PLATE III.

FROM an evolutionary point of view, it has often been thought that the Marsipobranch fishes, now represented only by the Lampreys (*Petromyzontidæ*) and the Hags (*Myxinidæ*), must have existed abundantly in ancient geological times; and it is very probable that they did. But as their purely cartilaginous skeletons are not readily conservable in a stony matrix, and as Nature does not preserve anything for us in

alcohol, it must be admitted that the difficulty in the way of getting any evidences of fossil Marsipobranchs is extreme.

The minute tooth-like bodies known as conodonts, which have been found in the greatest variety of form in Silurian and Carboniferous rocks both in Europe and America, have by many been supposed to have possibly belonged to Marsipobranch fishes, while others have been inclined to refer them rather to Mollusca or to Annelides. In an elaborate paper published in 1886, Professor von Zittel and Dr. Rohon,¹ after careful microscopic study of the bodies in question, totally discard the Marsipobranch theory, and record their belief that the entire series of conodonts must have belonged to the oral apparatus of Worms.

In 1890 I briefly noticed (1) a small organism from the Old Red Sandstone of Achanarras, Caithness, which I named *Palæospondylus Gunni* after its discoverers Dr. Marcus Gunn and Mr. Alexander Gunn, and whose head, apparently formed of calcified cartilage, seemed to me to suggest a Marsipobranch affinity; but as it also possessed a segmented vertebral column, I admitted that a Myxinoid with ossified skeleton including differentiated vertebral centra was rather a startling idea. The idea was, however, favourably received by Professor Howes (3) and Mr. Smith Woodward (4), and last year I was able to follow it up by publishing a more detailed account (5) of the structure of this remarkable fossil from fresh material. In August last (1893) I obtained still more perfect specimens from Achanarras, a description of which (7) I read before the Royal Physical Society of Edinburgh in the following December.

As this little organism is of great zoological interest, and has as yet been found nowhere else than in one locality in the north of Scotland, a brief *résumé* of its structure may be considered a suitable contribution to the "Annals of Scottish Natural History."

Palæospondylus Gunni is a very small organism, usually under one inch in length, though exceptionally large specimens occasionally measure one inch and a half: its appearance, natural size, is shown in Plate III. Fig. 7. It has

¹ "Ueber Conodonten." *Sitzungsb. der bayer. Acad. der Wissenschaften* 1886. Mathem.-phys. Classe, pp. 108-136.

a head and vertebral column, but no trace of jaws or limbs ; and, strange to say, all the specimens are seen only from the ventral aspect, as is shown by the relation of the neural arches to the vertebral centra. The head is in most cases much eroded, but its surface is fairly well seen in the specimen represented in Plate III. Fig. 5. It is divided by a notch on each into two parts : anterior (*t.p.*) and posterior (*p.a.*) The anterior part shows a groove the edges of which are elevated, while the surface on each side shows two depressions like fenestræ (*b.* and *c.*), though perhaps they are not completely perforated, and also a groove partially dividing off, posteriorly and externally, a small lobe (*a.*) In front there is a ring-like opening (*n.*) flattened by pressure, surrounded by small pointed cirri,—four ventrally (*v.c.*), at least five dorsally (*d.c.*), and two long lateral ones (*l.c.*) which seem to arise inside the margin of the ring instead of from its rim like the others. The posterior part of the cranium is flattened, but the median groove is still observable. Connected with the posterior or occipital aspect of the skull are two small narrow plates (*x.*) which lie closely alongside the first half dozen vertebræ.

The bodies of the vertebræ are hollow or ring-like, and those immediately in front are separated from each other by perceptible intervals (restoration, Fig. 8) ; their surfaces are marked with a few little longitudinal grooves, of which one is median. They are provided with neural arches, which are at first short and quadrate, but towards the caudal extremity lengthen out into slender neural spines, which form the dorsal expansion of a caudal fin, while shorter hæmal ones are also developed on the ventral aspect. In one specimen which has the tail exceptionally well preserved, these neural rods or spines are seen to be twice bifurcated towards their extremities (Fig. 6).

As I have already stated, none of the numerous specimens which have occurred show the smallest trace of jaws or of limbs.

The anterior moiety of the skull (*t.p.*) I interpret as equivalent to the trabeculo-palatal part of the cranium of the Lamprey, the posterior to the parachordal part and auditory capsules. The cirrated ring (*n.*) receives its most obvious interpretation as the median nasal opening of a Marsipobranch, while the small lobe (*a.*) strangely suggests in

its relation to other parts the styliform or epihyal process of the skull of the Lamprey. The dichotomisation of the elongated neural spines in the caudal region may also be compared with the same condition in the caudal spinous processes: the so-called fin rays of the Lamprey.

If I am right in my interpretation of these facts in the structure of *Palæospondylus* there seems no escape from the conclusion that the little creature must be classed as a Marsipobranch; and the calcification of its cranium, with the development also of calcified ring-vertebræ in the sheath of the notochord, need be no bar to the acceptance of this view of its affinities, especially if the modern representatives of the group are degenerate forms, as some suppose. It must here be noted that there is no basicranial fontanelle; so that there could have been no posterior nasal canal, either opening into the pharynx as in *Myxine*, or ending in a blind sac as in *Petromyzon*:

It is also clear that the hyolingual apparatus, whose absence in the living state can scarcely be conceived, must have been composed of a softer variety of cartilage, uncalcified, and therefore incapable of preservation in the rock. It is well known that in the recent Marsipobranchii two varieties of cartilage enter into the formation of the cranio-facial apparatus, one of which is considerably harder and more solid than the other; and a similar condition may have existed in *Palæospondylus*, the hard cartilage becoming in addition actually calcified.

Sir J. W. Dawson (6) has suggested an Amphibian affinity for *Palæospondylus*; but the facts which have come out regarding its structure since the work in which he expresses that opinion went to press, render it hardly necessary to discuss that question here, though I have done so in my last paper (7) communicated to the Royal Physical Society. No Amphibian, adult or embryo, with which I am acquainted shows a median ciliated opening, presumably a nose, in the front of the head.

To sum up the evidence of the Marsipobranch affinity of *Palæospondylus* we have the following facts:—

1. The skull is apparently formed of calcified cartilage, and devoid of discrete ossifications.

2. There is a median opening or ring, surrounded with cirri, and presumably nasal, in the front of the head.

3. There are neither jaws nor limbs.

4. The rays which support the caudal fin-expansion, apparently springing from the neural and hæmal arches, are dichotomised (at least the neural ones), as are the corresponding rods in the Lamprey,

And if *Palæospondylus* be not a Marsipobranch, it is quite impossible to refer it to any other existing group of Vertebrata.

LITERATURE OF *PALÆOSPONDYLUS*.

1. Traquair, R. H., "On the Fossils found at Achanarras Quarry, Caithness," *Ann. and Mag. Nat. Hist.* (6), vol. vi. (1890), p. 485.
2. Woodward, A. Smith, *Catalogue of the Fossil Fishes in the British Museum*, part ii. (1891), p. 553. Reference to the above.
3. Howes, G. B., "On the Affinities, Inter-relationships, and Systematic Position of the Marsipobranchii," *Trans. Biol. Soc. Liverpool*, vol. vi. (1891).
4. Woodward, A. Smith, "The Forerunners of the Back-boned Animals," *Natural Science*, October 1892, pp. 597-599, Fig. 1.
5. Traquair, R. H., "A further description of *Palæospondylus Gunni*," *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part i. (1893), pp. 87-94, Plate I. Reviewed by Mr. Smith Woodward in *Natural Science*, August 1893, p. 128, and in *Geol. Mag.* (3), vol. x. p. 471.
6. Dawson J. W., *Salient Points in the Science of the Earth* (London: 1893), pp. 285, 286. With a figure.
7. Traquair, R. H., "A still further Contribution to our Knowledge of *Palæospondylus Gunni*," *Proc. Roy. Phys. Soc. Edin.*, vol. xii. pp. 312-321, Plate IX.

EXPLANATION OF PLATE III.

(For permission to reproduce this plate, the author is indebted to the Council of the Royal Physical Society.)

The lettering is uniform throughout all the figures. *t.p.*, Anterior or trabeculo-palatine part of the cranium; *p.a.*, posterior or parachordal part; *a.*, lobe divided off from the anterior part; *b.*, anterior depression or fenestra; *c.*, posterior depression or fenestra; *n.*, nasal ring; *v.c.*, cirri of the ventral margin of the ring; *l.c.*, long lateral cirri; *d.c.*, cirri of the dorsal margin; *v.*, vertebral centra; *x.*, post-occipital plates.

Fig. 1.—Head of *Palæospondylus Gunni*, seen from the ventral aspect, and showing the presumed nasal ring with its cirri. The rest of the cranium is eroded. Magnified five diameters.



Fig. 1



Fig. 4.

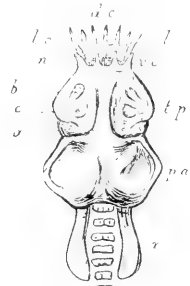


Fig. 3



Fig. 2

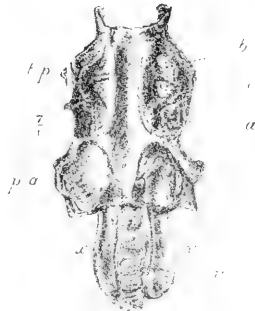


Fig. 5.



Fig. 7



Fig. 3.

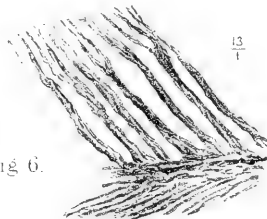


Fig. 6.

Fig. 2.—Another head; the two inner cirri of the ventral part of the ring lost; the rest of the cranium eroded. Magnified six diameters. The entire specimen represented of the natural size in Fig. 7.

Fig. 3.—Another head still more eroded, but the position of the nasal opening indicated by the remains of the cirri around it. Magnified six diameters.

Fig. 4.—Anterior part of another head, magnified six diameters. The dorsal margin of the nasal ring with stumps of cirri is seen, but the ventral margin is broken through in the middle.

Fig. 5.—A head figured in my former paper (5,¹Plate I. Fig. 2), but here magnified up to seven diameters. Only the ventral margin of the nasal ring is seen, with obscure traces of cirri externally on each side. In this specimen the surface of the skull is wonderfully entire and uneroded, but it seems just a little frayed along the margins.

Fig. 6.—Part of the tail of the specimen the anterior part of whose head is represented in Fig. 4, to show the dichotomisation of the neural spinous processes. Magnified thirteen diameters.

Fig. 7.—The specimen, natural size, whose head is represented in Fig. 2.

Fig. 8.—Restored outline of *Palcospondylus Gunni*, altered from the figure previously given (5, p. 90) in accordance with the present state of knowledge.

LIST OF ADDITIONAL HEMIPTERA COLLECTED IN PERTH DISTRICT IN 1893.

By T. M. M'GREGOR.

(Perthshire Society of Natural Science.)

- Peritrechus luniger*, Schill.—Minkie Moss in October, under bark of stumps growing out of marsh.
- Gastrodes ferrugineus*, Lin.—Woody Island in October, dead specimen under spruce bark.
- Salda saltatoria*, Lin.—Minkie Moss in October, under bark of upright stumps in marsh.
- Salda cineta*, H. S.—Minkie Moss in October, under bark of upright stumps in marsh.
- Ceratocombus muscorum*, D. & S.—Minkie Moss in August, in sphagnum.
- Tetraphleps vittata*, Fieb.—Woody Island in June and July, by beating spruce and larch.
- Myrmedobia tenella*, Zett.—Minkie Moss in June.
- Labops mutabilis*, Fall.—Top of North Inch, June and July, sweeping.
- Orthotylus fuscescens*, Kb.—Bankfoot, June.
- Psallus obscurellus*, Fall.—Woody Island, June; Scots fir, spruce, larch, by beating. Countless specimens were got off one

particular tree (Scots fir); and on this identical tree I found on 14th and 30th June *Plesiodema pinetellum* quite as numerous. It is worth noting that while *Ples. pinetellum* was common this year throughout the district, on no particular tree (except this one) was the species numerous.

Plagiognathus Wilkinsoni, D. & S.—Minkie Moss, June, under sphagnum.

Corixa hieroglyphica, Duf.—Perth, North Inch Ponds, 30th May.

Corixa fabricii, Fieb.—Perth, Wild Orchard Pool in April.

Corixa concinna, Fieb.—Perth, North Inch Ponds, 30th May.

Corixa carinata, Fieb.—Dalguise, in April. In pools and hills between Dalguise and Dunkeld.

Strongylocephalus agrestis, Falc.—Minkie Moss, October, sweeping.

Eupelix cuspidata, Fal.—Minkie Moss, August, sweeping.

Deltocephalus sabulicola, Curt.—Linn of Campsie, May, off wild thyme by sweeping.

Limotettix nigricornis, J. Sahl.—Bankfoot, June, sweeping.

ON SCOTTISH DESMIDIEÆ.

By the late JOHN ROY, LL.D., and J. P. BISSET.

[Continued from page 46.]

PLATE IV.

49. *C. De Notarisii* (Wittr.), Nordst.—Very rare. Ross—Falls of Connon; Kincardine—south from Portlethen; Stirling—Fintray Hills.
50. *C. eboracense*, W. West.—Very rare. Perth—Craig-an-Lochan.
51. *C. eductum*, Roy and Bisset (“Desmidieer from Bornholm,” O. Nordstedt, 1888).—Very rare. Aberdeen—Powlair, Heughhead near Aboyne; Kincardine—Crathes, Durris. (Our Plate I. fig. 9.)
52. *C. elegans*, n. sp.—Medium sized; unequally hexagonal; sides minutely undulated and converging towards the truncate produced and more boldly undulated ends; minute crenulations extend from all the undulations towards the centre of the frond, which appears to be smooth; constriction narrow, of medium depth; frond from side view of nearly equal thickness. Length, 43-45 μ ; breadth, 28-30 μ ; isthmus, 17 μ . (Our Plate II. fig. 5.)
Very rare. Aberdeen—Logie-Coldstone and Glassel.

53. *C. elegantissimum*, Lundell.—Very rare. Aberdeen—Powlair and Slewdrum; Kincardine—near Bridge of Bogandreep and Blackhall in Strachan; Perth—Glen Garry, Ben Lawers.
54. *C. Etchachanense*, n. sp.—Medium sized; semi-orbicular; about one-third longer than broad; semi-cells semi-orbicular; basal angles bluntly acute; sides unequally undulated; ends rather flattened and more obscurely undulated; surface finely granulated; granules in perpendicular rows, about nine in a row; constriction deep and narrow. Length, 38-40 μ ; breadth, 30-32 μ ; isthmus, 12-13 μ . (*Our Plate I. fig. 15.*)
Very rare. Aberdeen—Corrie Etchachan (Ben Macdhu).
55. *C. excavatum*, Nordst.—Rare. Aberdeen, Kincardine, Forfar.
56. *C. exiguum*, Archer.—General, but scarce.
57. *C. flavum*, n. sp.—Small sized; length and breadth equal; semi-cells reniform, in side view circular; constriction deep and opening widely; frond smooth; zygospore orbicular, smooth. Length, 32 μ ; breadth, 32 μ ; isthmus, 10 μ ; diameter of zygospore, 40 μ . (*Our Plate II. fig. 17.*)
This species is closely allied to *C. Jacobsenii*, Roy, *C. ellipsoideum*, Elfv., and *C. contractum*, Kirch., but appears to be sufficiently distinct.
Rare. Sutherland—Loch Inver; Aberdeen—Scotston, Birsemore, Craigendinnie, Dinnet, Dawin, Auchnerran, Glen Clunie; Kincardine—Crathes, Cammie, Dalbrake.
58. *C. fontigenum*, Nordst.—Not common. Ross; Inverness—Skye, and near Brin; Aberdeen; Kincardine; Perth.
59. *C. formosulum*, Hoff.—Rare. Argyle—Ben Laogh; Wigtown.
60. *C. galeritum*, Nordst.—Rare. Sutherland—near Loch Inver; Inverness—near Loch Coruisk (Skye); Aberdeen—Ben-na-Chie, Morven, Birse, Aboyne; Perth; Arran—near Corrie.
61. *C. Garrolense*, n. sp. (*C. latereundatus*, R. and B.'s MSS.)—Medium sized; about one-sixth longer than broad; sub-quadrangular; sides, with 3 to 4 undulations, converging slightly towards the ends, which are slightly curved, and obscurely plicated; constriction linear and moderately deep; membrane sparingly and obscurely punctate. Length, 30 μ ; breadth, 25 μ ; isthmus, 9-11 μ . (*Our Plate II. fig. 4.*)
Very rare. Kincardine—Den of Garrol; Forfar—Clova Tableland.
62. *C. gemmiferum*, Breb.—Rare. Ross—Loch Kinnellan and Falls of Connon (Mrs. Farquharson); Inverness—Loch Ruthven, etc. (Mrs. Farquharson); Aberdeen—near Alford and Cambus-o'-May; Fife.

63. *C. globosum*, Bulnh.—Not common. Inverness, Aberdeen, Kincardine.
64. *C. gradatum*, Roy (“Desmids of the Alford District,” in “Scot. Nat.,” January 1890, p. 203).—Not common. Caithness, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Fife, Wigtown.
65. *C. granatum*, Breb.—General.
 β *elongatum*, Nordst.—Rare. Aberdeen—near Aboyne, at Homehead in Logie-Coldstone; and in Ballochbuie near Balmoral; Kincardine— at Muchalls; Forfar—at Reeky Linn.
 γ *Grunovii* (Grunow, in Rabenhorst’s “Beiträge,” Heft II. p. 15, Taf. II. fig. 27).—Extremely rare. Aberdeen—in Glen Callater, at the Break Neck Fall.
66. *C. Grantii*, n. sp. (*C. didymopentachondrum*, R. and B.’s MSS.)—Medium sized; nearly as broad as long; sides and ends almost straight, with prominent undulations, which do not extend beyond the edges, minute granules or crenulations taking their place on the front of the frond; five pairs of more prominent granules at the base of each semi-cell; constriction deep and narrow. Length, 34-35 μ ; breadth, 30-31 μ ; isthmus, 13-14 μ . (Our Plate I. fig. 10.)
 Named in honour of Mr. P. Grant, a pioneer collector of *Desmidiæ* in the north-east of Scotland.
 Very rare. Found only on wet rocks as yet. Aberdeen—Glassel and Slewdrum; Kincardine—Letterbeg in Strachan.
67. *C. granulusculum*, n. sp.—Small sized; orbicular; nearly as broad as long; basal angles rounded; sides curving rapidly towards the rounded ends; constriction very deep and narrow; surface rather closely covered with minute pointed granules; semi-cells—in side view globose, in end view oval. Length, 35 μ ; breadth, 31 μ ; isthmus, 8 μ . (Our Plate II. fig. 8.)
 Very rare. Aberdeen—Howford near Inverurie; Kincardine—Gillan near Banchory; Perth—Folotry.
68. *C. Gregorii*, Roy and Bisset (Gutwinski, “Flora Głonów Okolic Lwowa,” Krakow, 1891).—Small sized; slightly longer than broad; constriction narrow, linear, deep; sides rectangular at first, then with two large rounded undulations; end truncate, half the breadth of the base, indistinctly 4 to 6 undulate; sides with minute granules on each undulation, from which rows of about 3 in each converge towards the centre, which is usually very obscure, but has 3 perpendicular

rows of 3 to 4 slightly larger granules in each, placed close together; two rows of granules close to the end; end view oval, no central protuberance; side view of semi-cell globular; isthmus about one-third the diameter. Length, 25-27.5 μ ; breadth, 23-24.5 μ ; isthmus, 7-8 μ . (*Our Plate I. fig. 11.*)

Named in honour of the Rev. Dr. Gregor of Pitsligo, from whom the first example was received.

Very rare. Banff—Iron Hill (Aberdour); Aberdeen—Collieston and Castleton, Braemar; Perth—Loch Lundie; Wigtown.

69. *C. Hammeri*, Reinsch.

Forma *A. majus*.—This certainly comes very near *C. homalodermum*, Nordst., but differs from the latter in "margo terminalis rectus." If the two are really distinct, Reinsch's form does not seem to occur with us. For distribution, see *C. homalodermum*.

Forma *C. octogibbosum*, Reinsch.—Rare. Aberdeen—Scotston Moor, near Aboyne, in Birse, near Ballater, and in Glen Clunie. Kincardine—Cammie, Strachan.

70. *C. hexalobum*, Nordst.—Rare. Ross—in the Black Isle; Aberdeen—Koynach Moor and Presswhin, Cromar; Craigendinnie, Aboyne; and head of the Forest of Birse; Kincardine—Den of Garrol, Durris; Perth—Glen Shee.

β *minor*, n. var.—Smaller than the type; ends less produced, and the undulations not nearly so bold. Length, 32-35 μ ; breadth, 28-30 μ ; isthmus, 10-11 μ . (*Our Plate I. fig. 12.*)

Very rare. Aberdeen—Presswhin, Cromar, along with the type.

71. *C. hexastichum*, Lundell.—Very rare. Aberdeen—Dalbagie near Ballater.

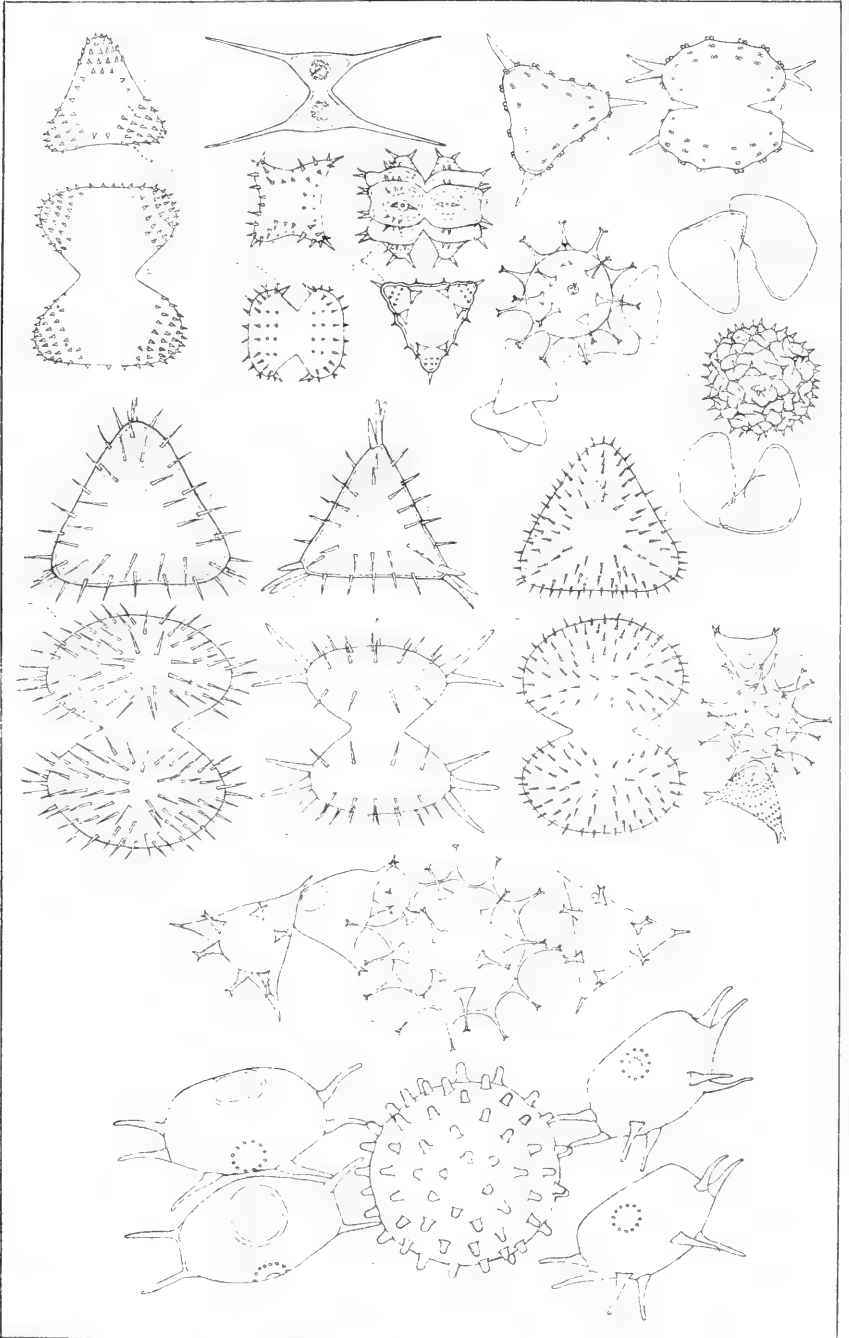
β *octastichum*, Nordst.—Very rare. Inverness—Loch Ruthven (Mrs. Farquharson).

72. *C. Holmiense*, Lundell.—Not common. Ross—at Strome; Inverness—Glen Urquhart, and in Skye at the Quirang and near Loch Coruisk; Aberdeen—several localities in Cromar, and Upper Deeside; Kincardine—Clochnaben; Forfar—Canlochan and Reeky Linn; Perth—Ben Lawers, and at Bracklin near Callander; Stirling—Fintray Hills and Alva Glen; Arran—at Corrie.

β *integrum*, Nordst.—Not common. Inverness—Glen Urquhart; Aberdeen—Cromar and Upper Deeside; Forfar—Lundie and Reeky Linn; Perth—Glen Shee and Craig-an-Lochan.

A large form occurs in Aberdeen at the Vat and in the Corrie of Loch Kandor, and in Perth on Ben Lawers and at Bracklin.

73. *C. homalodermum*, Nordst.—Not common. Ross—Poolewe; Inverness—Glen Urquhart; Aberdeen—Auchterless, Birse, Cambus-o'-May, Culblean, Glen Callater, etc.; Kincardine—Durris; Forfar—Clova Tableland and Canlochan; Perth—Durdie, Ben Lawers, Rannoch, Lochearnhead, Bracklin; Stirling—Alva Glen; Argyle—Mull.
74. *C. impressulum*, Elfv.—General, but scarce.
75. *C. intermedium*, Delp.—Rare. Inverness—in Skye, near Portree; Aberdeen—near Aboyne; Argyle—in Mull, near Tobermory (Mr. George Ross).
76. *C. isthmochondrum*, Nordst.—Not common. Inverness—Loch Ruthven (Mrs. Farquharson); Aberdeen—not uncommon; Kincardine—Bishop's Dam in Strachan; Forfar—Tannadice Curling Pond and Clova Tableland; Perth—Durdie, and near Fowlis Wester; Argyle—Glen Coe.
77. *C. Jacobsenii*, Roy (*C. moniliferum*, forma, *Jacobsen*, "Desmid. du Danemark," p. 200, Tab. VIII. fig. 24).—Not common. Aberdeen—Slewdrum, Presswhin, Logie-Coldstone, Glen Clunie; Kincardine—Crathes, Dalbrake in Strachan.
78. *C. jenisejense*, Boldt.—Very rare. Inverness—Cairngorm.
79. *C. Kjellmani*, Wille.—Very rare. Aberdeen—Dalbagie near Ballater, Slewdrum.
Sub. sp. *grande*, Wille.—Very rare. Aberdeen—Bourtie.
80. *C. lave*, Rab.—Very rare. Aberdeen—Tonley; Perth—Glas Mhoel.
β septentrionale, Wille.—Rare. Inverness—Loch Ruthven (Mrs. Farquharson); Aberdeen—Slewdrum in Birse; Kincardine—Nigg; Perth—Bracklin; Stirling—Alva Glen; Kirkcudbright—New Galloway.
81. *C. latifrons*, Lundell.—Extremely rare. Forfar—Barrelwell Moss near Brechin (Mr. Scott).
82. *C. latum*, Breb.—Not common. Sutherland—near Loch Inver; Ross—Falls of Connon; Inverness—Loch Ruthven (Mrs. Farquharson); Aberdeen—many localities; Kincardine—Cammie in Strachan; Forfar—Menmuir, Balquhadly in Fern; Perth—Durdie and Glen Shee; Stirling—Fintray Hills. (*Our Plate II. fig. 10.*)



Var. minor, n. var. (*C. simililatum*, R. & B.'s MSS.)—Very like the type in form, but smaller and more closely granulated. Length, 60-67 μ ; breadth, 48-55 μ ; isthmus, 20-22 μ . (*Our Plate II. fig. 11.*) Very rare. Aberdeen—above Loch Etchachan, Ben Macdhuil; Forfar—in Canlochan.

83. *C. Logiense*, Bisset.—Not common. Inverness—near Brin (Mrs. Farquharson); Aberdeen—Moss of Logie (Cromar), Cambus-o'-May, Dalbagie near Ballater, near the summit of Lochnagar, Glen Callater at the Breakneck Waterfall and on the Tableland above; Forfar—Canlochan, at the west end of Rescobie Loch; Perth—Glen Tilt and at Lochearnhead; Dumbarton—between Loch Lomond and Loch Long (Dr. Watson). (*Our Plate II. fig. 15.*)

84. *C. lepidum*, W. West.—Extremely rare. Perth—Ben Chroin.

(*To be continued.*)

DESCRIPTION OF SCOTTISH DESMIDIEÆ, PLATE IV.—Fig. 1. *Arthrodesmus longicornis*, R. and B., $\times 400$. Fig. 2. *Staurastrum horametrum*, R. and B.: *a*, end; *b*, side (of larger specimen); $\times 400$. Fig. 3. *S. rostellum*, R. and B.: *a*, end (slightly tilted); *b*, side; $\times 400$. Fig. 4. *S. monticulosum*, Breb.: *a*, end; *b*, front; $\times 400$. Fig. 5. *S. cornutum*, Archer: *a*, end; *b*, side; $\times 600$. Fig. 6. *S. granulosum* (Ehr.), Ralfs, and zygospore, $\times 400$. Fig. 7. *S. orbiculare* (Ehr.), Ralfs (*forma?*), and zygospore, $\times 400$. Fig. 8. *S. polytrichum* (Perty), Rab.: *a*, end; *b*, front; $\times 400$. Fig. 9. *S. setigerum*, Cleve.: *a*, end; *b*, side; $\times 400$. Fig. 10. *S. saxonicum*, Buln.: *a*, end; *b*, front; $\times 400$. Fig. 11. *S. avicula*, Breb. (*forma?*), and zygospore, $\times 400$. Fig. 12. *S. armigerum*, Breb., and zygospore, $\times 400$. Fig. 13. *Xanthidium antilopœum* (Breb.), Kg., and zygospore (*immature*), $\times 400$.

ON THE FOOD OF *UTRICULARIA VULGARIS*, AN INSECTIVOROUS PLANT.

By THOMAS SCOTT, F.L.S.

Naturalist to the Fishery Board for Scotland.

EVER since Darwin, in his important work on "Insectivorous Plants," brought together such a mass of information,—some of it of a startling description, bearing on the habits and structure of various species of plants, which, though in some cases differing widely in their position in classification, are yet

alike as to their power of preying upon insects,—more than usual interest has been excited in regard to them. Several of the plants that formed the subjects of Darwin's experiments belong to comparatively common species, such as *Utricularia vulgaris*, *Drosera rotundifolia*, and *Pinguicula vulgaris*; and this no doubt has tended still further to increase the interest in the peculiar and remarkable habits possessed by such plants.

Utricularia vulgaris is an aquatic plant, and in the Edinburgh District occurs in moderate abundance in pools at Gullane Links, near Aberlady. The utricles of this species are large and numerous, and very frequently contain micro-organisms that have found their way into what has proved to them a living tomb.

Many years ago I examined a number of utricles of another species—*Utricularia minor*—discovered in pools by the side of the road between Port Glasgow and Kilmalcolm (west of Scotland); and a Note of the organisms observed in the utricles was published in the "Greenock Telegraph"; but for various reasons I had not till lately the privilege of examining the much larger and finer *Utricularia vulgaris*. During the month of May last year my son, Mr. Andrew Scott, and I made a partial investigation of the locality about Gullane and Aberlady and collected some specimens of *Utricularia vulgaris*, which were placed in spirit till a convenient opportunity occurred to look over them. A considerable number of the utricles on these specimens have now been examined, and the following is a record of some of the results obtained.

In the first place, I examined five hundred utricles, none of them being smaller than about the one-twelfth of an inch across the longest diameter. They were taken from the plants indiscriminately,—except as regards size,—and their contents were carefully investigated and recorded. Of the 500 utricles, 81 were empty,—that is, they did not contain organic matter; 35 contained organic matter, but so much decomposed as to be indistinguishable; while 384 contained organic matter that could be identified.

Of the 384 utricles containing matter that could be identified—

- 70 contained only one organism each (equal to 70 specimens). Of these 34 were *Cyclops* (24 ♂, 4 ♀, 6 ?); 9 *Canthocamptus*; 25 *Cypris*; 1 *Cladoceran*; and 1 *Tardigrada*.
- 59 contained two organisms each (equal to 118 specimens). Of these 62 were *Cyclops* (47 ♂, 11 ♀, 4 ?); 7 *Canthocamptus*; 48 *Cypris*; and 1 *Rotifer*.
- 51 contained three organisms each (equal to 153 specimens). Of these 51 were *Cyclops* (42 ♂, 4 ♀, 5 ?); 8 *Canthocamptus*; 90 *Cypris*; 3 small *Annelides*; and 1 insect larva.
- 28 contained four organisms each (equal to 112 specimens). Of these 29 were (*Cyclops* 28 ♂, 1 ?); 5 *Canthocamptus*; and 78 *Cypris*.
- 19 contained five organisms each (equal to 95 specimens). Of these 20 were *Cyclops* (18 ♂, 2 ♀); 5 *Canthocamptus*; and 70 *Cypris*.
- 15 contained six organisms each (equal to 90 specimens). Of these 28 were *Cyclops* (25 ♂, 3 ♀); and 62 *Cypris*.
- 27 contained seven organisms each (equal to 189 specimens). Of these 34 were *Cyclops* (24 ♂, 10 ♀); 6 *Canthocamptus*; 148 *Cypris*; and 1 small *Annelide*.
- 29 contained eight organisms each (equal to 232 specimens). Of these 68 were *Cyclops* (59 ♂, 7 ♀, 2 ?); 5 *Canthocamptus*; 158 *Cypris*; and 1 *Cladoceran*.
- 19 contained nine organisms each (equal to 171 specimens). Of these 50 were *Cyclops* (49 ♂, 1 ♀); 2 *Canthocamptus*; and 119 *Cypris*.
- 21 contained ten organisms each (equal to 210 specimens). Of these 49 were *Cyclops* (47 ♂, 1 ♀, 1 ?); 5 *Canthocamptus*; and 156 *Cypris*.
- 11 contained eleven organisms each (equal to 121 specimens). Of these 27 were *Cyclops* (26 ♂, 1 ♀); 1 *Canthocamptus*; and 93 *Cypris*.
- 9 contained twelve organisms each (equal to 108 specimens). Of these 31 were *Cyclops* (27 ♂, 3 ♀, 1 ?); *Canthocamptus*; and 72 *Cypris*.
- 10 contained thirteen organisms each (equal to 130 specimens). Of these 20 were *Cyclops* (11 ♂, 2 ♀, 7 ?); 2 *Canthocamptus*; and 108 *Cypris*.
- 7 contained fourteen organisms each (equal to 98 specimens). Of these 18 were *Cyclops* (17 ♂, 1 ?); 80 *Cypris*.
- 5 contained fifteen organisms each (equal to 75 specimens). Of these 6 were *Cyclops* (2 ♂, 4 ?); and 69 *Cypris*.

2 contained sixteen organisms each (equal to 32 specimens). Of these 7 were *Cyclops* (all ♂); 1 *Canthocamptus*; 23 *Cypris*; and 1 insect larva.

1 contained seventeen organisms (equal to 17 specimens). Of which 1 was a *Cyclops* (♂); and 16 *Cypris*.

The total number of organisms in the 384 utricles containing matter that could be identified, as shown by the preceding records, was 2021. The total numbers were: *Cyclops*, 535 (454♂, 50♀, 31?); *Canthocamptus*, 61; *Cypris*, 1415; 2 *Cladocera*; 4 small *Annelides*; 1 *Rotifer*; 1 *Tardigrada*; and 2 insect larvæ.

Dividing 2021 (the total number of organisms) by 384 the (number of utricles containing matter that could be identified), we get an average of about $5\frac{1}{4}$ organisms to each utricle, or more correctly 5.2629 organisms.

Some weeks after the first lot of five hundred utricles had been worked up, three hundred more from the same ponds were examined. This was done in order to ascertain if some of the results brought out by the examination of the first lot would be repeated, as for example the preponderance of *Cypris*, and the large proportion of males to females among the *Cyclops*. In the examination of this second lot, empty utricles were discarded.

Of the 300 utricles, 11 contained organic matter, but too much decomposed to be distinguishable; the remaining 289 contained matter that could be identified.

50 of the 289 utricles contained one organism each (equal to 50 specimens). Of these 23 were *Cyclops* (20♂, 2♀, 1?); 8 *Canthocamptus*; 18 *Cypris*; and 1 "Water-mite."

36 contained two organisms each (equal to 72 specimens). Of these 31 were *Cyclops* (27♂, 3♀, 1?); 2 *Canthocamptus*; 37 *Cypris*; 1 "Water-mite"; and 1 small *Annelide*.

29 contained three organisms each (equal to 87 specimens). Of these 24 were *Cyclops* (22♂, 1♀, 1?); 3 *Canthocamptus*; 58 *Cypris*; and 2 insect larvæ.

23 contained four organisms each (equal to 92 specimens). Of these 14 were *Cyclops* (11♂, 2♀, 1?); 1 *Canthocamptus*; 77 *Cypris*.

19 contained five organisms each (equal to 95 specimens). Of these 20 were *Cyclops* (all ♂); 3 *Canthocamptus*; and 72 *Cypris*.

- 20 contained six organisms each (equal to 120 specimens). Of these 24 were *Cyclops* (all ♂); 3 *Canthocamptus*; 91 *Cypris*; 1 small *Annelide*; and 1 insect larvæ.
- 30 contained seven organisms each (equal to 210 specimens). Of these 56 were *Cyclops* (all ♂); 3 *Canthocamptus*; and 151 *Cypris*.
- 23 contained eight organisms each (equal to 184 specimens). Of these 27 were *Cyclops* (24 ♂, 1 ♀, 2 ?); 5 *Canthocamptus*; and 152 *Cypris*.
- 21 contained nine organisms each (equal to 189 specimens). Of these 33 were *Cyclops* (31 ♂, 1 ♀, 1 ?); 4 *Canthocamptus*; 151 *Cypris*; and 1 small *Annelide*.
- 12 contained ten organisms each (equal to 120 specimens). Of these 32 were *Cyclops* (all ♂); 4 *Canthocamptus*; and 84 *Cypris*.
- 12 contained eleven organisms each (equal to 132 specimens). Of these 43 were *Cyclops* (all ♂); 2 *Canthocamptus*; and 87 *Cypris*.
- 10 contained twelve organisms each (equal to 120 specimens). Of these 23 were *Cyclops* (21 ♂, 2 ♀), and 97 *Cypris*.
- 4 contained thirteen organisms each (equal to 52 specimens). Of these 12 were *Cyclops* (all ♂); 2 *Canthocamptus*; and 28 *Cypris*.

The total number of organisms in this second lot of utricles was 1523, and comprised 362 *Cyclops* (343 ♂, 12 ♀, 7 ?); 40 *Canthocamptus*; 1113 *Cypris*; 2 "Water-mites"; 3 small *Annelides*; and 3 insect larvæ.

Dividing 1523 (the number of organisms) by 289 (the number of utricles containing matter that could be identified), we get an average of about $5\frac{1}{4}$ specimens to each utricle, or more correctly 5.2698 specimens. The average number of specimens to each utricle in the two lots is thus remarkably close, and on that account is worthy of note. But though in this instance the averages are practically the same, it is highly probable that they would have varied more or less if the two lots had been from widely different localities.

Having ascertained so much concerning *Utricularia vulgaris* from Gullane ponds, I next endeavoured to find out approximately the average number of utricles on a piece of stem of a given length; and for this purpose I carefully

counted the number on one piece of stem, and my son (Mr. John Scott) counted the number on other four pieces that had previously been all accurately measured. The minimum size of the utricles included in our enumeration was, as in the former experiments, about the one-twelfth of an inch across the longest diameter.

TABLE SHOWING THE NUMBER OF UTRICLES ON THE FIVE PIECES OF *UTRICULARIA* STEM.

No. of the piece of stem examined.	Length in inches.	No. of utricles containing organic matter.	No. of empty utricles.	Total number of utricles.
First piece . . .	5·875	222	43	265
Second piece . .	8	452	32	484
Third piece . . .	6	270	34	304
Fourth piece . .	6·25	219	24	243
Fifth piece . . .	7	208	27	235
Totals for five pieces	33·125	1371	160	1531

The total number of utricles (excluding those under the one-twelfth of an inch across the longest diameter) on the five pieces of stem was 1531, and the total number of these containing organic matter, 1371. If from this latter number we deduct the 71 utricles as probably containing matter that could not be identified, and multiply the remaining 1300 by $5\frac{1}{4}$ (the average number of specimens to each utricle), we get 6825 as the number of organisms captured by the utricles on these five small pieces of stem.

Should the number of specimens captured, as brought out here, be only approximately correct for the rest of the *Utricularia* growing in the ponds,—and the statistics I have given tend to prove that it may be so,—it becomes evident that the number of micro-organisms destroyed in the Gullane ponds during the year by the *Utricularia* must be very great.

It was observed, during the examination of the *Utricularia* stems, that the utricles were proportionally much fewer in number on the lower (or older) portions than on the upper (or younger) portions; and one of the questions consequently suggested was, Had the utricles on the lower part of the stem

fallen off by reason of the disorganisation of their tissues from their having become gorged with animal matter, or had they fallen off as the result of normal development similar to that which causes the leaves of trees, etc., to fall in the autumn? A second question suggested was, If becoming gorged with animal matter does not injure the utricles and cause them to fall off, is the animal matter they contain gradually, and more or less continuously, assimilated by the plant, so that the utricles remain more or less permanently active and able to go on adding fresh captures to those previously made? I find no satisfactory evidence bearing on these questions.

Darwin's investigations certainly proved that animal matter is absorbed by the quadrifid processes that so thickly beset the internal surface of the utricles; but whether they can continue for a lengthened period to absorb such matter as it would be necessary for them to do if the utricles are to remain active and capable of adding to their captures, is still doubtful. My own opinion is that the utricles, after becoming gorged with animal matter, gradually decay and fall off.

From what has been said above, it is clear that *Utricularia* growing in any quantity in ponds must be a formidable enemy to the smaller active organisms living in the same water. A tow-net examination of the pond-water of Gullane, from which the *Utricularia* were taken, shows that while almost all such organisms may be occasionally captured, certain of them fall a prey to the *Utricularia-traps* in far greater proportion than others. *Cypris* is the most abundant in both lots of utricles examined, while *Cyclops* comes next. It seems that the proportion in which the different organisms are captured by the utricles depends to a large extent upon peculiarities in their structure or shape. For instance, it will be observed that, among the *Cyclops* captured, there is a far larger number of males than females. The statistics given above show that the number of organisms in the two lots of utricles examined (which together amounted to 800) was 3544. Of this number 897 were *Cyclops*, and comprised 799 males, 61 females, and 37 doubtful; or, in other words, over 89 per cent were males, while less than 7 per cent were

females. What can be the reason for such a large percentage of male *Cyclops*? It was certainly not due to an abnormal abundance of that sex in the ponds at Gullane; for my own and my son's observation proved that males were not unusually numerous, compared with the number of females present. Our experience tends rather to show that in tow-net collections males are usually in the minority. It becomes necessary, therefore, to seek some other explanation of the remarkable difference in the percentage of the two sexes; and probably the most satisfactory explanation is to be found in the difference in the structure of the anterior antennæ of the male and female. In the male, both of the anterior antennæ are modified for grasping, being distinctly hinged near the middle as well as near the end; they can, therefore, at the will of the animal, be bent or folded over so that the amount of the horizontal extension of the antennæ is very much reduced. The female's anterior antennæ are not hinged in the middle; and when the animal is swimming they are always extended at, or nearly at, right angles to the axis of the body. The female is likely, in this way, to meet with greater obstruction than the male when attempting to enter the door of this natural trap. Whether the above explanation is sufficient to account for the large percentage of male *Cyclops* captured by the utricles, or whether the difference is due to other causes, the fact that there is such a difference is of interest as indicating the influence such plants possess over the destinies of these lowly organisms in their struggle for life.

When we come to the question of the great preponderance of *Ostracoda* over all the other organisms observed in the utricles, we find the explanation much easier. 2528 specimens of *Ostracoda* were obtained in the 800 utricles; and they nearly all belonged to two species,—*Cypria lævis* (O. F. Muller) and *Cypria serena* (Koch),—which, from their active habits, small size, and globose form, could more easily make their way into the *Utricularia-traps* than any other Entomostracan inhabiting the ponds. A few specimens of *Cypria ophthalmica* (Jurine)—a somewhat larger species, and much compressed in form—were the only other Ostracods observed.

ZOOLOGICAL NOTES.

Polecat (*Mustela putorius*) in Aberdeenshire.—In a little glen a few miles from Peterhead, a Polecat (or perhaps a pair) has taken up its winter quarters, and up to this date (December 1893) has eluded the gun and trap. The schoolmaster of the district saw the last one in the parish about ten years ago, and that was on the Ugie bank at the ruins of Ravenscraig Castle.—WILLIAM SERLE, Peterhead.

The Dipper (*Cinclus aquaticus*) in Barra.—When riding, on the 25th of January last, accompanied by Mr. William MacGillivray, we observed a Dipper at the side of a loch that bordered on the road. It was quite close to us when observed, and, on flying off uttered his lively notes. I have not met with this species either here or in Uist before, although I believe a few have been seen by others. The only other strange visitor that I have seen in Barra this winter was a young Iceland Gull (*Larus leucopterus*, Faber) on the 14th of December.—JOHN MACRURY, Barra.

Albino Bunting (*Emberiza miliaria*) in Aberdeenshire.—I saw on December 12th last an albino specimen of the Common Bunting of which I had been previously told. It was pure white, with the exception of two feathers in the wing, and I am told it is whiter this year than it was last. It has lived continuously in the district of Newseat Station for two years, and is familiar to the work-people on the farm. It reared a brood of young this summer, but her progeny was quite normal in colour.—WILLIAM SERLE, Peterhead.

The Hoopoe (*Upupa epops*) in West Ross-shire.—One day in September 1877 I was shore-shooting near Loch Duich, when one of these birds rose in front of my companion, and was shot. It is a great pity that such a fate almost always awaits this beautiful stranger, which would certainly breed in South, if not in North Britain, were it hospitably treated.—EDWARD S. MARSHALL.

Snowy Owl in Shetland.—A fine specimen of the Snowy Owl (*Nyctea scandiaca*) was shot on the 26th of January, near Balta Sound in the island of Unst. It is a considerable time since one of these birds was last seen on the island.—*Shetland Times*, 3rd February, 1894.

Sparrow Hawk (*Accipiter nisus*) preying upon a Magpie (*Pica rustica*).—While walking down the carriage drive, Dalmeny Park, on the 3rd March, I heard a fluttering of wings under a privet bush. On going forward to the spot, a female Sparrow Hawk made off carrying something heavy in her talons, and flying close to the

ground. The Hawk, however, alighted after proceeding a short distance, and on my approach flew away, leaving a fine Magpie freshly killed and partly eaten about the neck. I do not find any mention made of the Sparrow Hawk preying upon such a formidable bird as the Magpie, and I think the incident worthy of record.—BRUCE CAMPBELL, Edinburgh.

Golden Eagle attacking a Stag.—On September 22nd I saw a Golden Eagle attack an ordinary-sized stag and strike it about the head; but the stag got clear, and made a desperate rush into the thickest part of the wood. The Eagle then hovered above the trees, and seemed puzzled at losing its prey. Two more Eagles then made their appearance. They seemed to be young ones, but in full plumage. This took place in the wood above Glasnoic known as the Black Wood (in Glen Kishorn). I have never before seen a case of an Eagle attacking a full-grown deer, although I have seen one kill and devour a young deer calf.—DONALD MATHESON, Kinloch, Shieldaig, West Ross.

Widgeon (*Mareca penelope*) on the White Loch of Myreton, Wigtownshire.—The White Loch of Myreton, a sheet of water about half a mile in length, lies in the park at Monreith, Wigtownshire. Camden, Holinshed, and other chroniclers followed one another in declaring that it never froze in the hardest winters. This I can testify to be incorrect, for I have repeatedly seen it sheeted with strong ice from end to end. For forty years it has been treated as a sanctuary for wild-fowl. It is regularly frequented by great numbers of Mallard, Teal, Pochard, Tufted Duck, Coots, and Waterhens. A few brace of Golden-Eye visit it occasionally, and among rarer visitors have been Wild Swans, Goosanders (I once counted nine of these), and Bittern. Cormorants and Seagulls of various kinds disport themselves on it, and Herons sometimes breed in the woods around, but not regularly. But long as I have known this lake, and much time as I have spent with the spy-glass examining birds on its surface, I never saw the common Widgeon there till three years ago. This is the more remarkable, because on the sea coast, not a mile distant, and in Wigtown and Luce Bays, and also on other fresh-water lakes in the county, Widgeon are extremely plentiful. Three years ago I spied five Widgeon, much to my delight; for they are the liveliest and most graceful of all British ducks, and their wild whistle adds a great charm to the winter landscape. Since that time Widgeon have visited it in ever-increasing numbers, until, during the present season, there is a flock of 150 or 200 constantly upon it. I attribute this to the great increase in Canadian pond-weed (*Elodea canadensis*, Hooker; *Anacharis alsinastrum*, Babington). The winter winds drive this ashore in great swathes, much to the benefit of my delightful visitors. I need hardly observe that unless this lake were treated as sanctuary, Widgeon, the shyest of all wild-fowl, would not

make themselves at home within a few hundred yards of the mansion-house, and in view of people constantly passing along the shore.—HERBERT MAXWELL, Whauphill.

Pochard (*Fuligula ferina*) **on the River Carron, Stirlingshire.**—Although this bird is common enough on the Firth of Forth, and probably breeds within the area, in all my experience of this part of the district I do not remember to have ever met with the Pochard upon the river Carron or Bonny until to-day,—the 9th January 1894,—when I shot a fine male—J. A. HARVIE-BROWN.

Smew in Aberdeenshire.—On the 16th January 1894 a female Smew (*Mergus albellus*, Linn.) was shot on the Don, near Fintray. Its stomach contained a large number of aquatic insects, and small pieces of quartz.—G. SIM, Aberdeen.

Stock Dove (*Columba oenas*) **in West Lothian.**—When shooting Wood Pigeons (*Columba palumbus*) on 17th February near Cramond in the county of West Lothian, I was fortunate enough to secure a Stock Dove. I may mention this is the first specimen I have observed in the district.—BRUCE CAMPBELL, Edinburgh.

Stock Dove (*Columba oenas*) **in Forfarshire.**—On the 14th of December, two Stock Doves (one male, one not dissected), were shot to the west of the town, about a mile inland. Though I have been carefully on the outlook for this species for over two years, this is the only case of their occurrence here of which I have learnt.—T. F. DEWAR, Arbroath.

The Stock Dove (*Columba oenas*) **in West Ross-shire.**—Mr. Harvie-Brown's very interesting paper in the January number seems to imply that the Stock Dove is little, if at all, known as a bird of the North-West Highlands. It may therefore be worth while to record the fact that in late August or early September 1877 I shot a specimen close to the shooting-lodge of Dorisduan, Kintail, West Ross, and frequently saw birds of this species while fishing the River Croe. I cannot, of course, speak with any confidence upon the question of their having bred thereabouts, or immigrated after the nesting season; but the comparatively early time of year and the tolerable frequency of their occurrence make it quite as likely as not that they had been resident throughout the summer. Is it not probable that in many cases there are, so to speak, "cycles" of bird-occurrence, *i.e.* that a migratory species visits a given district in yearly increasing numbers, and then, for reasons which we do not yet know, diminishes, at length ceasing to arrive at all?—EDWARD S. MARSHALL.

[These records of first occurrences of the Stock Dove are useful and interesting. That the bird should have been found in West Ross-shire is a surprise; and it does not appear to have come under the notice of other observers either before or since.—EDS.]

Nesting of Quails in Shetland.—Numbers of Quails bred in Unst this season. I have not known the bird to breed here before. One was killed at Haroldswick with a scythe, and the eggs taken.—JAMES FERRIER, Burrafiord, North Unst.

Knot (*Tringa canutus*) in Tiree in Winter.—On the 17th of January last I found a Knot with a broken wing under the telegraph wire here. Although a few small parties of this bird call here in the early autumn, I have never seen one here in winter before.—PETER ANDERSON, Tiree.

Little Gull (*Larus minutus*) in Inverness-shire.—On the 8th of January last a specimen of the Little Gull was found dead on the shore of Loch Ness in sufficiently good condition to admit of its being preserved.—T. E. BUCKLEY, Inverness.

Great Skua (*Stercorarius catarrhactes*) in the Outer Hebrides.—In September last I examined a specimen of the Great Skua which had been shot at Abhuinnsuidh in North Harris. As this bird has not hitherto been observed, to my knowledge, in the Outer Hebrides, it is well that the occurrence should be placed on record.—T. E. BUCKLEY, Inverness.

Great Crested Grebe (*Podiceps cristatus*) on the Aberdeenshire Coast.—On the 19th or 20th of December 1893 a man shot a fine female specimen of the Great Crested Grebe in the south bay of Peterhead. Mr. Sim of Aberdeen is preserving it for the local museum recently opened.—WILLIAM SERLE, Peterhead.

Scottish Newts Wanted.—With a view to ascertaining the distribution of the various species of Newts in Scotland, I desire to receive specimens for examination from all parts of the country. All assistance will be fully and gladly acknowledged. They travel well alive in a little damp moss.—WILLIAM EAGLE CLARKE, Museum of Science and Art, Edinburgh.

Valvata piscinalis in Loch Tay, Perthshire.—I happened to visit the pretty village of Kenmore, Perthshire, during September last year, and had the privilege of making a partial investigation of the invertebrate fauna of the east end of this fine loch. Among the species obtained were a few Molluscs, including the species named above. I have been unable to find any records of the occurrence of *Valvata piscinalis* in Loch Tay, and therefore the present note may be of interest. Mollusca appeared to be scarce round the east end of the loch, but I was only able to examine the bottom where the water was shallow; it is therefore probable that a careful examination of the loch might yield other species not yet recorded for "Mid-Perth."—THOMAS SCOTT, Leith.

Note on the Life-History of a Weevil (*Hypera plantaginis*, De Geer).—At North Berwick, about the second week of last June (1893), my attention was attracted by the unusually brilliant red colour of a large patch of *Lotus corniculatus* growing at the edge of the links, almost on the beach itself. A little observation showed that the flowers were not only abnormally coloured, but also deformed; for though of fully the normal size, their petals had never expanded, and the mature blossoms presented the appearance of bright red, greatly swollen, and inflated buds. On examination, every organ in the flower showed the same swelling, which was especially marked in the stamens and ovary; and at the base of these, especially inside the staminal tube, I found numerous minute whitish larvæ about two millimeters in length. Though every flower in the patch (which covered fully a square yard of ground) was thus discoloured and deformed, and more or less eaten into holes, at the time I examined them only the younger specimens were still occupied by the larvæ, which at a very early age seem to eat their way out and disappear. I was not fortunate enough to find the eggs in a single instance; but, as the youngest larvæ were always found at the base of the staminal tube, especially inside it, I concluded the eggs had been deposited there, and the great deformity of the ovary tended to strengthen this belief. I gathered a number of the still occupied flowers, and kept them under a bell-glass. The young larvæ were very much given to wander, and somehow most of them disappeared. In about ten days one or two of them had grown to the length of about three-eighths of an inch, and were then pale green. Only one made a cocoon, which was also of a light green colour, oval in shape, and of a silky texture, very thin, but not transparent. About a fortnight afterwards the beetle ate its way out. I found the larvæ on no other flowers but those of the patch mentioned. The numerous neighbouring patches were entirely free from them.—L. H. HUIE, Edinburgh.

[This beetle is recorded by Sharp in "Insecta Scotica" ("Scot. Nat.," 1879, vol. v. p. 143), from the Forth and Solway areas only.—EDS.]

Rare Lepidoptera in the Solway District.—The following note of captures of Lepidoptera last year will, I think, be of interest to the entomological readers of the "Annals." I do not wish, in these days of professional collectors, to specify the exact locality, for obvious reasons—"the south-west of Scotland" will suffice. The insects in question are two specimens of *Polyommatus Phlwas* var. *Schmidtii* Gerh., and five specimens of *Plusia bractea*, L., with several others seen at bramble flowers. The butterfly mentioned is of very rare occurrence in this country. Lang mentions a specimen from Perthshire, which he figures. On the Continent it occurs most frequently towards the southern portion of the range of the type. It is a very

beautiful insect, and may generally be described as an albino of the type, pure white taking the place of the red in that insect. *Plusia bractea* has not, I believe, turned up in this country for some years, though it occurs occasionally in Ireland.—A. BUCHAN HEPBURN, Smeaton-Hepburn.

Humming-bird Hawk-moth (*Macroglossa stellatarum*) in Moray.—I have just had a specimen of this moth brought to me, which was found dead under the eaves of an outhouse, in a garden in Elgin. When relaxed, I find that the wings are in good preservation, and it has probably been dead about two months. The species is rare here, occurring by single specimens.—HENRY H. BROWN, Elgin.

Scottish Diptera Wanted.—I am at present engaged in working out the distribution of Flies in Scotland, with a view to publication, and should be grateful for specimens of *any* species, however common, from any part of the country. All assistance in this way will be duly acknowledged.—PERCY H. GRIMSHAW, Museum of Science and Art, Edinburgh.

Scottish Arachnids—Correction and Additions.—In the "Annals" for 1893, p. 224, I recorded a species of Phalangid from Morven as *Oligolophus palpinalis*, Herbst. Comparison of the specimens with undoubted Continental examples of that species has convinced me that my determination was erroneous, and that the Morven Phalangids are really young examples of *O. tridens*, C. L. Koch: a species hitherto recorded from Dorset, the Cheviots, and Ireland in the British Isles. I have now received an undoubted specimen of *O. palpinalis* from Mr. W. Evans, who captured it at the Bridge of Allan in December last.—G. H. CARPENTER, Dublin.

On the occurrence of *Cytheropteron humile* (Brady and Norman) in the Firth of Forth.—A few specimens of this rare Ostracod have recently been obtained in the Firth of Forth. Two specimens were taken in the vicinity of Largo Bay in the valve of a dead *Cyprina islandica*, and another was obtained among hardened mud a few miles west of Queensferry. *Cytheropteron humile* was first observed in the Clyde near Fort Matilda, Greenock, and was afterwards obtained by the Marquis de Folin off Vigo; these being the only records of the occurrence of this little species. It is easily overlooked from its small size, and this may account for its apparent rarity. It forms an interesting addition to the invertebrate fauna of the Forth. Those interested in the species will find it well and fully described and figured in the "Monograph of the Marine and Freshwater Ostracoda of the North Atlantic and North-Western Europe," by Drs. Brady and Norman.—THOMAS SCOTT, Leith.

On the occurrence of *Cerebratulus angulatus* (O. F. Müller) in the Firth of Forth.—On the 16th of February last, a fairly good

specimen of this Nemertian was captured in the vicinity of Largo Bay, Firth of Forth. When alive, it measured about 14 inches in length by about three-quarters of an inch in breadth, but as it was continually changing its form, these measurements are only approximate. It was of a slate-blue colour, but the under surface was scarcely so dark in colour as the dorsal surface. *Cerebratulus* has a short horizontal slit on each side along the lateral edge and close to the anterior extremity, in addition to the longitudinal oral aperture which is situated in the middle of the ventral surface and also near the anterior end: the edges of the oral slit are incurved in our example. The specimen unfortunately broke into three portions ere it could be preserved. When alive it had somewhat the appearance of a Hag-fish (*Myxine glutinosa*) at first sight. I can find no previous record of the occurrence within the Forth area of this Nemertian; but in the "Monograph of the British Annelida," by Professor MacIntosh, part i. p. 195 (1874), the author states that it occurs "generally in deep water throughout the British coasts." H. D. S. Goodsir published in the "Annals and Magazine of Natural History," vol. xv. p. 377, Plate XX. figs. 1, 2 (1845), a description of what appears to be this species, under the name of *Serpentaria*. Reference is made to his having received three specimens, the longest portion of the three being about a yard in length by about seven-eighths of an inch in breadth, but the locality where they were obtained is not stated. Sir John Dalzell in his fine work, "The Powers of the Creator," vol. ii. p. 55, Plates VI., VII., VIII. (1853), describes the species under the name of *Gordius fragilis*, but he also does not give the locality from whence his specimens were obtained. "A fine specimen" was sent to Professor MacIntosh from the neighbourhood of Montrose Bay by Dr. Howden ("Marine Fauna of St. Andrews," p. 105) (1875). For further details of this curious Annelid see the works of the authors referred to.—THOMAS SCOTT, Leith.

BOTANICAL NOTES AND NEWS.

Gentians.—Herr Svante Murbeck, in a paper entitled "Studien über Gentianen aus der Gruppe Endotricha Froel." (Stockholm, 1892), describes six forms, most of which are found in Britain. Mr. Beeby has drawn attention to his conclusions in the "Journal of Botany" for January of this year, and to it we must refer our readers for full information on the distribution of the several forms in Britain, and also for a discussion by Mr. Beeby of the synonymy of the forms. It is desirable that the Gentians of this group in Scotland should be revised; and to promote this we give a summary of the forms and of their distinguishing characters, after Herr Murbeck.

A. Calyx 4-partite; two broadly ovate segments enclosing two much smaller segments.

Gentiana ballica, Murb.—Annual; basal leaves few, ovate or lanceolate, each broadest below middle; corolla-tube usually shorter than calyx, rarely longer. Fl. mid-August to October. Not known from Scotland; occurs in West Cornwall, South Devon, Carnarvon, and (?) Norfolk.

G. campestris, L.—Biennial; basal leaves in a rosette, spatulate, broadest above the middle; corolla-tube usually longer than calyx, rarely shorter.

Sub-sp. *suecica*, Murb.—Internodes usually much longer than their leaves; middle and upper stem-leaves strap-shaped or oblong, rounded or obtuse at apex; middle leaves erect or erect-patent. Fl. mid-June to end of July, in high northern or alpine regions. A Shetland gathering by Mr. Beeby approaches this in its very long internodes.

Sub-sp. *germanica*, Murb. (non Willd.)—Internodes slightly shorter or slightly longer than their leaves; middle and upper stem-leaves lanceolate or ovate-lanceolate, more or less acute, spreading, especially the upper leaves. Fl. end of July to September. The common British plant.

B. Calyx 5- (or 4-) partite; segments all lanceolate or linear-lanceolate, subsimilar, not overlapping.

G. uliginosa, Willd.—Annual; basal leaves few, ovate or lanceolate, broadest below middle; corolla-tube equalling or slightly exceeding the calyx. Fl. mid-August to October. Recorded by Nyman for Scotland.

G. amarella, L.—Biennial; basal leaves in a rosette, strap-shaped or spatulate, broadest above middle; corolla-tube usually longer than calyx, rarely shorter.

Sub-sp. *lingulata*, C. A. Agardh.—Middle internodes mostly much longer than their leaves; middle and upper stem-leaves strap-shaped or oblong, rounded or obtuse at the apex; middle leaves erect or erect-patent. Fl. mid-June to end of July, or, in extreme north, to August. Represented by the form *pratensis* from the south of England. This form differs from Murbeck's in flowering earlier (May-June), and in being dwarfer, with fewer internodes, scarcely longer than their leaves.

Sub-sp. *axillaris*, Murb.—Middle and lower internodes rather shorter than their leaves, or slightly longer; middle and upper stem-leaves ovate-lanceolate or lanceolate, more or less acute, usually spread-

ing, upper leaves greatly so. Fl. end of July to September. This is the common British *Amarella*.

Herr Murbeck has cultivated the several forms, and finds (from two or three years' results) that they retain the above characters in cultivation; but in dealing with so closely allied forms it is evidently desirable to have fuller evidence as to specific value. The close parallelism of the series *A* and *B* is certainly curious. It may be questioned whether there is not a very serious risk of attaching undue importance to minute differences, in the tendency to give specific or sub-specific rank where the differences are found to continue after two or three years' cultivation; the distinctive characters often being exceedingly minute, and not proved to be more constant than the far greater differences recognised to exist in cultivated species. There is much in a name—in the tendency to attribute to named "species" a permanence and value not always justly due; and the relationships of the several forms may be thus obscured to us.

The Common Nettle (*Urtica dioica*) in Scotland.—In "Botanical Notes from North Cardiganshire" (see "Current Literature" in this number, p. 126), Messrs. Burkill and Willis say of the Common Nettle: "A septal plant up to 800-900 ft.; beyond this it is dependent on man; our highest records are for places where man has disturbed the ground, *i.e.* under walls of ruined cottages and sheepfolds. Highest record 1350 ft." In the following (Feb.) number of the "Journal of Botany" the Rev. E. S. Marshall says, in allusion to this: "I have seen *Urtica dioica* up to about 1700 ft., but by no means especially where man has disturbed the ground; indeed it is often abundant miles away from habitations, in the heart of a deer-forest."

It is of course most difficult in the case of so wide-spread and abundant a plant as the Common Nettle to prove that it owes its introduction to man's agency; but in the north of Scotland at least its distribution is suggestive that it was probably introduced by man. Once established, its fruits can very readily be distributed, so that it might well be very widely diffused, even where no traces of man's occupancy can be detected in the immediate vicinity. Indeed the marvel is that its distribution is not even more plentiful than we find it to be in Scotland. All are familiar with the plant as an abundant weed by roadsides and ditches, around houses and ruins, or in clumps in arable land; but, so far as observation continued for a good many years may be reliable, I believe that it seldom occurs at a distance from ground occupied at some time by man, and that in the rare cases where it does so the fruits probably may have been carried by sheep. Its prevalence around sheepfolds is suggestive of this mode of distribution.—JAMES W. H. TRAIL.

Juncus alpinus, Vill., in Easternness.—Among some forms of rushes which I gathered in Glen Eunich, in 1887, I have lately seen that one is *Juncus alpinus*, Vill., a new county record for Easternness.—J. CLARIDGE DRUCE.

Poa laxa on Lochnagar.—I notice, on p. 59, that Prof. Hackel has determined Lochnagar specimens of *Poa laxa* as belonging to *P. alpina*. No doubt he is correct, so far as the specimens submitted to him go. But that by no means disproves the existence of the true plant, about which I know that Prof. Babington entertains no doubt. In 1886 Mr. F. J. Hanbury and myself paid two visits to the mountain, and gathered three forms, viz. *P. minor*, *P. laxa*, and viviparous *P. alpina*. The second of these was cultivated in the garden at Clapton, and remained quite distinct from *P. alpina*. Whether it be the true *P. laxa* or not, I am unable to say; but it is certainly not ordinary British *alpina*. I have cultivated two curious states of the latter from Ben Lawers, which at once reverted to type, except that they remained viviparous. I do not think that, until better evidence is forthcoming, we ought to expurge from our list a species recorded on very high authority. It is easy for a collector to be taken in by a peculiar state of the common alpine meadow-grass.—EDWARD S. MARSHALL.

First Records of Scottish Plants.—In the continuation in the "Journal of Botany" (January, 1894) of "First Records of British Flowering Plants," by Wm. A. Clarke, F.L.S., the following are recorded as having been first noted in Britain from localities in Scotland:—

Erythraea linarifolia, Pers., 1805.—"Mr. Winch finds it abundantly near Newcastle, and Mr. Brodie . . . equally copiously near Brodie House, in Elginshire."—Dawson Turner in "Bot. Guide," 469.

Gentiana nivalis, L., 1794, Ben Lawers.—James Dickson in "Linn. Trans.," ii. 290.

Symphytum tuberosum, L., 1777.—"Mr. Yalden found it growing sparingly opposite the new well at the Water of Leith."—Lightfoot in "Fl. Scot.," 1092.

Myosotis repens, D., 1821.—"Moist hills about Glasgow, D. Don; and Ochil Hills, G. and D. Don."—Hooker in "Fl. Scot.," 67.

M. alpestris, Schmidt, 1813.—Found "long ago" by G. Don, J. Mackay, and others, on Highland mountains in Scotland (E. B., 2559, *M. rupicola*), but first published in Don's "Herb. Brit.," 205, in 1804, as *M. alpina*.

Cuscuta europæa, L., 1797.—"Mr. Sowerby last autumn received wild specimens of the real *europæa* from Mr. Alexander Smith of Aberdeen" (E. B., 378).

Scrophularia umbrosa, Dumort. (= *S. Ehrharti*, C. A. Stevens), 1840, Edinburgh.—“Mr. W. H. Campbell, Cramond Woods; West Lothian, D. A. Hunter.”—C. A. Stevens, in “Annals Nat. Hist.,” i. 1840.

Veronica Tournefortii, C. C. Gmel. (= *V. Buxbaumii*, Ten.), 1829.—“In the shrubbery in front of the house at Whiterig, Berwickshire. Borrer . . . found it several years ago near Henley [Henfield] in Sussex.”—G. Johnston in “Flora of Berwick-upon-Tweed,” p. 225.

V. alpina, L., 1790.—Found by James Dickson “in montibus prope Garway Moor, et in Ben Nevis” in 1789 (“Trans. Linn. Soc.,” ii. 287).

V. fruticans, Jacq. (= *V. saxatilis*, Scop.), 1790.—Found by James Dickson on Ben Lawers in 1789 (“Trans. Linn. Soc.,” ii. 288).

[NOTE.—It is curious that *Cuscuta europæa* should have been recorded as British from Aberdeen, as the above note implies. It could have occurred only as a “casual”; and I am not aware of its ever having been found again near Aberdeen. It is almost needless to add that no *Cuscuta* is indigenous there. *Veronica Tournefortii* is now common in the north-east of Scotland; indeed, its larger size and more showy flowers make it often more noticeable than *V. agrestis* in our cultivated ground.—J. W. H. T.]

Notes on *Parka decipiens*.—Four slides of the sporocarps of *Parka* received from Mr. James Reid through Sir William Dawson, 18th December 1893, were examined by me under the numbers 1, 2, 3 (*a, b, c, d*), and 4.

No. 1 shows a fine macrospore 43.2μ in diameter, and many smaller round bodies of somewhat variable size, chiefly 14.4μ – 16μ in diameter. These are probably the microspores, though they do not show the oval form of, and are rather larger than, the original specimens.

No. 2 shows an undoubted cellular structure, which probably represents the macrospores in an early state of development, possibly the sporangia.

No. 3 shows in all four sporocarps undoubted cellular tissue. From the fact that the cells are loosely aggregated, and that they measure about 38.4μ in diameter, I conclude that they must be macrospores *in situ*. But as the walls of these bodies are thin, I infer that they are in an undeveloped state; and this view would seem to be strengthened by the occurrence of numerous isolated bodies of a similar nature in the neighbourhood of *3d*.

No. *3c* shows the spores *in situ* particularly well, as also does *a*.

No. 4 shows nothing beyond one or two macrospores.

Prothalli were not found, and this would be consistent with the supposed state of development of the structures represented in the preparations.

It may also be pointed out that the occurrence of prothalli in sporocarps must be regarded as very exceptional. Hence one could expect to find them only by examination of a very large amount of material.—D. P. PENHALLOW.

CURRENT LITERATURE.

The Titles and Purport of Papers and Notes relating to Scottish Natural History which have appeared during the Quarter—January-March 1894.

[The Editors desire assistance to enable them to make this Section as complete as possible. Contributions on the lines indicated will be most acceptable and will bear the initials of the Contributor. The Editors will have access to the sources of information undermentioned.]

ZOOLOGY.

MAMMALIAN REMAINS FOUND IN PEAT MOSS AT DUNBLANE. By David B. Morris. *Trans. Stirling Nat. Hist. and Arch. Soc.*, 1892-93, pp. 104-106.

RED DEER SHEDDING HORNS IN DECEMBER. John Hargreaves. *The Field*, 30th December 1893, p. 1005.—A stag, a royal, shed his horns in Gaigh Forest, Inverness.

THREE-HORNED STAG. *The Field*, 10th March 1894, p. 356.—A stag shot at Struy, Inverness-shire, on the 9th of October 1893, had three distinct horns, each springing from its own coronet.

MORTALITY AMONGST SHORT-EARED OWLS IN SCOTLAND. R. Service. *Zoologist* (3), vol. xviii. p. 57 (February 1894).—In the districts lately infested with Voles, from want of food.

PINK-FOOTED GOOSE IN DUMFRIESSHIRE. H. A. Macpherson. *Zoologist* (3), vol. xviii. p. 114 (March 1894).—One shot lately between Annan and Gretna. This species has of late years to some extent replaced the Bean Goose on the Solway Firth.

LITTLE GULL ON THE SOLWAY FIRTH. H. A. Macpherson. *Zoologist* (3), vol. xviii. p. 115 (March 1894).—An immature bird shot in January last between Annan and Dumfries.

BLACK GUILLEMOT ON THE SOLWAY FIRTH. R. Service. *Zoologist* (3), vol. xviii. p. 55 (February 1894).—Not so rare as generally understood. Breeds on Ailsa Craig.

A CONTRIBUTION TOWARDS A LIST OF THE MARINE MOLLUSCA AND BRACHIPODA OF THE NEIGHBOURHOOD OF OBAN. G. W. Chaster and W. H. Heathcote. *Journ. of Conch.*, vol. vii. No. 9

(January 1894), pp. 289-312.—A very fully annotated list of 196 species, with introductory remarks and including all previous records. Special attention drawn to the occurrence of *Cyclostrema millepunctatum*, Friele.—W. D. R.

SECOND REPORT ON STIRLINGSHIRE LAND AND FRESHWATER SHELLS. By A. M'Lellan. *Trans. Stirling Nat. Hist. and Arch. Soc.*, 1892-93, pp. 106-109.

NOTES ON THE CONCHOLOGY OF CLACKMANNANSHIRE AND SOUTHERN PERTHSHIRE. By Gilbert M'Dougall. *Trans. Stirling Nat. Hist. and Arch. Soc.* (1892-93), p. 49.

THE RAISED BEACHES OF THE FORTH VALLEY. By David B. Morris. *Trans. Stirling Nat. Hist. and Arch. Soc.*, 1892-93, pp. 18-47.—Contains an account of the various fossils found.

MESOLEIUS BIGNELLII, BRIDGM., AT PITLOCHRY. A. Beaumont. *Ent. Mo. Mag.* (2), vol. v. p. 40 (February 1894).—Two examples taken on 5th September 1892.

AGRIOTYPUS ARMATUS, CURTIS, IN PERTHSHIRE. Kenneth J. Morton. *Ent. Mo. Mag.* (2), vol. v. p. 62 (March 1894).—Specimens taken on 1st May 1893 on the shores of Loch Ard.

ON THE VERTICAL DISTRIBUTION OF THE BRITISH LEPIDOPTERA. By W. Harcourt Bath. *Entomologist*, vol. xxvii. pp. 2-6 (January 1894), and pp. 37-40 (February 1894).—Five vertical zones are defined, with the limitations of each in Scotland.

BISTON HIRTARIA AND CLEORA VIDUARIA IN SCOTLAND. J. B. Hodgkinson. *Entomologist*, vol. xxvii. p. 65 (February 1894).—Specimens bred from pupæ taken near Kinloch Rannoch.

MICRO-LEPIDOPTERA FROM . . . SCOTLAND. By the Right Hon. Lord Walsingham. *Ent. Mo. Mag.* (2), vol. v. pp. 50-52 (March 1894).—Three examples of *Argyresthia illuminatella*, a species not hitherto recorded as British, taken at Forres.

ERIOPELTIS LICHTENSTEINII AND SIGNORETIA LUZULAE IN SCOTLAND. J. W. Douglas. *Ent. Mo. Mag.* (2), vol. v. p. 17 (January 1894).—The sacs of both species found in Argyleshire, though not hitherto recorded north of Cheshire.

SPECIES OF THE DIPTEROUS GENUS DIASTATA NEW TO BRITAIN. Alfred Beaumont. *Ent. Mo. Mag.* (2), vol. v. p. 64 (March 1894).—*D. nebulosa*, Fall., taken at Pitlochry in August 1892.

NEW GENERA AND SPECIES OF BRITISH SPIDERS. By the Rev. F. O. Pickard-Cambridge. *Ann. and Mag. Nat. Hist.* (6), vol. xiii. pp. 87-111, Plates I. and II. (January 1894).—*Lepthyphantes Whympersi*, sp. n., captured on the summit of Ben Nevis in the autumn of 1892 by Mr. Edward Whympers. *Porrhomma pygmaeum*, Blackw., also recorded for Scotland.

ON SOME NEW AND RARE CRUSTACEA FROM SCOTLAND. By Thomas Scott, F.L.S. *Ann. and Mag. Nat. Hist.* (6), vol. xiii. pp. 137-149, Plates VIII. and IX. (February 1894).—Notes on 16 species, including descriptions and figures of seven species new to science.

ON A BIFID EARTHWORM (*LUMBRICUS TERRESTRIS*). By Henry C. Williamson, M.A., B.Sc. *Ann. and Mag. Nat. Hist.* (6), vol. xiii. pp. 217-225, Plate X. (March 1894).—The specimen described was sent to Professor M'Intosh by Dr. Fulton, Superintendent of Scientific Investigations of the Fishery Board for Scotland.

BOTANY.

PLANT SUPERSTITIONS. By Samuel Arnott. *Trans. and Proc. of Dumf. and Gall. N. H. and A. Soc.*, No. 9.

THE SIZE, AGE, AND RATE OF GIRTH-INCREASE ATTAINED BY TREES OF THE CHIEF SPECIES IN BRITAIN, PARTICULARLY IN SCOTLAND. By Dr. D. Christison. *Trans. Bot. Soc. Edin.*, xix. part iii.—Contains notes on almost all native British, and of several introduced, species.

FIRST RECORDS OF BRITISH FLOWERING PLANTS. Compiled by Wm. A. Clarke, F.L.S. *Journ. Bot.*, 1894, pp. 13-18.—This instalment covers from *Anagallis* into *Veronica*, and includes a number of first records from Scotland (see p. 122).

REPORT ON TEMPERATURE AND VEGETATION IN THE ROYAL BOTANIC GARDENS, EDINBURGH, from July 1892 to June 1893, inclusive. By Robert Lindsay. *Trans. Bot. Soc. Edin.*, xix. part iii.

THE INFLUENCE OF INSECTS ON FLOWERS. By G. F. Scott-Elliott, B.Sc., F.L.S. *T. and P. of D. and G. N. H. and A. Soc.*, No. 9.

BOTANICAL NOTES FROM NORTH CARDIGANSHIRE. By J. H. Burkill, B.A., and J. C. Willis, M.A. *Journ. Bot.*, 1894, pp. 4-10.—The authors, in the summing-up, compare the vertical range in Wales with records from the East Highlands of Scotland, and show that the upper limit of many plants in Cardigan is much below the same limit in Scotland.

EXCURSION OF THE SCOTTISH ALPINE BOTANICAL CLUB TO KILLIN, IN JULY 1892. By Charles Stuart, M.D. *Trans. Bot. Soc. Edin.*, xix. part iii.—The party visited Meall-nan-Tarmachan, Creag-na-Caillich, the corrie of Ben Cruban, and Ben Lawers. On this last hill *Carex ustulata*, Wahl., was found by Mr. Paul on a slope above Lochan-a'-Chait.

ACCOUNT OF THE EXCURSIONS OF THE PERTHSHIRE SOCIETY OF NATURAL SCIENCE IN 1892. By Dr. F. B. White. *Proc. P. S. N. S.*, vol. i. part vii.—In this are numerous notes on the plants of Perthshire.

NOTES ON THE FLORA OF STIRLINGSHIRE. By Colonel Stirling and Robert Kidston. *Trans. Stirling Nat. Hist. and Arch. Soc.*, 1892-93, pp. 109-113.

REPORT ON THE BOTANY OF THE MOFFAT DISTRICT FOR 1892. By J. Thorburn Johnstone. *Trans. Bot. Soc. Edin.*, xix. part iii.—Contains nothing of special importance. Four plants from Lanarkshire are noted here also.

LIST OF PLANTS FOUND IN THE GLENLUCE DISTRICT OF WIGTOWNSHIRE. By Rev. George Wilson. *T. and P. of D. and G. N. H. and A. Soc.*, No. 9.—Though giving a considerable number of species, cannot be regarded as at all complete, and contains little of special interest.

BOTANICAL NOTES FOR 1892. By James M'Andrew. *T. and P. of D. and G. N. H. and A. Soc.*, No. 9.—Enumerates new records and rare plants for the shires of Wigtown, Kirkcudbright, and Dumfries, including both Phanerogams and Cryptogams.

NITHSDALE WILLOWS. By James Fingland. *T. and P. of D. and G. N. H. and A. Soc.*, No. 9.—Gives a full preliminary list, following Dr. F. B. White, as regards species, varieties, and hybrids.

NOTES ON THE MORPHOLOGY OF SOME BRITISH LEGUMINOSÆ. By James A. Terras, B.Sc. *Trans. Bot. Soc. Edin.*, xix. part iii.—Deals with some general points, and more fully with *Ulex europæus*, with a bibliography of the subjects treated of.

RUBI NOTES. By Rev. W. Moyle Rogers, F.L.S. *Journ. Bot.*, 1894, pp. 40-50.—Supplementary to the "Essay at a Key to British Rubi" (*l.c.* 1892-93). *Rubi* from Scotland noticed are *R. mucronatus*, Blox., var. nov. *criniger*, found in 1892 by Rev. E. S. Marshall between Fowlis and Dingwall in E. Ross; *R. villicaulis*, Koehl., var. *Selmeri*, from Scotland (*sine loco*), and var. *insularis*, F. Aresch., from near Fowlis (E. S. Marshall); *R. mollissimus*, sp. n., from W. Sutherland, as well as from Devon and Dorset; typical *radula*, Weihe., "from Scotland"; *R. britannicus*, n. sp., from a wood near Bridge of Lochay in Perthshire, as well as at Munstead in Surrey.

SVANTE MURBECK ON GENTIANS. By Wm. H. Beeby. *Journ. Bot.*, 1894, pp. 1-4.—Gives a summary of Herr Murbeck's determination of the British Gentians of the group *Endotricha*, Froel. (see p. 119).

NOTES ON THE GENUS OROBANCHE IN SCOTLAND. By Arthur

Bennett, F.L.S. *T. and P. of D. and G. N. H. and A. Soc.*, No. 9, 1892-93.—Enumerates *O. rapum*, Thuill., from Dumfries and Kirkcudbright (and doubtfully from Fife and Perth); *O. minor*, from Fife; *O. rubra*, from Fife and from several counties in the West of Scotland; and *O. cruenta*, from Argyle.

LIFE-HISTORY OF PINGUICULA VULGARIS. By T. D. Sadler. *Trans. Bot. Soc. Edin.*, xix. part iii.—Gives a bibliography of papers relating to this plant and its allies.

ELEVATION ATTAINED IN SCOTLAND BY UTRICULARIA MINOR AND URTICA DIOICA. By Edward S. Marshall. *Journ. Bot.*, 1894, p. 53.—Records *Utr. minor*, “freely on Rannoch Muir, near Kings-house, Argyle, up to 1000 feet,” and “*Urtica dioica*, up to about 1700 feet.”

RANGE OF UTRICULARIA MINOR. By H. N. Dixon. *Journ. Bot.*, 1894, p. 88.—Records its occurrence, in July 1883, with *U. intermedia*, neither being in flower, in pools north-west of Loch Ericht at an elevation of at least 1200, and probably of 1500 feet above sea-level.

BETULA INTERMEDIA, THOMAS, IN WEST SUTHERLAND. By Edward S. Marshall. *Journ. Bot.*, 1894, pp. 23-24.—Records this form from Cashil Dhu, near Ben Hope, and also mentions its occurrence at the entrance to Corrie Kandor in Bræmar. Mr. Marshall states his belief that it is a hybrid between *B. nana*, L., and *B. pubescens*, Ehrh.

SUPPLEMENTARY NOTES ON THE MARINE ALGÆ OF THE ORKNEY ISLANDS. By George Wm. Traill. *Trans. Bot. Soc. Edin.*, xix. part iii.—Enumerates several additions to Orkney flora, including *Dictyosiphon hippuroides* (Lyngb.), Kütz., forma *fragilis* (with figure), a form new to Britain.

NEW BRITISH MARINE ALGÆ. By E. A. L. Batters, B.A., etc. *Grevillea*, 1894, p. 90.—*Rhodochorton membranaceum*, Mag., var. *macroclada*, Rosenvinge, is recorded from Berwick.

VAUCHERIA CORONATA, NORDST. By E. M. Holmes, F.L.S. *Grevillea*, 1894, p. 91.—Found by Mr. Jack, in May 1893, at the Mason's Cove, near Arbroath, forming “a dense cushion about $\frac{1}{3}$ inch in height, but extending for many inches. It grows near high-water mark.” It is new to Britain. The original description is quoted from “Botaniska Notiser.”

ELVELA AURICULA, SCHAEFF. By G. Masee. *Grevillea*, 1894, pp. 65-66.—Is a “critical investigation of the species of *Otidea*,” of which two are distinguished and described as British, viz. (*Peziza*) *Otidea auricula*, Masee (non Bresadola), and *Otidea neglecta*, Masee (= *P. auricula*, Rehm., non Cooke), which is recorded from Aboyne and elsewhere.

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ON THE CHANGES OF PLUMAGE IN THE RED
GROUSE (*LAGOPUS SCOTICUS*).

By W. R. OGILVIE-GRANT,
British Museum (Natural History).

PLATES V. & VI.

NO group of birds, as far as I am aware, go through so many and such varied annual changes of plumage as the members of the genus *Lagopus*, which includes the four species of Ptarmigan, the Willow Grouse, and the Red Grouse. The various seasonal plumages of the common Ptarmigan (*Lagopus mutus*), varying conspicuously from one another in colour, long ago attracted the attention of ornithologists, and have been more or less well described by earlier writers; but by far the most accurate and complete account is given by Mr. J. G. Millais in his "Game Birds and Shooting Sketches," pp. 69, 70 (1892). This same author was, I believe, the first to suggest that the Red Grouse goes through similar but somewhat less conspicuous changes; for none of our standard books on British Birds make any allusion to the very important alterations in plumage in this species, the seasonal differences being probably referred to individual variation. Mr. Millais was of opinion when he

published the above interesting volume that the moults of the Ptarmigan and Red Grouse were coincidental in number ; but I have since conclusively proved that this is not really the case, the changes in the male and female Red Grouse occurring at different seasons, and being in this respect quite peculiar. See "Annals and Magazine of Natural History" (6), xii. pp. 62-65 (1893), and "Catalogue of the Birds in the British Museum," xxii. pp. 36-38 (1893).

The Willow Grouse (*Lagopus lagopus*)—of which the Red Grouse is considered by most ornithologists merely an insular form—has three distinct partial moults during the year. Seeing that the latter species does not assume the white winter garb, one is very naturally led to suppose that this protective plumage, being no longer a necessity, has been gradually dropped, and that the spring and autumn plumages only are retained ; but this is only the case with the female.

For many years the changes in the plumage of the Red Grouse has been one of my special studies, but it was only during the preparation of the above-mentioned volume of the Catalogue that I was able to bring together a fairly complete series of birds of both sexes shot during every month of the year, and thus obtain absolute confirmation of what I had long suspected.

The male has no distinct summer plumage, but has distinct autumn and winter plumages, and retains the latter throughout the breeding season.

The female has a distinct summer plumage, which is complete by the end of April or beginning of May ; also a distinct autumn plumage, which is retained till the following spring.

To put it more shortly, both male and female have two distinct moults during the year, but in the male they occur in autumn and winter, and in the female in spring and autumn ; the former having no distinct spring, and the latter no distinct winter, plumage.

So far as I am aware, these remarkable facts are without parallel in ornithology.

Since I last wrote on this subject in vol. xxii. of the "Catalogue of Birds," I have examined much additional

material which has merely confirmed the already conclusive evidence; and though I have no fresh facts to add, I hope, with the aid of the two coloured plates, to be able to point out the various seasonal changes of plumage more clearly.¹

Before attempting to deal with the various moults and changes, it is necessary, in order to thoroughly understand the subject, that we should say a few words regarding individual variation, the Red Grouse being one of the most variable birds in existence. The ordinary varieties of the male may be divided into three distinct types of plumage: a *red form*, a *black form*, and a *white-spotted form*. The first of these, in which the general colour is red (Plate V. Fig. 8) without any white spots on the breast, is mostly to be found on the low grounds of Ireland, the west coast of Scotland, and the Outer Hebrides. Typical examples of the second or black form (Plate V. Fig. 10) are rarely met with, and are usually found mixed with either the red or white-spotted forms, but most often with both, and specimens in a mixed plumage are those most commonly met with. The third or white-spotted form has the feathers of the breast and belly, and sometimes those of the head and upper parts, tipped with white. The most typical examples of this variety are usually found on the high grounds of the north of Scotland.

In the female no less than five distinct types are recognisable: the *red*, the *black*, the *white-spotted*, the *buff-spotted*, and the *buff-barred* forms. The first two are the rarest, the latter being extremely uncommon (Plate VI. Figs. 5 and 13); the white-spotted form occurs as in the male; the buff-spotted form, which is much the commonest and that usually met with, has the feathers of the upper parts spotted at the tip with whitish buff (Plate VI. Figs. 2 and 3); the fifth, or buff-barred form, is met with in the south of Ireland, and resembles in winter (autumn plumage) (Plate VI. Fig. 4) the ordinary female in breeding plumage, having the upper parts coarsely barred with buff and black. I have been unable to

¹ As it was found necessary to have two plates to illustrate the principal changes, moults, and varieties, Mr. Henry Seebohm most generously ordered the second plate to be prepared at his expense. In this way I have been able to devote a plate to each sex, and figure a much more complete series of feathers than would otherwise have been possible.

obtain any fresh material or information regarding this form, and I should be very glad to receive specimens from any gentleman residing in the southern and western counties, and in fact from any part of Ireland.

The different types of male bear a much closer resemblance to one another in their new autumn plumage than they do in their winter dress ; but even in autumn plumage one can generally tell at a glance to which of the three types any individual belongs, provided he is a fairly typical example of any one form.

In the same way all the females, no matter to what type they belong, assume the black and buff-barred breeding plumage, and are then much more alike than they are in their autumn garb.

It is extremely seldom that we come across a male in complete autumn or complete winter plumage, that is to say, with the whole of the back and upper parts alike ; generally speaking, only *part* of the old feathers are replaced by a new autumn plumage, and before this is complete the new winter feathers begin to appear. Still, examples are to be found here and there ; for one shot in the beginning of September at Otley, Yorkshire, is in absolutely complete autumn garb, while another individual killed in Perthshire in the month of December has the upper parts entirely clad with new winter plumage only, the *whole* of the comparatively fresh autumn feathers having been cast and replaced. Presumably such individuals are abnormally strong and vigorous birds.

In no two individuals of the same sex are the changes of plumage quite alike at the same date. The moults are greatly affected by the mildness or severity of the weather, and the abundance or scarcity of the food supply, as well as by the constitution of the individual. In mild winters, for example, we find birds of both sexes still moulting a few feathers in the middle of December, and in such seasons the changes are the most complete ; on the other hand, in sudden severe winters, the food supply being diminished or nearly cut off, the moult is arrested and apparently goes no further.

Bearing in mind the above remarks, the changes in the ordinary male may be described as follows :—

Adult Male (Autumn Plumage).—After the breeding

season a very complete autumn moult takes place ; the quills, tail, and feathers on the feet being entirely renewed. As already mentioned, the males, no matter to what type they belong, bear at this season a much closer resemblance to one another than they do in their winter plumage.

In most examples the feathers of the back, scapulars, rump, and upper tail-coverts are black margined and irregularly barred with bright tawny buff ; in most cases the bars cross the feathers more or less transversely (Plate V. Fig. 4), but in some they are more or less concentric and parallel with the marginal band, giving the upper parts a scaled appearance (Plate V. Figs. 6 and 7).

The feathers of the chest are rather widely barred with buff or rufous-buff and black (Plate V. Fig. 11), and some of the flank feathers are more narrowly barred with the same colours. The rest of the under parts vary according to the type to which the individual belongs. In a specimen shot on the 6th June the autumn moult has commenced on the upper mantle, so that three different sets of feathers can be seen on the back at once, viz. the new autumn, the old winter, and the old autumn plumages, both the latter very clearly showing the result of wear and tear (Plate V. Figs. 1-3).

The first feathers of the winter plumage begin to appear about the beginning of September.

Adult Male (Winter-Summer Plumage).—General colour above black, with finely mottled bars of dark chestnut (Plate V. Fig. 5) ; head, neck, and chest (Plate V. Fig. 12) mostly dark chestnut finely marked with black ; mantle, lower back, rump, upper tail-coverts, and flanks with narrow transverse bars and vermiculations of black and dark chestnut, the latter colour usually predominating. Generally a greater or less number of autumn feathers are retained, and are conspicuous among the new winter plumage.

The general tone of each bird varies of course according to the type to which it belongs. When once the winter moult is complete, *no change whatever* takes place in the plumage till the following autumn moult, except that the feathers become bleached and worn at the extremities. In summer the white spots on the under parts, if present, are

much less prominent, but this is accounted for by the wearing off of the ends of the feathers.

*Female Adult (Autumn-Winter Plumage).*¹—Upper parts black, with narrow irregular bars and mottlings of rufous, and a buff spot at the tip of most of the feathers (Plate VI. Figs. 2 and 3); chest-feathers narrowly and often irregularly barred with rufous and black, and usually more or less tipped with buff (Plate VI. Figs. 10 and 11). The rest of the under parts are dark chestnut mottled and barred with black, or black barred with chestnut. The typical white-spotted form differs, of course, in having the feathers of the under parts widely tipped with white.

This plumage is retained throughout the autumn and winter; in early spring the feathers of the summer plumage begin to appear, and by the end of April or the beginning of May the change is complete. In some individuals many of the chestnut and black autumn-winter feathers on the chest, sides, and flanks, are not renewed, but change their pattern without a moult, as will be fully explained below.

Female Adult (Summer Plumage).

a. *Feathers of the Upper Parts.*

So far as I have been able to ascertain from examining a large number of specimens, the summer feathers of the upper parts, that is to say, of the mantle, scapulars, inner wing-coverts, back, and rump are always attained by moult, and never by change of pattern. The summer moult of these parts is very complete, and the transformation from the autumn-winter plumage very remarkable. Every female assumes the summer plumage; and though all the different types closely resemble one another in their breeding dress,

¹ I have, of course, here described the commonest or buff-spotted form of the female in autumn plumage. In the most extreme examples of the red form the buff spots at the ends of the feathers of the upper parts are absent, and this is also the case in the much rarer black form. In the buff-banded form from the south and west of Ireland the terminal buff spot takes the form of a marginal bar, and the feathers are practically indistinguishable from the breeding or summer plumage. It may possibly transpire that in the south of Ireland, the most southerly point of this bird's range, the female retains her breeding plumage throughout the year, but this seems very unlikely.

one can generally tell by the feathers of the under parts to what form any individual belongs. In the average female in full summer plumage the upper parts may be described as black, each feather being rather widely margined, barred and marked with orange buff (Plate VI. Fig. 1). The protection afforded by this plumage is so perfect that, when the bird is sitting on its nest among heather and dead grass, it may easily remain unnoticed though only a few yards distant.

This plumage, however, varies much in different individuals, birds from Yorkshire and Ireland having the rufous or orange-brown bars much brighter and wider than in the more finely mottled and darker specimens generally characteristic of the east of Scotland.

As already mentioned, the autumn plumage of the upper parts in the commonest or buff-spotted type is black, finely barred or mottled with rufous, most of the feathers having a triangular buff spot at the extremity (Plate VI. Figs. 2 and 3).

b. *Feathers of the Sides and Flanks.*

By the first week in May the summer plumage of the female Grouse is fairly complete, and many of the finely mottled rufous and black autumn flank feathers are replaced by widely and often irregularly barred buff and black feathers similar to those of the chest. It must be particularly noted that in *none* of the many females examined in breeding plumage were the *whole* of the autumn flank feathers cast or changed in the summer moult, a large proportion being retained till the next (autumn) moult. The summer flank feathers are produced in two ways, either by the gradual rearrangement and change in the pigment of the autumn feathers (Plate VI. Figs. 6-8) or by moult (Plate VI. Fig. 9). In some birds the whole of the alteration in the plumage of the flanks is produced by change of pattern in the old autumn feathers, in others the change is entirely produced by moult, while sometimes both methods are employed by the same individual. In the former case the first indication of the coming change may be observed in the beginning of the

month of November, or even earlier, when many of the flank feathers show traces of an irregular buff stripe or spot next the terminal half of the shaft (Fig. 7). As the bird only changes about half the flank feathers, these buff marks are only to be observed on such as are destined to undergo alteration of pattern, which, roughly speaking, means every second or third feather. The buff gradually spreads along the shaft, then becomes constricted and broken up into patches, which gradually spread laterally towards the margins of the webs, forming wide irregular buff bands (Fig. 8). Meanwhile the interspaces become black, and the rufous of autumn dies out.

When the summer feathers are supplied by moult they usually begin to make their appearance about the beginning of March, and even when fully grown may generally be recognised from the former by their more regular black and buff barring (Plate VI. Fig. 9). The change of pattern without a moult appears to take a long time to become complete, for we find, as already shown, that feathers altered in this way begin to show traces of the coming metamorphosis as early as the beginning of November, and are often imperfectly rearranged by the end of April; whereas, when the summer feathers are supplied entirely by moult, no change whatever is visible in the autumn plumage of the flank feathers till at earliest the end of February, when the first new feathers begin to appear. It must, however, be noted that in one bird from Nairnshire obtained in the middle of December, a single half-grown summer feather is visible on the left flank, though no doubt this is quite unusual.

After making allowance for the different type to which each individual belongs, irregular as the moults and changes of these at first seem (no two individuals being exactly alike at the same date), it will nevertheless be found that all the changes are governed by fairly well-marked laws, though they are to some extent subject to the external influence of climate. For instance, some females shot in October—especially in cold years when winter sets in early—have entirely finished their autumn moult, no young feathers being found even on the back of the neck and mantle;

on the other hand, when the weather is comparatively open and mild, a few feathers of the mantle may still be found in quill as late as the middle of December, by which time the male bird has not only passed through his autumn change, but also completed his winter moult. The food supply being much greater in mild weather, no doubt accounts for the bird being apparently unable to continue its moult in very cold weather when food is comparatively scarce. There can be no doubt that the male completes his autumn moult very much more quickly than the female does, many males being in full autumn plumage by the beginning of September. Possibly this may be accounted for by the resources of the female being more severely taxed than those of the male during the breeding season. It may very naturally be asked why some females should change their summer flank feathers by moult, while others are enabled to go through the much less exhaustive process of redecorating their old autumn feathers and making them serve the purpose of new summer plumage. This is a difficult question to answer, but it seems natural to suppose that the more vigorous birds gain their summer flank feathers by moult, while nature has enabled the weaker individuals to obtain the necessary protective nesting plumage by a more gradual and less exhaustive process.

c. *Feathers of the Chest.*

The summer change of the feathers of the fore neck and chest in the female Grouse is similar to what takes place on the sides and flanks, but very much more complete, all the feathers being widely barred with black and yellowish buff by the beginning of May (Plate VI. Fig. 12). It will be easily understood that the fore neck and chest being conspicuous parts of the bird when she is sitting on her eggs, it is most important for her that the protective black and buff plumage should be complete. The greater part of this change is generally produced by moult; but, as is the case in the flank feathers, some individuals (probably less robust females) attain the greater part of the change without a moult. The same rearrangement of the pigment described

in speaking of the flanks takes place in the chest feathers, the finely mottled and barred rufous and black autumn plumage becoming widely barred with black and buff.

In conclusion, I can only hope that I may have succeeded in making clear to my readers the somewhat intricate changes of plumage in the Red Grouse, more especially in the female. I trust that any friends and correspondents who may meet with good examples of any of the above-mentioned types, or with peculiar varieties of this species, will remember that by forwarding them to me at the Natural History Museum, Cromwell Road, London, they will be making a valuable addition to the National Collection, which is as yet by no means complete.

SYNOPSIS OF THE PLUMAGES.

MALES.

	<i>Autumn Plumage.</i>	<i>Winter-Summer Plumage.</i>	
1. Red form . . .	Upper parts black, margined and irregularly barred with bright tawny buff. Under parts as in the winter-summer plumage, differing according to the type to which each individual belongs.	Feathers of the upper parts dark chestnut, more or less mottled with black (Fig. 8).	Feathers of the breast and belly dark chestnut mottled with black.
2. Black form . . .		Feathers of the upper parts black, with a few indistinct mottlings of rufous towards the extremities of some (Fig 10).	Feathers of the under parts black, or with here and there a few faint red mottlings.
3. White-spotted form.		Feathers of the upper parts black, finely barred and mottled with dark chestnut, or chestnut finely marked with black.	Feathers of the under parts widely tipped with white. (Head and back sometimes similarly marked.)





FEMALES.

	<i>Summer Plumage.</i>	<i>Autumn-Winter Plumage.</i>	
1. Red form.	Feathers of the upper parts black, rather widely margined, barred, and marked with orange buff. Chest and flank feathers widely barred with black and buff. Under parts vary according to the type to which each individual belongs, but Nos. 4 and 5 are indistinguishable.	Feathers of the upper parts mostly rufous chestnut, finely marked and mottled with black.	Feathers of the underparts ditto.
2. Black form.		Feathers of the upper parts black, indistinctly mottled with rufous chestnut.	Feathers of the underparts ditto.
3. White-spotted form.		Upper parts black, with irregular bars and mottlings of chestnut and a buff spot at the tip of most of the feathers.	Feathers of the under parts widely tipped with white.
4. Buff-spotted form.			Feathers of the under parts mottled with black and chestnut.
5. Buff-barred form.		Plumage similar to the summer dress of the buff-spotted form (No. 4).	

EXPLANATION OF THE PLATES.

PLATE V.—FEATHERS OF THE RED GROUSE. ♂

- Figs. 1-3. Feathers from the back of a male, Banffshire, 6th June—1, old autumn; 2, old winter; 3, new autumn.
 Figs. 4, 5. Feathers from the back of a male, Stirlingshire, December—4, old autumn; 5, new winter.
 Fig. 6. Feather from the back of a male, Yorkshire, September, autumn plumage.
 Figs. 7, 8. Feathers from the back of a male, County Mayo, November—7, old autumn plumage; 8, new winter.
 Fig. 9. Feather from the back of a male, Perthshire, December, new winter.
 Fig. 10. Feather from the back of a male, Stirlingshire, 10th December, winter plumage.
 Fig. 11. Feather from the chest of a male, Stirlingshire, 17th July, autumn plumage.
 Fig. 12. Feather from the chest of a male, Stirlingshire, December, winter plumage.

PLATE VI.—FEATHERS OF THE RED GROUSE. ♀

- Fig. 1. Feather from the back of a female, Ayrshire, 27th April, new summer plumage.
 Fig. 2. Feather from the back of a female, Loch Long, 14th September, new autumn plumage.

- Fig. 3. Feather from the back of a female, Yorkshire, December, new autumn plumage.
- Fig. 4. Feather from the back of a female, County Mayo, November, new autumn plumage.
- Fig. 5. Feather from the back of a female, Stirlingshire, 10th December, new autumn plumage.
- Fig. 6. Feather from the flank of a female, Loch Long, 14th September, new autumn plumage.
- Fig. 7. Feather from the flank of a female, Stirlingshire, 22nd November, showing change of pattern from autumn to summer without moult.
- Fig. 8. Feather from the flank of a female, Argyllshire, 10th December, showing change of pattern from autumn to summer without moult.
- Fig. 9. Feather from the flank of a female, Stirlingshire, 17th July, showing summer feather acquired by moult, with the barring more regular.
- Fig. 10. Feather from the chest of a female, Loch Long, 14th September, new autumn plumage.
- Fig. 11. Feather from the chest of a female, County Mayo, November, new autumn plumage.
- Fig. 12. Feather from the chest of a female, Ayrshire, 27th April, new summer plumage.
- Fig. 13. Feather from the chest of a female, Stirlingshire, 10th December, autumn plumage.
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THE BIRDS OF THE ISLAND OF BARRA.

By JOHN MACRURY, M.B.

AS many species of birds are continually shifting their ground from one locality to another, I think it of sufficient interest to write out a list of the birds that at present occur in Barra, or have been found on the island within comparatively recent years.

No doubt many strangers visit these islands for a few days yearly on migration, but escape notice, as so few people take any interest in the subject.

Since the publication of Messrs. Harvie-Brown and Buckley's "Vertebrate Fauna of the Outer Hebrides" in 1888, a considerable number of species has been met with in the Outer Hebrides not included in that publication. Still greater changes in the avifauna of the group have taken place since the time when the Macgillivrays wrote. But the curious thing is that at the latter time, when a game-keeper in the Outer Hebrides was almost as rare as the hoopoe is to-day, bird life was much more abundant than it



is now, when game is as strictly preserved as in any part of the kingdom.

The same applies to the salmon, which, as is well known, was once so abundant that servants, when engaging, stipulated that they should only be served with this fish so many times a week. Whatever way this change can be accounted for, it certainly is not due to the increase of population, as some of these islands were then more thickly populated than they are at present.

The planting of trees about ten years ago at several spots on this island has attracted several of the smaller birds which formerly used to pass by; and no doubt, if the plantations continue to thrive, more species will come from year to year and remain to breed.

In the following list I shall include only species which I have no reasonable doubt have been found on the island. With but very few exceptions, all the species have been seen by myself: the exceptions will be noted, and my authorities for including them mentioned:—

SONG THRUSH, *Turdus musicus*, L.—Abundant, breeding and permanently resident.

REDWING, *Turdus iliacus*, L.—Winter visitor, abundant, seems increasing of late years.

FIELDFARE, *Turdus pilaris*, L.—Winter visitor, not numerous.

BLACKBIRD, *Turdus merula*, L.—Winter visitor, abundant, but does not remain to breed, which is rather strange, as the locality seems suitable, and the Song Thrush breeds in numbers. Another point that seems curious is that, although some Blackbirds remain with us till the middle of April, they never sing, only utter their harsh cry of alarm when startled, whereas the Thrush is in full song from the beginning of February. [Since the above was written (27th May 1894), a pair of Blackbirds, with two or three young newly fledged, appeared in my garden; so that we may take this season as the first in which the Blackbird has bred in Barra.]

WHEATEAR, *Saxicola œnanthe*, L.—Summer visitor, breeding, very abundant, arriving last week of March.

WHINCHAT, *Pratincola rubetra* (L).—Saw two solitary birds (both hens) for the first time in the summer of 1892. Then in 1893 a pair were seen for some time in a plantation, where I suspect they bred.

- STONECHAT, *Pratincola rubicola* (L).—Breeding and permanently resident, not abundant.
- REDBREAST, *Erithacus rubecula* (L).—Breeding and permanently resident. This is a species that seems to be decidedly increasing since the introduction of trees into the island. Five years ago I noticed only a single pair, and now fully a dozen pairs may be seen.
- WHITETHROAT, *Sylvia cinerea*, Bechst.—Summer visitor. Noticed first in 1892; a pair remaining for a long time in a plantation, where, I think, they must have bred. Last summer numbers were seen on the island, but no nest has been got as yet.
- BLACKCAP, *Sylvia atricapilla*, L.—The only record is a solitary bird, female or young male, I saw in my garden for about a week in October 1893 (13th-20th).
- WILLOW WREN, *Phylloscopus trochilus* (L).—On the 13th November 1893 a Willow Wren was caught by Mr. Wm. Macgillivray in their garden at Eoligary, which I saw. This was the first time the Willow Wren was identified as occurring in Barra; but there can be no doubt, from what Mr. Macgillivray tells me, that a pair used to breed in their garden for many years, up to a couple of years ago, when they ceased to appear. Numbers of them appeared in April and May 1894.
- SEDGE WARBLER, *Acrocephalus phragmitis*, Bechstein.—One was got by Mr W. Macgillivray at Eoligary in June 1893, which is in his collection. I think this is the first recorded from the Outer Hebrides.
- HEDGE SPARROW, *Accentor modularis*, L. — Breeding and permanently resident, not numerous, but increasing rapidly since the introduction of trees.
- DIPPER, *Cinclus aquaticus*, Bechstein.—A solitary bird seen by me on 15th January 1894. This is the only record of its occurrence on the island.
- WREN, *Troglodytes parvulus*, K. L. Koch.—Abundant and permanently resident. A pair reared their young on the hay-loft here last year.
- PIED WAGTAIL, *Motacilla lugubris*, Temminck.—Mr. W. Macgillivray saw one at Eoligary on 14th January 1894. This is the only record of its occurrence on the island, although it probably visits us on migration, along with the White Wagtail.
- WHITE WAGTAIL, *Motacilla alba*, L.—Common on migration in spring and autumn, but there is no evidence of its breeding.
- GRAY WAGTAIL, *Motacilla melanope*, Pallas.—Only one specimen of this species has been met with on the island. I examined the

bird which was got on 6th October 1893, and it appeared to be an adult male in the autumn plumage. I do not think the species has been found in any other part of the Outer Hebrides.

MEADOW PIPIT, *Anthus pratensis*, L.—Abundant, resident, chief foster parent of young Cuckoo.

ROCK PIPIT, *Anthus obscurus*, Latham.—Abundant, resident, and breeding.

SWALLOW, *Hirundo rustica*, L.—A few seen on migration in spring and autumn, but does not breed. Have noticed some one year as early as 22nd April.

MARTIN, *Chelidon urbica* (L.)—Occurs on migration in spring and autumn, but does not breed.

SAND MARTIN, *Cotile riparia* (L.)—Passes on migration in limited numbers like the two last, but does not breed.

GREENFINCH, *Ligurinus chloris* (L.)—Only two or three birds were noticed on the island as occasional winter migrants until October 1893, when large flocks arrived,—as many as 100 being counted together,—and these remained chiefly about stackyards and gardens till the beginning of April 1894, when they all left.

HOUSE SPARROW, *Passer domesticus*, L.—This species was not observed on the island till 24th November 1893, when five birds—three males and two females—appeared in my garden. They immediately took possession of an ivy tree on the porch as a roosting-place, displacing the Tree Sparrows which used to live there. They remained all winter, and some time in March another hen suddenly appeared, but the three pairs left early in May without nesting.

TREE SPARROW, *Passer montanus*, L.—Considerable numbers of this species have been permanently resident on the island for a great many years; and I think there can be no doubt it was this species, and not the preceding, that Macgillivray found on the island when he wrote in 1837. They nest in the holes in garden walls, chiefly at Eoligary and North Bay.

CHAFFINCH, *Fringilla coelebs*, L.—Winter visitor, arriving in October in considerable numbers, which seem to be increasing from year to year, and leaving early in April, none as yet having been known to breed.

BRAMBLING, *F. montifringilla*, L.—One was seen in January 1894, the only record from the island.

TWITE, *Acanthis flavirostris*, L.—Very abundant, breeding and permanently resident.

- LINNET, *L. cannabina*, L.—Three birds—two males and a female—were got at Eoligary in May 1894. This is the first record of the species.
- CORN BUNTING, *Emberiza miliaria*, L.—Abundant, breeding and permanently resident.
- REED BUNTING, *Emberiza schoeniclus*, L.—Fairly plentiful in autumn and winter, and a few breed. They were more abundant than usual in winter of 1893.
- SNOW BUNTING, *Plectrophenax nivalis* (L.)—Small flocks visit us on migration in spring and autumn, but remain only for a few days.
- SKYLARK, *Alauda arvensis*, L.—Fairly plentiful, breeding and resident. Considerable numbers pass on migration in the autumn, all apparently going south.
- STARLING, *Sturnus vulgaris*, L.—Very abundant, breeding and resident, roosting at night in the rocky caves. One of the Eoligary shepherds told me that he once saw a pair of starlings take possession of a hole in which a Shelduck had just built her nest and laid a few eggs. There was a short but sharp engagement, in which, as has sometimes happened among “the lords of the creation,” the dusky warriors came off victorious—the *red-coats* beating an ignominious retreat.
- The powers of mimicry of the Starling are well known, but I think those of one particular bird which is in the habit of performing in my garden are worth recording. The first thing that attracted my attention was its imitating the neighing of a foal so perfectly that it several times completely deceived me. Then I watched it, and was astonished at the number of birds it could mimic. Among these I may mention the Curlew (to perfection), the Golden Plover and Lapwing, the different kinds of Gulls, and especially the plaintive cry of their young, the Eider Duck, the notes of the Great Northern Diver, and a fair imitation of the Song Thrush, etc., not to speak of its clear, sharp whistle, of which any schoolboy might well be proud.
- JACKDAW, *Corvus monedula*, L.—Three birds were noticed in October 1893 along with a large flock of Rooks. They remained on the island for a good part of the winter. Then again, on 17th April 1894, a flock of eight birds were seen at Eoligary, but after a few hours' stay they flew across the Minch. With the exception of a bird or two seen a good many years ago, these are the only records of the occurrence of the Jackdaw in Barra.
- RAVEN, *Corvus corax*, L.—Comparatively numerous all the year, breeding in the high cliffs. On 22nd March 1893 I got a nest with six eggs.

- HOODED CROW, *Corvus cornix*, L.—Very abundant at all times. When it has exhausted eggs, chicks, and such palatable food, it has recourse to shellfish, breaking the harder shells by flying up in the air with them and letting them fall on a convenient rock. The usual number of eggs is four, but I have got six in nest.
- ROOK, *Corvus frugilegus*, L.—Every winter a small flock visits the island, but in October 1893 very large flocks arrived and remained till the spring. A few stragglers are seen in the summer, but it has not been known to breed on the island.
- SWIFT, *Cypselus apus* (L.)—I have noticed one or two birds nearly every summer since I came to the island, but they are far from common.
- KINGFISHER, *Alcedo ispida*, L.—On 25th July 1892 I saw a Kingfisher in a small plantation, through which runs a shallow stream, near my house. I watched the bright little stranger for about a week, after which he disappeared. I never saw any of the species in any other part of the Outer Hebrides.
- CUCKOO, *Cuculus canorus*, L.—Very common. Arriving about the 1st of May, and leaving early in September.
- SHORT-EARED OWL, *Asio accipitrinus*, Pallas.—Fairly common, especially in the autumn and winter; but a few breed, as the nest has been found more than once.
- SNOWY OWL, *Nyctea scandiaca* (L.)—One bird is said to have been shot in the island of Mingalay in 1887. Mr. William Macgillivray tells me that he saw a Snowy Owl at Eoligary, he thinks, in this same year, so that it was probably the same bird. There is no other record of its occurrence in Barra.
- HEN-HARRIER, *Circus cyaneus*, L.—A few pairs seen all the year round, breeds on the southern islands.
- GOLDEN EAGLE, *Aquila chrysaëtus*, L.—Very seldom seen now, although formerly it no doubt bred on the island.
- WHITE-TAILED EAGLE, *Haliaëtus albicilla* (L.)—This species bred in the southern islands of Barra some twenty-five years ago, but not since, and, like the preceding, is seldom seen hovering about now. Mr. Murdo Macgillivray shot one some years ago, and it is in their collection at Eoligary; and he tells me that they kept one as a pet for many years, which was taken out of an eyrie in the southern islands. This bird used to fly some distance away from the house, picking up rabbits and birds, until one day it was shot by a stranger who was ignorant of its being a tame bird. He is not quite sure whether this bird was a White-tailed or a Golden Eagle, but is inclined to think it was the latter.

(To be continued.)

REPORT ON THE MOVEMENTS AND OCCURRENCE OF BIRDS IN SCOTLAND DURING 1893.

By LIONEL W. HINXMAN, B.A.

SCHEDULES were sent, as last year, by Messrs. Harvie-Brown and Eagle Clarke to all the light-stations on the Scottish coasts, and of these fourteen have been returned filled up. Schedules and notes have also been received from twenty-five other observers in different parts of the country, making a total of thirty-nine reports examined and tabulated. While there is thus a slight decrease in the number of schedules sent in, their individual merit and the amount of information which they contain is considerably in advance of those received last year.

The faunal areas of Clyde and West Ross are now represented in the report, but additional observations are needed from Sutherland, Dee, Moray, West Ross, Tweed, and Solway; and it is hoped that subscribers to the "Annals" resident in those districts may be induced to interest themselves and their friends in this direction. It is also still to be regretted that no returns are available from the Isle of May.

We would again express our hearty thanks to all those who have so kindly helped us in these inquiries, and also to Mr. T. G. Laidlaw for assistance in the despatch and collection of reports.

The following list gives the names of observers from whom schedules have been received. The localities are arranged under the different faunal areas, proceeding from north to south along the east and west coasts.

NORTHERN ISLES.

SHETLAND.

<i>Locality.</i>	<i>Name of Observer.</i>
North Unst L.H.	James Ferrier, Lightkeeper.
Bressay L.H.	James M'Guffie, „
Scousbrough, Dunrossness	Thos. Henderson, jun.

ORKNEY.

<i>Locality.</i>	<i>Name of Observer.</i>
North Ronaldshay	Allan Briggs, Holland House.
Hoy Sound High Light	Thomas Hughson, Lightkeeper.
Pentland Skerries L.H.	Malcolm M'Dougall, „

SUTHERLAND.

Thurso and district Lewis Dunbar.

MORAY.

Helmsdale and Strath Brora	Hugh Miller, H.M. Geol. Survey.
Lower Strathspey and Cabrach	Lionel Hinxman, „
Aviemore, Strathspey	William Evans.

DEE.

Peterhead	Rev. William Serle.
Gourdas, Fyvie	George Sim.
Girdleness L.H.	John Gilmour, Lightkeeper.

TAY.

Arbroath district	T. F. Dewar, M.D. ; W. J. Dewar, M.B.
Carse of Gowrie	Charles Heron Watson.
Tayfield, Newport, Fife	William Berry.
Bell Rock L.H.	John R. Laurence, Lightkeeper.

FORTH.

Inchkeith L.H.	Chas. M'Fadyen, Lightkeeper.
Edinburgh district	William Evans.
„ „	T. G. Laidlaw.
Mid and West Lothian	Bruce Campbell.
Dalmeny Park	Chas. Campbell.
Doune, Perthshire	Lt.-Col. W. H. M. Duthie, Row.

TWEED.

Hallmyre, Peeblesshire	David G. Laidlaw.
Chirnside	Charles Stuart, M.D.

OUTER HEBRIDES.

Island Ghlais L.H., Harris	“The Lightkeepers.”
Monach Isles L.H.	Wm. A. Tulloch, Lightkeeper.
Barra Head L.H.	James Edgar, „
North Bay, Barra	John M'Rury, M.B.

WEST ROSS.

<i>Locality.</i>	<i>Name of Observer.</i>
Kinloch, Shieldaig	Donald Matheson.

ARGYLL AND INNER HEBRIDES.

Tiree	Peter Anderson.
Skerryvore L.H.	John Nicol, Lightkeeper.
Skervuile L.H., Jura	Alex. J. Grant and D. M'Donald, Lightkeepers.
Ben Nevis	The Observatory Staff.

CLYDE.

Sanda L.H.	Thomas Dawson, Lightkeeper.
Various localities	J. Paterson, J. Robertson, H. B. Watt.

SOLWAY.

Loch Ryan L.H.	Roderick M'Innes, Lightkeeper.
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GENERAL REMARKS.

The spring of 1893 presented a great contrast to that of the previous year, and the continued warm weather and prevalent southerly winds during the season of spring migration produced a marked effect on the movements of our summer visitants; the average dates of arrival of most species being from a week to ten days earlier than in 1892, while some exceptionally early dates—such as 19th March for Redstart and Sand Martin—were recorded.

The line of spring migration seems to have lain more to the westward than usual; for while the scarcity of birds at that season at Girdleness and Skervuile is made the subject of special mention, from Skerryvore we hear "more birds seen during April and May than usual," and the schedules from Tiree are exceptionally full for these months. At Skerryvore, Blackbirds and Thrushes occurred in large numbers during January, February, and March; and at the same station Wheatears, "Titlarks," Blackbirds, etc., continued to pass in an intermittent stream during April and May,

with rushes of Wheatears on 20th April and 15th and 16th May; the latter rush including also "Titlarks," Warblers, and Swifts. The northerly migration of White Wagtails (*Motacilla alba*) was also well marked at Tiree and Barra during April and May.

The autumn migration presents few points of special interest. The principal movements on the East Coast appear to have taken place on 4th, 5th, and 9th October—Finches and Linnets; 15th and 16th October—Fieldfares and Redwings; and 10th November—Finches; but no great rush occurred like that of the 5th and 6th October 1892. On the West Coast an early migration of Wheatears is reported from Skerryvore on 23rd August, repeated on 14th and 15th September and 18th October. Flocks of White Wagtails on their way south were observed in Tiree on 24th, 25th, and 29th August. A considerable rush, noted at I. Ghlais, Monach, and Skerryvore, took place between the 10th and 13th of November, with light easterly winds, and included Thrushes, Blackbirds, Fieldfares, Redwings, Finches, and Starlings.

Large flocks of Rooks and Jackdaws appeared in Barra and the Monach Isles, and were also seen passing Skerryvore, between 27th October and 9th November, during and after a gale from the W.N.W. From Monach they were observed in hundreds on 9th November, travelling N.N.W. in the direction of St. Kilda, a few returning on the 10th and 11th, while some were found washed up on the shore.

Other points worthy of note are: the occurrence of the Waxwing (*Ampelis garrula*) in many widely separated localities from January to April, and it is reported that there is some reason for believing that a pair reared their young near Invergowrie!; the unusual number of Quail (*Coturnix communis*) present in Scotland during the summer and autumn, and known to have bred in Unst, the Lothians, and Dumfriesshire; the further extension of range to the north and north-west of the House Sparrow, Stock Dove, and Sandwich Tern; and, finally, the capture of a specimen of the Red-breasted Flycatcher (*Muscicapa parva*) at Monach Light-house by Mr. W. A. Tulloch—a most interesting fact, and the first record of this rare straggler for Scotland.

TURDUS MUSICUS (Song Thrush).

Shetland.—Bressay, Oct. 10.

Orkney.—Hoy Sound, April 15; N. Ronaldshay, a few with Redwings, mid-Oct.

Dec.—Girdleness, Jan. 8, with Blackbirds; Nov. 23. Peterhead, Dec. 10, numerous, with Blackbirds, after strong E. gale.

Outer Hebrides.—Monach, Jan. 7, eight; Nov. 13, in rush with Blackbirds. Barra Head, Sept. 25. I. Ghlais, Oct. 9, a rush, wind S.W., light.

Argyll and Isles.—Tiree, last seen March 13, first seen Oct. 11. Skervuile, Jura, Nov. 13. Skerryvore, Feb. 18; March 7, numbers at Light, W., haze; Oct. 6, 8, 15, Nov. 7; Nov. 10-12, in rush with Blackbirds, etc., E.

Solway.—Loch Ryan, Feb. 7.

Principal movements Jan. 7-9, Oct. 6-9, Nov. 10-13.

TURDUS VISCIVORUS (Missel Thrush).

Dec.—Girdleness, Nov. 9, five.

Outer Hebrides.—Monach, Nov. 13, four at Light in rush with other *Turdidae*, "not noticed here before."

Argyll and Isles.—Tiree, Nov. 2, in flocks.

TURDUS ILIACUS (Redwing).

Shetland.—Bressay, Oct. 7.

Orkney.—N. Ronaldshay, first seen Oct. 4, numbers by Oct. 10 and to end of month. Pentland Skerries, last seen April 17; Oct. 4, with Redstarts and Chaffinches, S.W., light; Oct. 15, a great rush, S.E., light.

Moray.—Strathspey, Oct. 17; Strath Brora, Oct. 28.

Dec.—Girdleness, Oct. 15, a great rush, numbers killed at Light, E., haze; Fyvie, Sept. 21.

Forth.—Edinburgh, Oct. 11, flocks flying W. and S.W., high up.

Tweed.—Chirnside, April 24, Oct. 30.

Outer Hebrides.—Barra Head, Oct. 12; Barra, Oct. 13; Monach, Oct. 7, April 20; "very scarce this year."

Argyll and Isles.—Tiree, Oct. 12.

Earliest observed, Sept. 21, Fyvie; latest, April 24, Chirnside.

Principal movements, Oct. 10-15.

TURDUS PILARIS (Fieldfare).

Shetland.—N. Unst, Oct. 16, great rush, light breezes, fine; Dunrossness, Oct. 10.

Orkney.—N. Ronaldshay, Oct. 2, one; Oct. 16, large flock.

- Moray*.—Strathspey, Oct. 17; Strath Brora, Oct. 28.
Dee.—Fyvie, Oct. 6; last seen April 9.
Tay.—Newport, Oct. 8.
Forth.—Pentlands, Sept. 24.
Tweed.—Hallmyre, Oct. 13; last seen April 24.
Argyll and Isles.—Skerryvore, Nov. 12, in rush with other *Turdidae*, E.
Clyde.—Giffnock, Oct. 1.
 Earliest record, Sept. 24, Pentlands; latest record, April 24,
 Hallmyre. Principal movements, Oct. 16, Nov. 12.

TURDUS MERULA (Blackbird).

- Shetland*.—Dunrossness, Nov. 16.
Orkney.—Hoy Sound, Sept. 9, in rush with Starlings, W., clear; N.
 Ronaldshay, a few with Redwings and Thrushes, mid-Oct.
Dee.—Girdleness, Jan. 9, a few with Thrushes.
Outer Hebrides.—Monach, Jan. 7, March 6; first seen in autumn,
 Oct. 10; Nov. 13, a great rush, thirty-five killed at Light,
 E.S.E., cloudy, "unusually numerous." Barra, Oct. 10; Oct.
 13, in numbers with Redwings and Chaffinches.
Argyll and Isles.—Tiree, last seen March 13, arrived for winter
 Oct. 27. Skerryvore, Jan. 10, Feb. 18, March 20, May 24;
 Nov. 10-12, in rush, E.
Clyde.—Sanda L.H., Nov. 11-15, in rushes, N.E.-E., hazy.
 Principal movements, Jan. 7-10, Nov. 10-15.

SAXICOLA GENANTHE (Wheatear).

- Shetland*.—Bressay, April 10; Aug. 15, S.E., foggy.
Orkney.—N. Ronaldshay, April 7-Oct. 17; Pentland Skerries, April
 12-Oct. 5.
Moray.—Brora, March 25.
Dee.—Girdleness, March 25; Fyvie, March 28; Buchan Ness,
 Oct. 1.
Tay.—Arbroath, March 23-Oct. 9.
Forth.—Cramond Island, Jan. 1 [see "Annals," 1893, p. 113];
 Edinburgh, April 10.
Tweed.—Hallmyre, March 30.
Outer Hebrides.—Monach, April 3; Sept. 13, rush, 50 killed at
 Light, S.W.; light; last seen Sept. 29. I. Ghlais, June 15,
 great numbers, S., hazy; Barra, March 23; Barra Head,
 March 26-Sept. 29.
Argyll and Isles.—Tiree, March 28-Sept. 30. Skerryvore, April
 14, 15; April 20, a rush, N., hazy; May 3, 10, 15, and 16, in
 rush with Titlarks and Warblers, S.W., hazy; Aug. 23, a rush,
 38 at Light, S.W.; Sept. 5, four; Sept. 14, with Titlarks; Sept.
 15, a rush, S.W., strong; Oct. 7, eighteen at Light, S., light.

Clyde.—Mallsmire, March 24; numerous by March 31 on Campsie Hills.

Earliest, March 23, Arbroath and Barra; latest, Oct. 17, N. Ronaldshay. Principal movements, April 20; May 15, 16; Aug. 23; Sept. 13-15; Oct. 1-7.

PRATINCOLA RUBETRA (Whinchat).

Moray.—Strathspey, May 9.

Dee.—Fyvie, April 22, Aug. 20.

Forth.—Linton, May 1.

Tweed.—Hallmyre, April 21.

Clyde.—Giffnock, April 23.

Earliest, Hallmyre, April 21.

RUTICILLA PHENICURUS (Redstart).

Orkney.—N. Ronaldshay, Oct. 4, three; a few about till Oct. 9, mostly ♀. Pentland Skerries, Oct. 4, in rush with Redwings and Chaffinches, S.W., light.

Moray.—Strathspey, April 24; Golspie, April 26.

Forth.—Dalmeny, April 18; Edinburgh, April 25.

Tweed.—Hallmyre, April 19; Chirnside, April 23, Aug. 12.

Outer Hebrides.—Barra Head, May 15.

Argyll and Isles.—Skerryvore, March 19, at Light, S.E.

Clyde.—Giffnock, April 9.

Earliest, March 19, Skerryvore; April 9, Giffnock. Latest, Oct. 9, N. Ronaldshay. Principal movements, Oct. 4.

ERITHACUS RUBECULA (Redbreast).

Shetland.—N. Unst, Oct. 12; Bressay, Oct. 13; Dunrossness, Oct. 11.

Orkney.—N. Ronaldshay, Oct. 9. Pentland Skerries, Oct. 5, in rush with Linnets, Larks, and Blackbirds; N.E., light.

Principal movements, Oct. 5-13.

SYLVIA CINEREA (Whitethroat).

Orkney.—N. Ronaldshay, Oct. 4.

Dee.—Fyvie, April 28-Sept. 10.

Forth.—Kirkliston, April 24; Braids, April 25; Dalmeny, April 26.

Tweed.—Chirnside, April 29-Sept. 20; *S. curruca*, Hutton, June 10.

Outer Hebrides.—Barra, May 5.

Clyde.—Giffnock, April 23.

Earliest, April 23, Giffnock; latest, Sept. 20, Chirnside.

SYLVIA ATRICAPILLA (Blackcap).

Orkney.—N. Ronaldshay, Oct. 4, 9.

Forth.—Gosford, Midlothian, April 23.

Outer Hebrides.—Barra, Oct. 13; "the first seen here."

SYLVIA HORTENSIS (Garden Warbler).

Orkney.—N. Ronaldshay, one shot Oct. 4, another Oct. 5; "first observed here."

Argyll and Isles.—Skerryvore, May 11, in rush with Willow Wrens, etc.; one killed at Light, S.E., light.

REGULUS CRISTATUS (Golden-crested Wren).

Shetland.—Bressay, Oct. 14, at Light.

Orkney.—N. Ronaldshay, Oct. 4-11, a few seen.

Tay.—Bell Rock, Oct. 15, 16, with Starlings and Thrushes, S.W., haze.

Principal movements, Oct. 14-16.

PHYLLOSCOPUS COLLYBITA (Chiff-chaff).

Orkney.—N. Ronaldshay, Oct. 16, 23.

Tweed.—White Hall, Berwickshire, April 5.

Clyde.—Dundonald, April 2; Ayr, April 3.

Earliest, April 2; latest, Oct. 23.

(*To be continued.*)

ADDITIONS TO THE AUTHENTICATED COMITAL
CENSUS OF THE LAND AND FRESHWATER
MOLLUSCA OF SCOTLAND.

WM. DENISON ROEBUCK, F.L.S.

Hon. Secretary and Recorder to the Conchological Society of
Great Britain and Ireland.

I HAVE a considerable number of new records to report in continuation of my papers in previous numbers of the "Annals of Scottish Natural History," of which the last instalment appeared in the number for July 1893. I am

again indebted to my friends and former contributors Mrs. Janet Carphin of Edinburgh, Mr. William Evans, F.R.S.E., of the same city, and Mr. Lionel W. Hinxman of the Geological Survey of Scotland, for renewed help and constant vigilance, and have received assistance also from my old helpers Mr. Thomas Scott, F.L.S., of the Scottish Fishery Board; the Rev. John M'Murtrie, D.D., and the Rev. William Turner, both of Edinburgh; and from new helpers in the persons of Mr. Andrew M'Lellan and Mr. Robert Kidston, F.R.S.E., F.G.S., both of Stirling. The paragraphs are numbered in continuation of my last paper.

28. NEW RECORDS FOR ROXBURGHSHIRE.—In September 1893 Mrs. Carphin sent me a number of shells collected in the county of Roxburgh (16 species), all of which, with one exception, were “new records” for the county in the strictly limited sense in which that expression is used in these papers. From Faldonside Loch were collected *Valvata piscinalis* (a few), *V. cristata* (a few), *Pisidium milium* = *roseum* (one), *P. pusillum* (a few), *Physa fontinalis* (a few), *Planorbis albus* (several), *Pl. contortus* (a few), *Pl. fontanus* = *nitidus* Jeff. (two, small), *Limnæa palustris* (two, small), *L. auricularia* var. *acuta* (two, young), and *L. peregra* var. *lacustris* (two); the last-named being the one species sent which is not new for the county. From Faldonside came *Carychium minimum* (numerous examples) and *Hyalinia nitida* (several), and from Elwand, near Melrose, were sent *Helix pygmaea*, *H. ulucata*, and *Buliminus obscurus* (two of each). This consignment brings up the total list of authentications for the county to 41 species as against 26 in my original paper.

29. NEW RECORDS FOR SELKIRKSHIRE.—A consignment of shells collected by Mrs. Carphin at Clovenfords, in the county of Selkirk, brings up the total for that area to 37 species, the additional ones being *Hyalinia nitidula* (several), *H. nitida* (a few), *H. pura* var. *margaritacea* (one), *Succinea elegans* (two), *Pupa cylindracea* (a few), *Planorbis contortus* (a few), *Limnæa palustris* (two, small), and *Pisidium fontinale* (in abundance). With them were sent a specimen of *Helix hispida* and several of its variety *albida*, the species being one that has already been placed on record.

30. NEW RECORDS FOR LINLITHGOWSHIRE.—To Mrs. Carphin we are indebted for three additions to the Linlithgowshire list, bringing its aggregate up to the, as yet, meagre total of 39. The shells sent are single examples of *Planorbis nautilæus* and *Helix pygmaea*, collected at Dalmeny, and a few *Vertigo edentula* from Craigiehall

Wood. It will be of interest to add that the species named in this and the two preceding paragraphs have been, by the kindness of Mrs. Carphin, added to the collections of the Conchological Society.

31. FURTHER ADDITIONS TO THE BANFFSHIRE LIST.—We are indebted to Mr. Lionel W. Hinxman for a few shells collected during June and July of 1893 at Inchrory, Glenavon, Banffshire, at an altitude of from 1400 to 1600 feet above sea-level. They were **Limnæa auricularia* var. *acuta* and *L. peregra* (a few), *L. truncatula* (one, dead), **Ancylus fluviatilis* (two) and var. *albida* (two), a couple of *Bulimus obscurus*, and a couple of immature *Helix arbustorum*; the two species added to the list being marked with asterisks (*). With these additions, the Banffshire list now totals up to 37 authenticated species. These specimens, by Mr. Hinxman's kindness, have been added to the Conchological Society's collection. Mr. Hinxman mentions that he also obtained two detached valves of a young individual of *Sphærium*, but unfortunately lost them, and was never able to come upon the shell again, though he searched the locality carefully.

32. ADDITIONS TO THE STIRLINGSHIRE LIST.—I have recently had the pleasure of seeing the admirable work which Mr. Andrew M'Lellan has done in investigating the land and freshwater Mollusca of the county of Stirling, which he has worked at very systematically during the past three years. The species submitted by him to the Conchological Society's referees include the following, which are additional authentications for the county: *Succinea elegans*, *Hyalinia alliaria*, *H. pura*, *H. radiatula*, *H. fulva*, *Helix aculeata*, *H. aspersa*, *H. pulchella*, *Buliminus obscurus*, *Vertigo pygmaea*, *Carychium minimum*, *Bythinia tentaculata*, *Planorbis parvus*, *Bullinus hypnorum*, *P. fontinalis*, *Limnæa palustris*, *Unio margaritifera*, *Anodonta cygnea*, and *Dreissenia polymorpha*, bringing the Stirlingshire total of authentications up to 56. I omit mention of the already authenticated species which Mr. M'Lellan's collection contains; and I also refrain from particularising the localities of the species here recorded as new, in the hope that it may not be long before Mr. M'Lellan himself publishes a full and detailed account of the Stirlingshire Mollusca in one of our natural history periodicals.

33. SUCCINEA OBLONGA AND MONST. SINISTRORSUM IN SOUTH PERTHSHIRE.—Along with his Stirlingshire shells, Mr. M'Lellan submitted for examination some examples of this interesting species, one being sinistral, collected by a friend of his in the vice-county of South Perth with Clackmannan.

34. EDINBURGHSHIRE SHELLS.—Although none of them are actually new for the county, it may be of interest to note the occurrence of *Helix granulata* = *sericea* Jeff. (Roslin Glen, July 1893),

H. fusca (Dryden Glen, near Roslin, July 1893), *H. arbustorum* (immature, Roslin, July 1893), *Clausilia perversa* var. *dubia* (Bonaly Glen, March 1893), and *Balea perversa* (same locality and date), all sent by Mr. William Evans, F.R.S.E.

35. *HYALINIA RADIATULA* ADDED TO THE HADDINGTONSHIRE LIST.—From Mr. Evans we have received a box full of shells collected on Luffness Links, East Lothian, 6th October 1893, including numerous examples of *Bullinus hypnorum*, one of *Limnæa truncatula*, and a few each of *Pisidium pusillum* and *Hyalinia radiatula*, the last-named giving us a new county record.

36. *PLANORBIS SPIORBIS* ADDED TO THE LINLITHGOWSHIRE LIST.—Mr. Evans has submitted a few specimens of this species from Drumshoreland, West Lothian, where he collected them on 13th September 1893. This is a good addition to the authenticated list for the county.

37. *ADDITIONS TO THE SOUTH PERTHSHIRE AND CLACKMANNANSHIRE LIST*.—About the end of December 1893 Mr. William Evans collected a few shells in the vicinity of Bridge of Allan: a place which, although politically in Stirlingshire, is regarded for our purpose as in South Perthshire. These include three species new for the area, viz. *Helix aculeata* (one), *H. arbustorum* (one, immature), and *H. hispida* (a couple); as well as single examples of *Hyalinia fulva*, *Helix rotundata*, *Vertigo edentula*, and *Clausilia perversa*. The three additions, along with the *Succinea* recorded in my 33rd paragraph, bring up the South Perth list to 46 species.

38. *THREE ADDITIONS TO THE FIFESHIRE LIST*.—In April 1893 Mr. Evans sent me *Arion minimus* and *Buliminus obscurus* from Aberdour, both additional records for the "kingdom of Fife." The third addition is *Planorbis parvus* from Kilconquhar Loch, where it was collected by Mr. Evans on the 6th and 7th of September 1893, in company with a few examples each of *Pl. fontanus*, *Pl. contortus*, *Limnæa peregra*, *L. palustris*, *L. truncatula*, *Valvata cristata*, *Pisidium milium*, *Sphaerium corneum*, *Succinea putris*, *Cochlicopa lubrica*, *Carychium minimum*, and *Hyalinia fulva*. A few good-sized *Succinea putris* were also sent me, collected at Keilsden, near Largo, on the 30th of August; and some examples of very stunted forms of *Pupa cylindræa* and *Clausilia perversa*, collected on the Isle of May during the same month, were of remarkable interest. The Fifeshire list now amounts to 69 species.

39. *HELIX HORTENSIS* ON SPEYSIDE.—Although this species is not a new record for Easternness, it is nevertheless so rarely found far up the Highland valleys as to make it of considerable interest to record that, on the 12th of June 1893, Mr. Evans found it in plenty near the Doune, Rothiemurchus, and a large *Limax cinereo-*

niger from the same place at the same time. He sent me the latter, and a couple of examples of the *Helix*.

40. WATER-SHELLS IN LOCH TAY.—I am indebted to Mr. Thomas Scott, F.L.S., for a gathering of shells from the east end of Loch Tay, collected on the 11th of September 1893. It includes *Valvata piscinalis*, *Pisidium pusillum* and var. *obtusale*, which constitute new records for the vice-county of Mid-Perth, as well as *P. milium* = *roseum*, *P. fontinale*, and *Limnæa peregra*, which have already been placed on record for that division. The specimens sent are fairly numerous, and, by Mr. Scott's kindness, they have passed into the cabinet of the Conchological Society. The Mid-Perth list now amounts to 46 species, as authenticated by specimens seen by the Society's referees, and doubtless there are many more to add as the results of the labours of the active conchologists of the city of Perth, should we be able to enlist their assistance.

41. NEW RECORDS FOR PEEBLESSHIRE.—To the Rev. William Turner of Edinburgh, the Conchological Society is indebted for examples added to its collection, of seven species collected at West Linton,—a Peeblesshire village at the foot of the Pentland Hills, and lying about 800 feet above sea-level,—four of which are new authentications for the county, and are marked with an asterisk (*). *Helix fusca* was found sparingly among damp herbage beside the Lyne, a stream running through the village, and it has also been found at Leadburn, a few miles towards the east. In an old quarry occurred **Sphærium lacustre* plentifully, and **Pisidium milium* sparingly. **Helix arbustorum*, of which immature examples were sent, was scarce. On an adjoining slope to West Linton, and about 200 feet higher than it, were found several specimens of *Vertigo edentula* and **V. substriata*, and *Pupa cylindracea* commonly. Several other species were collected by Mr. Turner, which were not sent, otherwise there would have been four other new records to add to those mentioned above. The Peeblesshire list now amounts to 40 species.

42. EIGG SHELLS: NEW RECORDS FOR THE VICE-COUNTY EBUDES NORTH.—The Conchological Society's cabinet is indebted to the Rev. John M'Murtrie, D.D., of Edinburgh, for full sets of the land and freshwater mollusca of the island of Eigg. These form the subject of two papers in which fully detailed information is given as to their habitats and distribution. The first paper on "Eigg Shells" was published in the "Journal of Conchology" for October 1892, pp. 113-119, and the second in the same journal for April 1893, pp. 189-191. It will be unnecessary here to do more than give the list of species recorded (omitting the varieties), marking those which are new authentications for the vice-county with the usual asterisk. The "Eigg Shells" then are **Arion ater*, **A.*

subfuscus, *A. hortensis*, *A. circumscriptus*, *A. minimus*, *Agriolimax agrestis*, **Limax marginatus* (= *arborum*), **Vitrina pellucida*, **Hyalinia cellaria*, **H. alliaria*, *H. nitidula*, **H. pura*, **H. radiatula*, **H. crystallina* **H. fulva*, **Helix aspersa*, **H. nemoralis*, **H. hortensis*, **H. arbustorum*, **H. granulata* (= *sericea*, Jeff.), **H. itala* (= *ericetorum*), *H. rotundata*, **H. pygmaea*, *H. pulchella*, *H. acuta* (= *Bulimus acutus*) **Pupa anglica* (= *ringens*), **P. cylindracea* (= *umbilicata*), **Vertigo substriata*, **V. edentula*, **Clausilia perversa* (= *rugosa*), **Cochlicopa lubrica*, **Carychium minimum*, *Limnaea peregra*, *L. truncatula*, *Ancylus fluviatilis*, **Pisidium fontinale*, and **P. pusillum*,—38 species in all for the little island, of which no less than 26 are new authentications for the vice-county of Ebudes North, the total recorded molluscan fauna of which does not amount to more than the 38 given for Eigg.

RECORDS OF SCOTTISH PLANTS FOR 1893, ADDITIONAL TO WATSON'S "TOPO- GRAPHICAL BOTANY," 2nd Ed.

By ARTHUR BENNETT, F.L.S.

ABOUT 160 additions are here given, and from this diminished number it looks as though the commoner species are being pretty well filled in, and a rapid glance through "Top. Botany" seems to confirm this. From species whose census is between 90 and 112 there are few actually wanting where the situation of the counties affords any likelihood of their occurring. Much doubt still remains as to the nativity of many species that reach Scotland; and it seems a pity that the claims of some of these cannot be satisfactorily estimated. To determine these seems especially work that should be taken up by county residents; but as long as the aim is only "to swell the county list," it is useless to expect fair evidence *against* the nativity. In England I find botanists much more willing to be satisfied with the nativity of some species than I should be, after seeing them *in situ*.

The abbreviations, etc., are the same as in former records, viz. "Ann. S. N. H." = "Annals of Scottish Natural History," "J. B." = "Journal of Botany"; *sp.* denotes that a

specimen was sent to me, and ! denotes that I have seen a specimen from the county.

72. DUMFRIES.

Papaver Argemone, *Miss Adams* in "Trans. Dumfr. and Gall. N. H. Soc.," 1892.

Medicago lupulina, *J. T. Johnstone, l.c.*

Salix Smithiana, *J. T. J., l.c.*

†Euphorbia amygdaloides, *Miss Adams, l.c.*

Silene noctiflora, *Miss Hannay ! ex Scott-Elliot.*

Campanula Trachelium, *Miss Hannay, ex Scott-Elliot.*

Carex elongata, *T. Brown, ex Scott-Elliot.*

[Cladium Mariscus, "Loch Kander," *Scott-Elliot, l.c.*, but this loch is in Co. 73.]

Hieracium rubicundum, *Hanb., L. Watt, "Trans. Glas. N. H. Soc.," 1893.*

Hieracium clovense, *E. F. Linton, Linton, in "J. B.," 1893, p. 147.*

Hieracium callistophyllum, *Hanb., Linton, l.c.*

Hieracium langwellense, *Hanb., Linton, l.c.*

Hieracium nitidum, *Linton, l.c.*

Hieracium Sommerfeltii, *Lindeb., Linton, l.c., p. 177.*

Hieracium duriceps, *Hanb., Linton, l.c., p. 180.*

Hieracium euprepes, *Hanb., Linton, l.c., p. 181.*

Hieracium stenolepis, *W. R. Linton, Linton, l.c.*

Hieracium angustatum, *Lindeb., Linton, l.c., p. 182.*

73. KIRKCUDBRIGHT.

Utricularia neglecta, *Dumfries herb. !*

74. WIGTOWN.

Recorded by *Rev. G. Wilson* in "Trans. Dumfr. and Gall. N. H. Soc.," 1892.

Brassica oleracea.

Lepidium campestre.

Dianthus deltoides.

Prunus Padus.

Anagallis cærulea.

[Eriophorum gracile (?), doubtless of Smith, *i.e.* the small form of *angustifolium*.]

[Euphorbia Peplis, doubtless an error for Peplus, as the former is one of the most unlikely British species to occur in the county.]

Sedum Rhodiola, *Arnott, 1848, confirmed by Mr. J. M'Andrew.*

Campanula latifolia, *J. M'A.*

Geranium sylvaticum, *J. M'A.*

Polygonum Bistorta, *J. M'A.*

Potamogeton pectinatus (genuinus), *J. M'A.*

Catabrosa aquatica, *J. M'A.*

Avena pratensis, *J. M'A.*

Dipsacus sylvestris, *Miss Hannay, ex Scott-Elliot.*

Allium Scorodoprasum, *Miss Hannay, ex Scott-Elliot.*

75. AYR.

Sonchus asper, "1872," in *Boswell-Syme herb. !*

76. RENFREW.

Carex limosa (*seg.*), *T. B. Wilkie, sp., 1893.*

77. LANARK.

Pyrola rotundifolia, *C. C. Babington, "1840," in Herb. Brit. Museum.*

79. SELKIRK.

Hieracium buglossoides, *Arvet-Touv., Linton, "J. B.," 1893, p. 148.*

80. ROXBURGH.

[From report for 1892 delete *Utricularia neglecta.*]

86. STIRLING.

Erythræa Centaurium, "1836," *Boswell-Syme herb. !*

88. MID-PERTH.

Rosa resinoides, *Crépin, Druce, in "Ann. S. N. H.," 1893, p. 250.*

Hieracium buglossoides, *Arvet-Touv., Linton, "J. B.," 1893, p. 148.*

Hieracium bifidum, *Kit.*

Hieracium Boswelli, *Linton.*

Hieracium submurorum, *Lindeb.*

} *Linton, "J. B.," 1893, pp. 177-*
179.

89. EAST PERTH.

[In report for 1892 *Aquilegia vulgaris* should be marked with † as an introduction.]

Hieracium cæσιο-murorum, *Lindeb., Linton, "J. B.," 1893, p. 80.*

90. FORFAR.

(All recorded by *Mr. Linton, "J. B.," 1893.*)

Hieracium submurorum, *Lindeb.*

Hieracium clovense, *E. F. Linton, p. 146.*

Hieracium callistophyllum, *Hanb., p. 148.*

Hieracium oreades, *Fr., p. 149.*

Hieracium Sommerfeltii, Lindeb., p. 178.

Hieracium scoticum, Hanb., p. 200.

Hieracium farrense, Hanb., p. 197.

91. KINCARDINE.

Pyrola rotundifolia, *Boswell-(Syme)* herb. !

92. ABERDEEN, SOUTH.

(All recorded by *Mr. Linton*, "J. B.," 1893.)

Hieracium graniticolum, Linton, p. 145.

Hieracium Marshalli, Linton, p. 146.

Hieracium bifidum, Kit., p. 177.

Hieracium rubicundum, Hanb., p. 178.

Hieracium eustales, E. F. Linton, p. 196.

Hieracium farrense, Hanb., p. 197.

Hieracium reticulatum, Lindeb., p. 201.

94. BANFF.

(All recorded by *G. Druce*, F.L.S., in "Ann. S. N. H." 1893,
pp. 122-123.)

Arabis petraea.

Sedum rhodiola.

Cerastium arcticum, Lange.

Athyrium flexile.

95. ELGIN.

Hieracium Schmidtii, Tausch, *Druce, l.c.*

96. EASTERNESS.

[*Arctium nemorosum*, in report for 1892, is probably
A. intermedium.]

Ranunculus petiolaris, Marshall, *Macvicar*, Nov. 1892.

Sonchus asper, *Marshall*, "J. B.," p. 32.

Sambucus Ebulus, *Somerville, sp.*

Hieracium tridentatum, *Druce*, "Ann. S. N. H.," 1893, p. 121.

97. WESTERNESS.

[In report of 1892, after *Ranunculus petiolaris*, Marshall, add name
of the collector, S. M. Macvicar.]

(All collected by *Mr. Macvicar*. The species of *Rubus* were
determined by *Rev. Mr. Moyle Rogers*.)

Rubus carpinifolius, W. and M.

Rubus dumnoniensis, Bab.

Rubus pulcherrima, Newm.

Potamogeton pusillus, sp.

Rubus villicaulis, Kœhl.

Scirpus fluitans, sp.

Rubus rosaceus, var. W. and N.

Agropyrum junceum, sp.

98. ARGYLE.

[From report of 1892 delete *Hieracium angustatum*.]
 (All recorded by *E. S. Marshall*, save where otherwise recorded.)

Ranunculus heterophyllus, Bab., *Macvicar*, *sp.*

¹ *Thalictrum collinum*, Wallr. *sp.*

Cochlearia officinalis, at 2800 feet above sea-level.

(These are very interesting examples, as they are clearly
 typical *officinalis*, not *alpina*.)

Draba rupestris (confirmed), *Marshall*.

Viola canina, *sp.*

Cerastium arcticum, Lange.

Rubus plicatus, forma, *Moyle Rogers*.

Rubus "mucronatus."

Utricularia intermedia, *sp.*

Salix fragilis, *sp.*

Salix nigricans, *sp.*

Eriophorum latifolium, *sp.*

Glyceria plicata, *sp.*

Poa glauca, *sp.*

Poa Balfourii, *sp.*

Woodsia hyperborea, *sp.*

Utricularia neglecta, *sp.*

Hieracium crocatum, *L. Watt, l.c.*

99. DUMBARTON.

Hieracium angustatum, Lindeb., *L. Watt, l.c.*

Hieracium rubicundum, Hanb., *L. Watt, l.c.*

Hieracium buglossoides, Arvet-Touv. } *Linton, "J. B.," 1893,*
Hieracium stenolepis, W. R. Linton } pp. 148, 181.

103. EBUDES, MID.

Potamogeton nitens, *Macvicar, sp.*

104. EBUDES, NORTH.

(All, except those otherwise recorded, were found in Eigg
 by *Mr. Macvicar*.)

Prunus spinosa, *sp.*

Hieracium stenolepis, Lindeb., *Linton, 1893, "J. B.," p. 177.*

Hieracium Boswelli, Linton, *Linton, l.c., p. 179.*

Hieracium strictum, Linton, *l.c., p. 200.*

Carlina vulgaris, *sp.*

Eryngium maritimum, *sp.*

Erythræa Centaurium, *sp.*

¹ = *T. flexuosum*, Bernh. = *T. minus montanum*, Syme.

Thymus Chamædrydrys, *sp.*
 Salsola Kali, *sp.*
 Atriplex arenaria, *sp.*
 Polygonum amphibium, *sp.*
 Festuca elatior, *sp.*
 Psamma arenaria, *sp.*
 Elymus arenarius, *sp.* (perhaps introduced).

105. ROSS, WEST.

(All recorded by *G. C. Druce*, F.L.S.)

Hieracium prenanthoides.	Ruppia rostellata.
Potamogeton heterophyllus.	Carex extensa.
Spergularia neglecta.	Festuca sylvatica.
Geranium dissectum.	Bromus asper.
Epilobium parviflorum.	Equisetum maximum.
Galium erectum.	Elymus arenarius.
Utricularia neglecta.	

106. ROSS, EAST.

(Recorded by *Rev. E. S. Marshall*, "J. B.," 1893, p. 230.)

Rubus Gelerti.	Carex vesicaria.
Rumex (sanguineus) viridis.	

107. SUTHERLAND, EAST.

Cerastium semidecandrum, Grant, *sp.*
 Hieracium angustatum, Lindeb., *Linton*, "J. B.," 1893, p. 181.
 Lycopodium annotinum, *W. A. Stables*, "Phytologist," 1843,
 vol. i. p. 147.

108. SUTHERLAND, WEST.

Hieracium stenolepis, *W. R. Linton*, "J. B.," 1893, p. 181.
 Hieracium reticulatum, Lindeb., *Linton*, *l.c.*
 Hieracium oreades, Fr., *Linton*, *l.c.*
 Hieracium Boswelli, *Linton*, *Linton*, *l.c.*

109. CAITHNESS.

Hieracium Friesii, *Linton*, "J. B.," 1893, p. 99.
 Hieracium Boswelli, *Linton*, *Linton*, *l.c.*, p. 177.
 Hieracium rubicundum, Hanb., *Linton*, *l.c.*, p. 178.

110. HEBRIDES.

Hieracium cerinthiforme, Backh., *Linton*, *l.c.*
 Hieracium sparsifolium, Lindeb., *Linton*, *l.c.*
 Juniperus intermedia, Schur., *Duncan*, *sp.*

111. ORKNEY.

Hieracium caledonicum, Hanb., *Linton*, "J. B.," 1893, p. 178.

Hieracium rubicundum, Hanb., *Linton, l.c.*

Hieracium orcadense, W. R. Linton, *Linton, l.c.*, p. 196.

112. SHETLAND.

Veronica polita, *Beeby, m.s.*, 1893.

ALTITUDES REACHED BY CERTAIN PLANTS IN MID-PERTH.

By SYMERS M. MACVICAR.

THE following altitudes were taken during the last three years; and are all from localities within ten miles of Killin. The numbers opposite each name denote *upper* limits in feet above sea-level observed, unless otherwise specified. Mr. Arthur Bennett has kindly compared those here given with Watson's altitudes, and has added some notes in brackets. In the third column are given the altitudes recorded in Hooker's "Student's Flora," ed. 3.

	Feet.		Feet.
Ranunculus Flammula	2900		2700
Cardamine hirsuta	3400 }		3000
Cardamine flexuosa	3200 }		
Draba incana from 2000 to 3500			above 3000
Sisymbrium Thaliana	2100	in Yorkshire	1500
Viola lutea, <i>var.</i> <i>amœna</i>	3550		2800
Lychnis diurna ¹	2600		
Arenaria sedoides, from 2300 to 3970		from 2500 to	3000
Sagina Linnæi from 2100 to 3500			2700
Geranium sylvaticum	2900		2700
Anthyllis Vulneraria ²	2600		2400
Potentilla maculata, from 1800 to 3400			2700
Saxifraga aizoides	3500		3000
Sedum villosum from 3000 to 3200		in Yorkshire	2000

¹ [Over 3000 feet, SS, Miller.]

² [2700 feet, Marshall.]

	Feet.		Feet.
<i>Epilobium alsinefolium</i> ¹	3000	.	2900
„ <i>anagallidifolium</i>	3900	.	E. alpinum to near 4000
<i>Galium boreale</i>	3400	.	2800
<i>Erigeron alpinus</i> , from 2400 to	3400	.	3000
<i>Menyanthes trifoliata</i>	1880	.	in the Lake District 1800
<i>Myosotis alpestris</i> , ² from 2600 to	3700	.	nearly 4000
<i>Veronica saxatilis</i> , from 1900 to	3400	.	from 1600 to 3000
<i>Salix spuria</i> , <i>Willd.</i> (Lap-			
„ <i>ponum</i> × <i>arbuscula</i>)	2900		
„ <i>arbuscula</i>	2600	.	2400
„ <i>reticulata</i> , from 2300 to	3500	.	from 2000 to 3200
<i>Orchis mascula</i> ³	2600	.	in the Lake District 1500
<i>Tofieldia palustris</i>	2800	.	2400
<i>Juncus triglumis</i> ⁴ from 900 to	3200	.	3000
<i>Triglochin palustre</i>	2800	.	2000
<i>Carex dioica</i>	3200	.	2900
„ <i>echinata</i> ⁵	3250	.	3000
„ <i>Goodenowii</i>	3250	.	3000
„ <i>glauca</i> <i>var.</i> <i>stictocarpa</i>	2100	.	type, in Yorkshire 2000
„ <i>flava</i>	3100	.	2900
„ <i>pulla</i>	3550	.	3300
<i>Sesleria cœrulea</i> , ⁶ from 2000 to	2600	.	2500
<i>Briza media</i> ⁷	1300	.	in Yorkshire 2100
<i>Poa annua</i> <i>var.</i> <i>supina</i>	3500	.	type, 3200
„ <i>pratensis</i> <i>var.</i> <i>subcœrulea</i> ⁸	2900	.	type, in Yorkshire 2400
<i>Festuca rubra</i> , <i>L. form.</i>	3500		
<i>Lomaria Spicant</i> ⁹	3100	.	2000
<i>Polystichum Lonchitis</i>			
from 1650 to	3400	.	3200
<i>Phegopteris Dryopteris</i>	2800	.	2700
<i>Botrychium Lunaria</i>	2800	.	2700
<i>Equisetum arvense</i> , <i>var.</i>			
„ <i>alpestre</i>	3100	.	type, in N. England 2000
„ <i>pratense</i>	3100	.	type, in N. England 1200
„ <i>palustre</i> <i>var.</i> <i>alpinum</i>	2900	.	type, 2500
<i>Lycopodium Selago</i>	3950	.	3500

The following species are found in this district down to the elevations noted :—

¹ [Watson's actual height for this is 2880 feet.]

² [3900 feet, Watson.] ³ [2900 feet in Caenloch Glen, Marshall.]

⁴ [3300 feet on Ben Lawers, Druce, "Journ. Bot.," 1890, p. 44.]

⁵ [2970 feet actual, Watson.] ⁶ [2800 feet on Ben Lawers, Druce.]

⁷ [1890 feet in Highlands, Watson.] ⁸ [2250 feet in Highlands, Watson.]

⁹ [3900 feet, Watson, in Comp. "C. Brit."]

	Feet.	Feet.
Draba rupestris, on Ben Lawers	3400,	and elsewhere in the district to 3100 and 2600
Cochlearia alpina, <i>Wats.</i> descends to.	. . . 1900	
Alchemilla alpina 1600	
Saxifraga nivalis 1900	
„ stellaris 1600	
Gnaphalium supinum 1600	
Armeria maritima 2450	
„ „ <i>var.</i> planifolia, <i>Syme</i> 2250	on Craig Lochan, Larig, 2400
Poa alpina descends to 2100	

I have not mentioned the Ben Lawers varieties which have a very limited range of altitude, as it would only hasten their extermination; nor have I given any altitude of plants growing by the side of streams, as it is impossible to know how far they have been carried out of their natural habitats. When *Cerastium alpinum* and *Arenaria sedoides* are seen to occur at about 800 feet, and not again below 2000 feet, as is the case in one stream in the district, there need be no doubt; but it is different with such plants as *Alchemilla alpina* and *Oxyria digyna*, which follow the course of a stream to near its termination. The former I have not seen on the hillsides in Mid-Perth below 1600 feet; and it is usually first met with between 1600 feet and 1800 feet. My lowest note for the *Oxyria* is 2000 feet, but this may be too high.

In taking altitudes it is quite necessary to have an Ordnance Survey sheet of the district, to give not only the height of the starting-point, but also that of a few easily recognisable places on the hill by which the aneroid can be compared, otherwise a mistake of one or two hundred feet can readily be made in a day's work.

[NOTE.—In connection with the above paper reference may be made to one by Dr. Buchanan White on “The Altitudes attained by certain Plants,” published in the “Scottish Naturalist” (vol. i. pp. 119-123) in October 1871. In this are given the altitudes of the alpine plants of the Braemar highlands, and of Caenlochan in Forfarshire, where such altitudes differed from the records in the “Com-

pendium" to the "Cybele Britannica." The following may be quoted here:—

Lychmis diurna, at 3500 feet, on Lochnagar.

Geranium sylvaticum, at 3200 feet, on Lochnagar.

Salix arbuscula, at 2550 feet, on Little Craigendal.

Poa pratensis (typical), at 2900 feet, on Morven.

JAMES W. H. TRAIL.]

ON SCOTTISH DESMIDIEÆ.

By the late JOHN ROY, LL.D., and J. P. BISSET.

[Continued from page 105.]

85. *C. margaritatum* (Lundell), Roy and Bisset ("Jap. Desm.," 1886, p. 194 = *C. latum*, β *margaritatum*, Lundell).

Large; about one-third longer than broad; sides very slightly rounded, nearly straight, gradually curving upwards into the broadly rounded ends; constriction moderately deep, narrow, not opening widely outwards; semi-cells with the base slightly reniform, and not increasing in width upwards; densely covered with large granules, having a punctum in the centre of the space between every three granules; the granules are arranged in about thirteen perpendicular rows, of about eight in a row, and leaving a small space at the base smooth; semi-cells in side view nearly circular, and in end view oval. Length, 78 μ ; breadth, 58 μ ; isthmus, 27 μ . (Our Plate II. fig. 12.) This form seems sufficiently distinct to constitute a good species. The resemblance to *C. latum* is not striking. It is considerably smaller, and has larger granules, while the puncta between granules is a marked and invariable feature. Rare. Ross—pool near View Rock, Strathpeffer (Mrs. Farquharson; Aberdeen—Slewdrum in Birse, Aboyne, Cambus-o'-May, and Dalbagie near Ballater, Glen Clunie, one mile from Castleton.

86. *C. margaritiferum* (Turp.), Menegh.—General. With zygospores, in a small pool at the side of the Deeside turnpike road, about half-way between Banchory and Bridge of Potarch, and south of Birsemore.
87. *C. melanosporum*, Archer.—Small; length and breadth equal; semi-cells transversely oblong; constriction moderately deep, close, opening out widely into the rounded sides; ends broadly rounded; semi-cells from side view circular, from

end view oval. Surface smooth, not punctate. Isthmus about one-third of the breadth of the semi-cell. Zygosporc thick-walled, very dark brown, almost black; perfectly smooth and globular. Long., 15-17 μ ; lat., 15-17 μ ; crass., 7-8 μ ; isth., 5 μ ; dia. of zygosporc 23-25 μ . (*Our* Plate I. fig. 14.) Very generally distributed.

This simple-looking, but very distinct, species was detected by Mr. Archer, in Ireland, many years ago. It conjugates abundantly, sometimes in profusion, and may be readily recognised by the smooth, globular, very dark zygosporc.

88. *C. Meneghinii*, Breb.—Abundant. Most of the so-called varieties of this species occur abundantly. But surely the form to which De Bary affixes this name is a very different thing from that of De Brebisson as limited and figured by Ralfs; while again, both are quite different from the var. *β simplicimum* of Wille. It is much to be wished that the zygosporcs of all these forms could be found and published.

89. *C. microsphinctum*, Wittr. and Nord.—Very rare. Aberdeen—Ardtannes near Inverurie, Craigmennie near Aboyne, and Presswhin in Cromar.

Var. *majus*, n. var. Differs from the ordinary form in being double the size. Long., 80 μ ; lat., 52 μ ; isth., 35 μ . (*Our* Plate I. fig. 7.) Extremely rare. Aberdeen—Presswhin in Cromar, with the type.

Var. *parvula*, Wille.—Very rare. Fife—Kemback near St. Andrews (Mrs. Farquharson).

90. *C. moniliforme* (Turp.), Ralfs.—Not uncommon. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle. One form of this species has a distinct isthmus, connecting the semi-cells; its zygosporc (found in a small pool north of Loch Dawin, Aberdeen) is globular, smooth, and twice the size of a semi-cell.

Forma *elliptica*, Nord. ("Sydl. Norg. Desm.," 1873, p. 22), is probably the same as our species *C. Jacobsenii* (Jacobsen's "Desmid. du Danemark," p. 200, Tab. VIII. fig. 24, under the name of *C. moniliferum*).—Now, while granting this, we can scarcely admit that these are merely two forms of one species. While bearing a certain resemblance, each holds constantly to its special characteristics: the semi-cells of *moniliforme* are globular from all points of view, while those of *Jacobsenii* are transversely oval in front view, circular in side view, and oval in end view; besides, the

latter is larger. With such differences as these, we fail to see what is to be gained by making them *forms* of each other.

91. *C. monochondrum*, Nord.—Very rare. Inverness—Loch Ruthven (Mrs. Farquharson); Aberdeen—Dinnet, Birsemore Loch, south side of Birsemore.
92. *C. monomazum*, Lundell.
 β *polymazum*, Nord.—Very rare. Ross—near View Rock, Strathpeffer (Mrs. Farquharson).
93. *C. Nägelianum*, Breb.—Very rare. Aberdeen—Springhill near Aberdeen, pool near Loch Dawin; Kincardine—near Cowie.
94. *C. nasutum*, Nord.
 β *granulata*, Nord.—Very rare. Aberdeen—near the summit of Lochnagar, Corrie Etchachan (Ben Macdhui).
95. *C. nephroideum* (Wittr.), n. sp. (= *C. Portianum*, Archer.
 β *nephroideum* (Wittr.) (*Our* Plate II. fig. 3.)—Length, 25 μ ; breadth, 22 μ ; isthmus, 7 μ . Our Scotch examples are considerably smaller than those recorded by Messrs. Wittrock and Nordstedt. Very rare. Aberdeen—Glen Clunie near Braemar; Arran.
96. *C. nitidulum*, De Not.—Rare. Aberdeen—formerly near a well on Aberdeen Links, Heughhead near Aboyne, foot of Culblean (east side); Kincardine—N.W. side of Kerloch; Perth—Meal Odhar.
97. *C. norimbergense*, Reinsch.—Very rare. Aberdeen—Slewdrum; Forfar—in a marsh N.W. from Menmuir Church.
98. *C. notabile*, Breb.—Not common. Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle.
 Var. *minor*, Wille. Perth—Craiganlochan.
99. *C. Nymannianum*, Grun.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran.
100. *C. obliquum*, Nord.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran. The three forms are about equally common.
101. *C. ochthodes*, Nord.—Not common. Ross, Inverness, Aberdeen, Forfar, Perth, Stirling, Fife.
102. *C. odontopleurum*, Archer, in lit.—Small-sized; a little longer than broad; sides nearly straight, but widening out slightly and forming an obscure blunt tooth at each of the upper angles; ends semicircular; constriction moderately deep

and narrow; surface smooth; zygospore orbicular and smooth. Length, 22 μ ; breadth, 20 μ ; isthmus, 8 μ ; diameter of zygospore, 30 μ . (*Our* Plate II. fig. 13.)

This species was first found in Ireland, by Mr. Archer many years ago. Very rare. Aberdeen—Powlair (Birse), Heughhead (Aboyne), Homehead (Cromar).

103. *C. oligogongrus*, Reinsch.—Very rare. Kincardine—Glen Dye, above the Shooting Lodge.
104. *C. orbiculatum*, Ralfs.—Not common. Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle.
105. *C. ornatum*, Ralfs.—General.
106. *C. orthostichum*, Lundell.—Not uncommon in South Aberdeen and North Kincardine, but rare elsewhere. Forfar—in Glen Clova; Perth—at Buchanty; Argyle—near Kingshouse.
 β *pumilum*, Lundell.—Rare. Aberdeen—Slewdrum, Forest of Birse, Dawin, Dalbagie, Glen Clunie near Castleton; Kincardine—Kerloch and Bishop's Dam; Forfar—Glen Clova; Perth—Spital of Glen Shee; Argyle—near Kingshouse.
107. *C. ortogonum*, Delp.—Very rare. Stirling—Fintray Hills (Mr. Croall).
108. *C. ovale*, Ralfs.—Aberdeen—Khoil; Perth—Ben Lawers, Craig-an-Lochan.
109. *C. pachydermum*, Lundell.—Rare. Sutherland—near Loch Inver; Ross—Falls of Rogie; Aberdeen—Slewdrum, Birsemore, and Heughhead near Aboyne, Dalbagie, Lochnagar; Kincardine—Cammie and Glen Dye; Stirling—Fintray (Mr. Croall); Argyle—near Kingshouse, and in Mull.
 β *minus*, Nordst.—Rare. Ross—Poolewe; Inverness—near Brin (Mrs. Farquharson); Aberdeen—Gight, at the Break Neck Fall (Glen Callater); Forfar—Canlochan; Perth—Rannoch (Dr. F. B. White); Stirling—Alva Glen (Mr. Croall).
110. *C. Palangula*, Breb.—Rather rare. Ross—Poolewe; Inverness—near Brin (Mrs. Farquharson), in Skye near Loch Coruisk; Aberdeen and Kincardine—not uncommon; Forfar—Lundie Bog and Glen Dole; Perth—Methven Moss, Birnam, Rannoch; Dumbarton—between Lochs Long and Lomond; Argyle—near Kingshouse and Oban.
111. *C. parvulum*, Breb.—Rather rare. Sutherland—Loch Inver; Ross; Inverness—Brin and Skye; Aberdeen—Slewdrum;

Kincardine—Cammie, Muiryhaugh, Dalbrake, Glen Dye; Argyle—near Kingshouse and Ben Laoigh; Fife.

112. *C. perforatum*, Lundell. — Very rare. Inverness — Loch Ruthven (Mrs. Farquharson); Aberdeen — Dalbagie and Loch Ullachie near Ballater, Birsemore, near Castleton (Braemar).

113. *C. Phaseolus*, Breb. — Pretty common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran, Fife, Kirkcudbright.

β elevatum, Nordst. — Rare. Aberdeen—near Ballater, in Glen Muick; Kincardine — Glen Dye; Perth—Rannóch.

γ achondrum, Boldt. — Very rare. Inverness—near Loch Coruisk in Skye.

114. *C. plicatum*, Reinsch. — Rare. Ross; Inverness—Brin (Mrs. Farquharson); Aberdeen — Brimmond, Dalbagie; Kincardine—Pitreddie and Curran (Strachan); Perth—Methven Bog.

Var. *majus*, Reinsch. (?) — Length, 87-92 μ ; breadth, 48-50 μ ; isthmus, 22 μ . (*Our* Plate II. fig. 1.) Very rare. Aberdeen—Powlair, Birse; Kincardine — Scolty near Banchory.

Var. *Scoticum*, n. var. — Sides hollowed; ends straight or slightly drawn out; cell walls very thick and closely punctate. Length, 57-67 μ ; breadth, 38-40 μ ; isthmus, 22-25 μ . (*Our* Plate II. fig. 2.) Exceedingly rare — a rupestral species. Aberdeen—The Vat, Presswhin (Cromar).

115. *C. polygonum*, Näg. (*Euastrum*, Näg.) — Not common. Sutherland, Ross, Aberdeen, Kincardine, Forfar, Argyle, Fife.

116. *C. Portianum*, Archer. — General. With zygospores at Brimmond, Aberdeen, agreeing with D. Bary's fig. "Conjugatæ." Taf. VI. fig. 50, given under *C. orbiculatum*, Ralfs.

117. *C. prae grande*, Lund. — Exceedingly rare. Perth—Spital of Glen Shee.

118. *C. præmorsum*, Breb. — This species, if we understand it aright, must be extremely rare. It occurred in a gathering made near Tillypronie, Aberdeen, a good many years ago. Perth—Glen Shee; Argyle—Ben Laoigh.

Mr. Archer, whose judgment in such a matter is entitled to the greatest respect, supposed that probably this species might be the same as that given by Ralfs, "Brit. Desmid.," Plate XXXIII. fig. 6, under *C. margaritifera*. But this

view can hardly be accepted; for, in the first place, Brebisson founded, or at least published, this species several years after Ralfs' work was issued, and therefore must have known well what forms Ralfs included under *C. margaritifera*; and secondly, *C. præmorsum* is described as having the ends emarginate, which Ralfs' form has not. Indeed, *C. præmorsum* is more nearly related to *C. Botrytis* than to *C. margaritifera*, or rather the form in question so named by Ralfs, which is really a very different thing from *C. margaritifera* proper.

119. *C. prominulum*, Racib.—Very rare. Ross—Poolewe; Inverness—Brin.
120. *C. protractum* (Näg.), Archer.—Extremely rare. Aberdeen—Tableland above the head of Glen Callater.
121. *C. protuberans*, Lundell.—Very rare. Aberdeen—Bottomend near Aboyne.
122. *C. pseudobirenum*, Boldt.—Very rare. Aberdeen—foot of Birsemore, near Aboyne.
123. *C. pseudoconnatum*, Nordst.—Rare. Aberdeen—Tomachar and Dawin in Cromar, Dalbagie near Ballater; Kirkcudbright—New Galloway.
- 124.—*C. pseudonitidulum*, Nordst.—Not common. Orkney, Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran.
125. *C. pseudoprotuberans*, Kirch.—Very rare. Inverness—Loch Ruthven and Clachan (Mrs. Farquharson).
Var. *alpinum*, Racib.—Very rare. Aberdeen—small pool north side of Loch Dawin, Cromar.
126. *C. pseudopyramidatum*, Lundell.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Dumbarton, Argyle, Arran.
Sub. sp. *stenonotum*, Nord and Wittr.—Ross—Poolewe; in many places in Aberdeen and Kincardine; Argyle—Ben Laoigh; not observed elsewhere.
127. *C. pulcherrimum*, Nordst.—Very rare. Forfar—in Canlochan.
128. *C. punctulatum*, Breb.—Very rare. Aberdeen—near Dinnet, and pool west side of Loch Dawin; Fife—near St. Andrews; Perth—in Glen Garry, near Dalnacardoch. Length, 26-29 μ ; breadth at base of semi-cell 27.2 μ ; do. end, 16 μ ; isthmus, 9.6 μ .
129. *C. pusillum* (Breb.), Archer.—Rare. Inverness—near Loch Coruisk, in Skye; Aberdeen—near Birse Church; Cairnton Moss, near Aboyne, Homehead in Cromar; Kincardine—

Scolty Dam, Cammie; Forfar—Glen Clova, Clova Tableland.

130. *C. pychnochondrum*, Nordst.—Very rare. Aberdeen—Mount Keen, Colonel's Bed (Braemar); Kincardine—Den of Garrol; Forfar—Clova Tableland.
131. *C. pygmæum*, Archer.—Widely diffused, but scarce. Sutherland, Ross, Inverness, Moray, Banff, Aberdeen, Kincardine, Forfar, Perth, Fife, Stirling, Dumbarton, Argyle, Arran. With zygospores, at Folotry, Perth.
132. *C. pyramidatum*, Breb.—General.
133. *C. quadratum*, Ralfs.—Not very common. Sutherland, Ross, Inverness, Banff, Aberdeen, Kincardine, Forfar, Perth, Argyle, Fife.
134. *C. quadrifarium*, Lundell.—Rare. Inverness—in Skye; Aberdeen—near Longside (Dr. Walker); Argyle—Glen Coe (Mr. Archer); Arran—Goat Fell and Glen Ranza.
135. *C. quadrum*, Lundell.—Very rare. Sutherland—Loch Inver; Aberdeen—Homehead, Pittellachie, and Tomachar in Cromar; Kincardine—near the source of the Bervie; Perth—Ben Lawers.
136. *C. Quasillus*, Lundell.—Very rare. Aberdeen—near Longside (Dr. Walker); Stirling—Alva Glen (Mr. Croall).
137. *C. quinarium*, Lundell.—Very rare. Aberdeen—near Dinnet Schoolhouse.
 Forma *irregularis*, Nordst.—Very rare. Inverness—Loch Ruthven (Mrs. Farquharson).
138. *C. Ralfsii*, Breb.—Not common. Sutherland—Loch Inver; Ross—Poolewe; Inverness—Ben Nevis, Brin, and in Skye; Aberdeen; Kincardine; Forfar—Fern and Clova; Perth—Durdie, Fowlis Wester, Rannoch, and Callander; Argyle—Glen Coe and Mull; Arran—Goat Fell, Glen Ranza, North Glen Ranza, and Glen Sannox.
139. *C. rectangulare*, Grunow (*C. Gotlandicum*, Wittr.)—Not common. Sutherland—Loch Inver; Ross—near Tain; Inverness—Loch Ruthven; Aberdeen—Slewdrum, Achnerran, Glen Callater; Kincardine—Cammie, Bishop's Dam, Clochnaben; Perth—Glen Shee; Argyle—Mull.
140. *C. rectangulum*, Reinsch.—Extremely rare. Aberdeen—south end of Scotston Moor—once only.
141. *C. Regnesi*, Reinsch.—Not common. Sutherland; Ross; Inverness; Banff; Aberdeen; Kincardine; Forfar—Canlochlan; Perth—Birnam Hill, Buchanty; Stirling—Fintray Hills; Argyle—Glen Coe and Mull.

142. *C. Reinschii*, Archer (*Cos. sp.* Reinsch., "Contrib. Alg. and Fung.," p. 83, Taf. XVIII. fig. 4).—Extremely rare. Perth—Folotry in Fowlis Wester.
143. *C. reniforme*, Archer (*Cos. margaritifera*, Turp., β *reniformis* Ralfs, "Brit. Desmid.," p. 100, Tab. XVI. fig. 2a).—General, but scarce.
The zygospore of this species, as pointed out by Mr. Archer long ago, is perfectly smooth and globular. It has not been observed in Scotland.
144. *C. retusum* (Perty), Rab.—Extremely rare. Aberdeen—Glen Clunie, Braemar; Birse.
145. *C. Schliephackeanum*, Grunow.
Forma *Spetsbergensis*, Nordst. (= *C. asphærosporum*, Nord., ined.)—Rare. Inverness—Brin (Mrs. Farquharson); Aberdeen—Alford, Dinnet (with zygospores), Morven; Kincardine—Kerloch (with zygospores), Muiryhaugh, Glen Dye; Forfar—Barrelwell near Brechin, Clova Tableland; Perth—Fowlis Wester; Stirling; Argyle—Glen Coe.
146. *C. sexangulare*, Lundell.—Somewhat rare. Caithness—Loch Hempriggs; Aberdeen—Scotston Moor, Brimmond, Slewdrum, Bottomend and Birsemore near Aboyne, Pittellachie in Cromar; Kincardine—Crathes, Loch Loirston, and Paldy Hill.
147. *C. Simii*, n. sp.
Fairly large sized, about one-sixth longer than broad; sides nearly straight, ends semicircular, constriction deep, and opening *very* widely; surface covered with pearly granules arranged in perpendicular and concentric rows. Length, 53-58 μ ; breadth, 45-50 μ ; isthmus, 20-22 μ . (*Our* Plate II. fig. 16.)
Named in honour of Mr. John Sim, a skilled Kincardineshire botanist.
Very rare. Aberdeen—Corrie Etchachan (Ben Macdhui).
148. *C. sinuosum*, Lundell.—Very rare. Ross—Poolewe; Aberdeen—Gight, Vat of Culblean, near top of Lochnagar; Kincardine—near Cammie; Argyle—near Oban, near Tobermory in Mull; Arran—Goat Fell and Glen Ranza.
 β *decedens*, Reinsch.—Extremely rare. Aberdeen—Vat of Culblean; Kincardine—Den of Garrol.
149. *C. Slewdrumense*, Roy ("Desmids of the Alford district," in "Scott. Nat.," January 1890, p. 204). (*Our* Plate II. fig. 19).—Not common. Caithness, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Fife.

150. *C. speciosum*, Lundell.
α biforme, Nordst.—Rare. Aberdeen—Den of Gight, Presswhin on Morven, Cambus-o'-May, Bogwattle in Cromar; Forfar—Recky Linn; Stirling—Alva Glen.
β simplex, Nordst.—Not common. Ross—Tain and Strome; Inverness—Glen Urquhart, Brin, Quirang in Skye; Banff—near Loch Builg; Aberdeen—Benna-Chie, Brimmond (near Old Mill), Birsemore, Heughhead near Aboyne, Koynach Moor, Presswhin, The Vat, Mount Keen; Kincardine—Slack of Birnie; Forfar—Recky Linn, Fern, Canlochan; Perth—Buchanty, Ben Lawers, north shore of Loch Tay, Bracklin near Callander; Stirling—Fintray Hills; Argyle—near Kyles of Butē.
151. *C. sphaerostichum*, Nordst.—Extremely rare. Inverness—Ben Nevis; Aberdeen—Morven (on wet rocks); Forfar—Canlochan.
152. *C. sportella*, Breb.—Not common. Ross—near Tain, Strome, and Strathpeffer; Inverness—Brin, Glen Urquhart, and near Portree in Skye; Aberdeen—Dens of Gight and Rothie, Cambus-o'-May, and Glen Callater; Kincardine—near Crathes, Den of Garrol, near Muchalls (with zygosporēs); Forfar—Canlochan; Perth—Durdie Moor; Stirling—Alva Glen; Arran—Corrie; Wigtown.
153. *C. striatum*, Boldt. (*C. erosum*, Archer's MSS.)—Not uncommon on Deeside, in Aberdeen, and Kincardine.
154. *C. subcostatum*, Nordst.—Extremely rare. Banff—Iron Hill, (Aberdour); Kincardine—in a wet spot close to the sea, near Mill of Muchalls.
155. *C. subcrenatum*, Hantzoch.—Very uncommon. Ross—Auchnasheen, Falls of Connon, Black Isle; Inverness—Brin and Glen Urquhart; Banff—Ben Avon; Aberdeen—Auchterless, Alford, Inch, Corbie Loch, Dinnet, Cambus-o'-May, head of Glen Callater; Kincardine—near Durris Bridge, Bogandreep, Slack of Birnie; Forfar—Canlochan; Perth—Rannoch, Ben Lawers.
156. *C. subpalangula*, Efv.—Very rare. Aberdeen—Birsemore Loch.
157. *C. subpunctulatum*, Nordst.—Very rare. Perth—Craig-an-Lochan, Glen Garry; Wigtown.
158. *C. subspeciosum*, Nordst.—Very rare. Aberdeen—near Mintlaw; Forfar—Clova Tableland, Canlochan; Perth—Spital of Glen Shee, Craig-an-Lochan.

159. *C. substriatum*, Nordst.—Very rare. Perth—Craig-an-Lochan.
160. *C. subtumidum*, Nordst.—Very rare. Sutherland—Loch Inver; Ross—Poolewe, Falls of Connon; Inverness—Brin; Perth—Spital of Glen Shee, Craig-an-Lochan; Kirkcudbright—New Galloway.
161. *C. subundulatum*, Wille.—Probably not uncommon. Ross—View Rock, near Strathpeffer; Inverness—Brin; Aberdeen—Upper Powlair, Slewdrum; Argyle—near Kingshouse.
162. *C. supraspeciosum*, Wolle.—Very rare. Perth—Ben Lawers.
163. *C. tatricum*, Recib.—Very rare. Ross—Poolewe (Rev. D. Campbell).
164. *C. tetrachondrum*, Lundell.—Not common. Not uncommon in Ross, Banff, Aberdeen, Kincardine, Forfar, and Perth. It occurs in Argyle, near Kingshouse. Not observed in other counties.
 Conjugated on Deeside, in a marsh between Loch Kinnord and Cambus-o'-May. Zygosporangia small, smooth, and globular, sometimes showing a tendency to elongate irregularly.
165. *C. tetragonum* (Næg.), Archer.—Aberdeen—Corrie Kandor.
Forma Lundell.—Rare. Aberdeen—Birsemore, Heughhead, Morven, Presswhin, Glen Callater; Kincardine—coast near Portlethen, Paldy Hill; Forfar—Balquhadly Hill in Fern, Reeky Linn; Perth—Glas Mhoel, Durdie Moor, Rannoch, Bracklin; Argyle—near Ardrishaig in Mull; Kirkcudbright—New Galloway.
166. *C. tetraophthalmum* (Kg.), Breb.—General.
 β *Lundellii*, Wittr.—Probably not uncommon. Ross—Poolewe; Aberdeen—Haughton, Heughhead near Aboyne; Kincardine—Cammie, Skatey shore near Stonehaven; Stirling—Fintray Hills.
167. *C. Thwaitesii*, Ralfs.—Not common. Aberdeen—Scotston Moor, Powlair in Birse, Dalbagie, Castleton, Glen Callater; Kincardine—Cammie, Dalbrake; Forfar—Rescobie; Perth—Durdie, Birnam, Athole Forest, Ben Lawers.
168. *C. tinctum*, Ralfs.—Probably general. Has not been observed in Caithness, Nairn, Stirling, and Renfrew. Seems rare at high altitudes.
 Conjugated in Aberdeen at Slewdrum, and between Loch Kinnord and Cambus-o'-May; in Kincardine, at Dalbrake.
169. *C. trachypleurum*, Lundell.—Extremely rare. Aberdeen—Scotston Moor.

β minor, Raciborski.—Very rare. Aberdeen—Marsh between Loch Kinnord and Cambus-o'-May; Kincardine—near Eslie in Durris.

This was originally figured by us (*our* Plate I. fig. 13) as a distinct species, to which it certainly has considerable claims.

170. *C. trilobulatum*, Reinsch.—Rare. Aberdeen—Corbie Loch north, and Springhill west of Aberdeen; Kincardine—Loch of Lumgair near Stonehaven; Perth—Buchanty in Fowlis Wester.
171. *C. truncatellum* (Perty), Rabenh.—Not common. Ross—Pool-ewe; Inverness—Brin, and head of Glen Sligachan in Skye; Aberdeen—Haughton, Ben-na-Chie, Corbie Loch, Cairnton Moss, Heughhead Aboyne (with zygospores); Kincardine—Cammie, Dalbrake (with zygospores), Clochnaben; Forfar—Finhaven (with zygospores); Perth—Craig-an-Lochan.
172. *C. tuberculatum*, Archer.—Seemingly very rare. Aberdeen—Scotston Moor; Kincardine—near the bridge over the Dee at Durris; Dumbarton—between Loch Lomond and the head of Loch Long.
173. *C. tumidum*, Lundell.—Not common. Aberdeen—Slewdrum, and Upper Powlair in Birse, several stations near Aboyne, and in Cromar, Castleton, and Glen Clunie; Forfar—near Menmuir; Perth—Folotry in Fowlis Wester.
174. *C. Turpinii*, Breb.
β Lundellii (Forma Lund.)—Rare. Ross—Coul, Loch Kinnellan, Black Isle; Aberdeen—Sand Loch, Collieston; Howford, Inverurie; M'Gregor's Well, Glen Gairn; Perth—Rannoch; Argyle—near Kingshouse.
175. *C. undulatum*, Corda.—Not uncommon. Ross, Inverness, Banff, Aberdeen, Kincardine, Forfar, Perth, Argyle.
β minutum, Wittr.—Not so common as the type.
γ crenulatum, Wolle.—Very rare. Perth—Craig-an-Lochan.
176. *C. variolatum*, Lundell.—Not Common. Ross—near Tain; Aberdeen—Alford, Torryburn (Kintore), Corbie and Bishop's Lochs, Slewdrum, Upper Powlair, Birsemore, Dawin, Homehead, Tomachar, Dalbagie, Corrie of Loch Kandor; Kincardine—Cammie, Dalbrake, Bishop's Dam, Slack of Birnie; Perth—Loch of Monteith; Argyle—Mull; Arran—Glen Sannox.
177. *C. venustum* (Breb.), Archer (= *Cos. cambricum*, Cooke and Wills.)—General.

β majus, Wittr.—Rare. Ross—Strathpeffer; Aberdeen—Upper Powlair in Birse; Kincardine—Dalbrake, and Bogandreep in Strachan; Forfar—Glen Clova and Clova Tableland; Perth—Folotry Loch in Fowlis Wester; Argyle—near Kingshouse.

Forma *minor*, Wille.—Very rare. Perth—Ben Lawers.

178. *C. Wittrockii*, Lundell.—Very rare. Aberdeen—near Heughhead, Aboyne.

ZOOLOGICAL NOTES.

Great Gray Shrike in the Solway District.—A specimen of this scarce winter visitant was secured at Terregles on February 15th, and I had the opportunity of inspecting it while in the hands of Mr. Mackay for preservation. Out of a large number of local specimens of *Lanius excubitor* that I have seen from time to time, it is the only one in which no trace could be found of the vermiculations usually so conspicuous on the feathers of the under parts. I should suppose from this that the bird is fully adult.—ROBERT SERVICE, Maxwelltown.

Nesting of the Great Spotted Woodpecker in Berwickshire.—

I am glad to inform the readers of the "Annals" that the Great Spotted Woodpecker (*Dendrocopus major*) is nesting this season in Duns Castle woods. Mr. John Fergusson, factor on the Duns estate, a most careful and accurate observer, having got a hint about the bird being seen, went with the keepers, and, concealing themselves, after half an hour's wait saw the female bird go into a round hole in the boll of an old ash tree, about 20 feet from the ground, and feed her young, who were heard quite distinctly. There is reason to believe that this bird bred in the Duns Castle woods last year. Is there any instance well authenticated of the Great Spotted Woodpecker nesting in Scotland?—CHARLES STUART, Chirnside.

[This Woodpecker is believed to have been a resident, and hence a breeding species, in Scotland down to about the middle of the present century, since which date, however, there is no reliable evidence, that we are aware of, that the species has nested in Scotland. Dr. Stuart's record we regard as of the greatest interest.—EDS.]

Swift in Mull.—As I have only once seen the Swift (*Cypselus apus*) in Mull, and never heard of a nest in the island, I venture to call attention to a statement in "The Field" of 5th May last, wherein it is stated that this bird breeds in Mull. I do not find this corroborated by the information afforded in the "Fauna of Argyll and the Inner Hebrides."—P. C. MACKENZIE, Linlithgow.

Sea Eagle (*Haliaëtus albicilla*) in West Ross-shire.—On 7th April an immature Sea Eagle was sent by Mr. J. G. Henderson from Ullapool, Garve, to Messrs. W. Mackay and Son for preservation. The tail was turning white, that colour predominating, but the head was very dark.—T. E. BUCKLEY, Inverness.

Nesting of the Tufted Duck in Renfrewshire and Wigtownshire.—On the 24th of May of this year the writer, in walking round one of the lochs in the parish of Eaglesham, Renfrewshire, raised a Tufted Duck (*Fuligula cristata*) from her nest and eggs. Mr. John Robertson of Eastwood, Thornliebank, who was about fifty yards off, was immediately hailed, and we at once saw that we had made an interesting addition to the birds of the political division of East Renfrewshire, at which we have been working for several years past. On the evening of the same day Mr. Robertson, having his curiosity excited, paid a visit to a nest which he had seen some days before at the White Loch, a very small sheet of water in the adjoining parish of Mearns. It proved to be a nest of the same species; and, as there was a lot of down in this case, its identification was rendered easy. A nest at the Little Loch, also in Mearns parish, found on the 19th of May on the occasion of the visit to that district of the Ornithological section of the Andersonian Naturalists' Society, is also referable to the Tufted Duck; while a careful examination of the eggs in Mr. Robertson's possession points to the fact of the Tufted Duck having nested at least last year in the Mearns district, which its general occurrence as now established helps to confirm.

In the course of a short holiday spent by the writer and Mr. Robertson in Wigtownshire, in the first week of June this year, the latter gentleman found on an islet on a large loch there a nest and eggs of the Tufted Duck. The bird was raised from the nest. The nesting of this species in Wigtownshire does not seem to have come before this time under the notice of Mr. Service, to whom the information has been communicated. Mr. Service frankly gave us many useful hints in connection with our visit to Galloway, which we are glad to acknowledge.—JOHN PATERSON.

Albino Ring Dove and Mole near Kelso.—A white Ring Dove (*Columba palumbus*) was shot at Lochton, about four miles from here, at the end of April, by John Hakin, who makes his living by shooting pigeons.

A white Mole (*Talpa europæa*) was caught in a mole trap at Crown Point about the same date, half a mile below Kelso, by Mr. John Trotter.—ARCHIBALD STEEL, Kelso.

Occurrence of the Whiskered Tern in Solway.—On the 30th May I was most agreeably surprised when Mr. Hugh M'Kay,

taxidermist in Dumfries, called upon me with a specimen in the flesh of the Whiskered Tern (*Hydrochelidon hybrida*, Pallas) which had just been sent to him for preservation. It had been shot on the previous day by Mr. John Kirkpatrick, gamekeeper, near the Carse Loch of Friars Carse, a place in Nithsdale, some six miles above Dumfries. Mr. M'Kay was kind enough to leave the bird in my hands till I had time to make a detailed examination of it, and to note down the following description:—The cap and nape glossy black, with greenish purple reflections in some lights; from the lower edge of the nape, the whole upper surface of an almost uniform light slaty gray, very slightly paler on outer webs of primaries, which present the frosted pearl-gray appearance described by Mr. Howard Saunders ("Manual," p. 621); shafts of primaries and secondaries on upper and under sides pure white, except for a little before the tips. Fibres on outer edge of first primary are dark, like the breast. A wedge-shaped stripe of white extends up the inner web of the primaries to within about two inches from the tips. Upper aspect of tips of primaries is of a rather darker shade, while the upper surface of tail is of paler shade, than back. Scapulars and secondaries very slightly tipped with white, which is, however, almost worn off. Cap has a very few small white feathers interspersed amongst the black ones in front of eyes and above the lores. Lores and under eyelids white, the white extending round to the black colour of nape, and shading quickly lower down into the plumbeous colour of upper neck. From the white patch on throat, the neck, breast, and abdomen as far as the vent are of a dark sooty plumbeous, like the colour on the under side of the Arctic Tern, but very much more intensified. This colour ends abruptly at the vent, which, with the under side of tail and under coverts, is pure white. There are a few white feathers in the breast, that have slight white tips or frilling. Under wing coverts pure white, axillaries pure white. Thighs are very pale slate gray, shading to pure white next the bare parts. Bill a deep blood red, hardly appreciably darker than the blood that was still oozing from the poor bird. Sides very dark blue, legs and toes vermilion, claws dark brown. Length, 11 $\frac{1}{4}$ inches; wing, 9 $\frac{1}{4}$ inches; bill, 1 $\frac{1}{4}$ inches; cleft of tail only half an inch deep. Subsequently Mr. M'Kay sent me the body, which, when dissected, proved the bird to be a male. Its stomach contained the remains of (apparently) one small white slug and a few "scurrs" or fresh-water shrimps (*Gammarus fluviatilis*), with the addition of some vegetable fibres. Its short cleft tail, deeply scalloped webs, and long slender toes are most conspicuous, and these differentiate it at once in the eyes of any one accustomed only to the common British species of Terns. The Whiskered Tern is an addition not only to Solway, but to the Scottish list. Mr. H. Saunders records six occurrences,—five English and one Irish,—and

it seems to be exactly twenty-nine years since a specimen has been taken in Britain.—ROBERT SERVICE, Maxwelltown.

Nesting of the Great Crested Grebe in Stirlingshire.—In April 1890 I had three eggs presented to me by a schoolfellow, which he had taken a day or two previously from a nest on a loch in Stirlingshire. These eggs remained unidentified until the other day, when I was informed that they were those of the Great Crested Grebe (*Podiceps cristatus*), and was invited by the Editors of the "Annals" to place the interesting fact of the nesting of this species in the Forth area on record.—HARRY CUMMING, Edinburgh.

Great Crested Grebe nesting in Fifeshire.—While enjoying a country ramble with my friend Mr. Meiklejohn on the 19th of May last, our surprise was considerable on coming to a small sheet of water—which for various reasons shall be nameless—to notice a pair of large Grebes sailing about accompanied by two young ones. We lay down and watched them for some time, and being provided with good glasses, and the birds coming several times within fair distance, there was no mistaking the nuptial crests, and the bright chestnut with dark margin of the nuptial tippet, for anything but those of *Podiceps cristatus*. I need hardly say it was a surprise, as both my friend and myself are under the impression that the Great Crested Grebe has never before been found nesting in the east of Scotland.—ALLAN BRIGGS, St. Andrews.

Great Crested Grebe breeding in Mid-Fife.—With reference to a note which, I understand from Mr. Eagle Clarke, is to appear in the *Annals* for July, regarding the breeding of the Great Crested Grebe (*Podiceps cristatus*) in Fife, I would like to state that on two occasions in June 1885 I had excellent views of a magnificent male, and a momentary glance of a female, on a loch in the centre of the county under circumstances which left little doubt in my mind that they were there for nesting purposes, though it was impossible for me to explore thoroughly the immense beds of *Arundo*, *Scirpus*, and *Equisetum* which covered the part of the loch frequented by the birds. The tenant of the adjoining farm told me he had noticed them during the four previous summers. In 1887 three were observed on the loch during the breeding season. I may also say that in August 1887 I examined in the flesh an adult female which was shot on a loch in Forfarshire on the 2nd of the month.—WILLIAM EVANS, Edinburgh.

Scorpæna daetyloptera in Scottish Waters.—A specimen of this richly coloured fish was captured by a Granton trawler on the 22nd of March this year; and another specimen was taken, also by a Granton trawler, on the 30th of April following. Both were cap-

tured to the south-east of the Isle of May, and within a comparatively short distance of each other. I am unable to give the exact locality where the first specimen was obtained, but the second was taken 17 miles north by east from Dunbar, with the South Ness of May Island bearing N.W. by W., $\frac{3}{4}$ W., distance 16 miles. Neither of the specimens were full grown. I am indebted to Mr. W. Eagle Clarke, F.L.S., of the Museum of Science and Art, Edinburgh, for the identification of the species, as I had not previously seen this fish. Those who wish to see a figure, description, and history of this species will find them in Mr. Eagle Clarke's excellent paper in the Proceedings of the Royal Physical Society of Edinburgh for 1893.—THOMAS SCOTT, Leith.

Common Wrasse in the Solway Firth.—I have to record my indebtedness to Mr. Wm. Wright, Annan, for a very beautiful specimen of above species (*Labrus tinca*, Linn.), which is a fish abundant enough off some parts of the British coasts where there is deep water with a rough, rocky bottom. I have not seen it hitherto from the shallow and turbid waters of the Solway, where a fish of its brilliant appearance is altogether out of its usual habitat. I understand it was captured near Newbie.—ROBERT SERVICE, Maxwelltown.

Six-gilled Shark (*Notidanus griseus*) on the West Coast of Scotland.—The Six-gilled Shark is one of the rarest of those found in British waters, and yet it cannot be so uncommon as is generally believed; and if all those captured were reported, we do not doubt our list would be greatly extended. Dr. Day records five captures in all, but we have ourselves had the opportunity of examining as many from various parts of the West Coast of Scotland; and as one of these was a young one, but 2 feet 9 inches in length, it is probable that it had been bred in our home waters. This is a somewhat sluggish ground Shark, and the four we saw in the Lewis during two winters' fishing were captured on the long lines to the west, where they showed little spirit compared with the blue or white sharks—submitting patiently to their fate. The eye, a very large one, of this fish is of especial beauty and iridescent brilliance, retaining its effect for some days after death. As the only Scottish specimen recorded by Day is that in the Banff Museum, it may be well to put on more permanent record the capture of four large specimens off Carloway, Lewis, in 1870-71, and the further capture of a young specimen off Lochbuie, Mull, in 1887. The central dentition of this specimen differs from the six-foot specimen figured by Day, while the shape of the tail is also distinct. At the same time, the arrow-shaped spines are a peculiarity that may be considered important for purposes of differentiation. Caught amongst a lot of Dog-fish, this Lochbuie specimen was only separated and

noted by accident. It is evidently a West Coast fish, and a ground-Shark, and if fishermen were stimulated to take note of their Dog-fish and Shark captures when at the winter white fishing, we should probably find many records of its capture in the West.—W. ANDERSON SMITH, Ledaig.

Some Singular Eels (*Anguilla vulgaris*) from the Isle of May.—At the meeting of the Scottish Microscopical Society on the 16th of February last, Mr. George Sandeman called attention to some remarkable Eels from a warm and stagnant loch on the Isle of May, which has no communication with the sea. He remarked that it was not known how long ago the Eels were placed in the loch, but it did not appear to have been within the memory of man. They are not known to breed, their ovaries and testes being somewhat atrophied, though still apparently functional. In the specimens examined, atrophy is also marked in the muscles and liver, and in the muscles are many hæmorrhages and leucocyte infiltrations. The liver is reduced to one-third of its normal size, is very pigmented, but not fatty. The spleen exhibits a peculiar waxy change, is small and thickened, with the pulpy material reduced. The ovaries and ova are very small, fatty, and the nuclei of the ova obscured. In appearance these Eels are singularly bony. The specimens were all about 26 inches long, but weighed only one-half the normal weight. Perhaps the most interesting feature about them was their eyes, which in some examples were eight times larger than normal. The cornea is opaque, and attacked with Gregarines and other organisms. These very remarkable abnormalities Mr. Sandeman believes to be due to senility. Some ten years ago several of these Eels were caught and cooked, with the result that those who partook of them were seized with illness.

On the Occurrence of *Salpæ* in the Moray Firth.—During the early days of October last year, specimens of *Salpæ* were captured by means of the surface tow-net in various parts of the Moray Firth. Owing to the delicate structure of these Ascidians, the greater number of those obtained were more or less injured from contact with the sides of the net. *Salpæ* have very seldom been captured by us; and, as a matter of fact, we have no previous record of their occurrence in the Moray Firth or anywhere else on the East Coast of Scotland, nor do I know of any records for the East Coast by other observers, but there are a few authentic records of their occurrence on the West Coast. Like many other marine organisms, *Salpæ* are almost perfectly transparent, so that the contents of the alimentary cavity appear as a dark-coloured mass through the otherwise transparent test. It may also be stated that I have had specimens of *Salpæ* sent to me from Shetland.—THOMAS SCOTT, Leith.

Euchloë cardamines in Moray.—On 24th May last I saw a

number of specimens of the Orange-tip Butterfly (*Euchloë cardamines*) flitting about in the wooded valley of the burn of Aberlour, Speyside. The species is recorded for the province of Moray, but is local and uncommon. I never saw the butterfly in that spot before, and nowhere in this province have I found it in such numbers.—HENRY H. BROWN, Elgin.

Pamphilius erythrocephalus at Dalguise.—On Saturday, 12th May last, in company with two brother collectors, I visited Dalguise Hill in brilliant weather. My attention was drawn to a beautiful sand-fly, of a bronze-blue colour, with red head (a female), resting on the heather immediately under a Scots fir, one of two isolated trees. The insects were found in profusion, both on the heather (but only immediately under said trees) and on the trees themselves. Fully fifty specimens were boxed, but hundreds could have been taken. The insects are apparently very ferocious, as five specimens which had unfortunately been boxed together had literally torn each other to pieces. On reference to Cameron's "Monograph of the British Phytophagous Hymenoptera," vol. iii. pp. 93-94, I find the species to be *Pamphilius erythrocephalus*, Linn., and the following extract from that work may prove of interest: "Rare. 'Near Bristol and in the West of England' (Stephens): 'Rannoch, Pitlochry' (A. Beaumont)." "According to Hartig, the larvæ live on *Pinus sylvestris*, each in a nest of silk spun by itself, of a roundish form, and about the size of a hazel-nut, plentifully garnished with the pellets of grass. Generally the larvæ attach their cocoons to the twigs of last year's growth, and as a rule near the ground. There are usually two or three or more larvæ on the same twig. They are found during July and August, and pupate in the earth. The eggs are laid in the needles of last year's growth."—T. M. M'GREGOR, Perth.

Odonestis potatoria (L.) in South Perth.—While spending a few days at Callander in the beginning of May last (1894), I found five larvæ of the Drinker Moth on a moor about two miles out on the way to Port o' Menteith. The insect has not, so far as I can ascertain, been previously recorded for "Forth." Dr. Buchanan White tells me that, though he has had good evidence of its occurrence in Perthshire, he has never seen it himself. I may add that the larvæ were abundant about Oban in April. The only other interesting lepidopterous insect seen at Callander was the Green Hairstreak (*Thecla rubi*), of which I captured a couple on 12th May.—WILLIAM EVANS, Edinburgh.

List of the Rarer Spiders of Renfrewshire.—Having for a number of years given a little attention to the spiders of Renfrewshire, and as my captures amount to about 150 species, most of which have been kindly named by the Rev. O. P. Cambridge, a

short list of the rarer species may be of interest to some of the readers of the "Annals of Scottish Natural History." A more complete list may yet be furnished.

<i>Segestria</i> , Latr.	<i>neglecta</i> , Cambr.
<i>senoculata</i> , Linn.	<i>viaria</i> , Blackw.
<i>Oonops</i> , Templeton.	<i>fusca</i> , Blackw.
<i>pulcher</i> , Templ.	<i>Walckenaëra</i> , Blackw.
<i>Micaria</i> , C. L. Koch.	<i>brevipes</i> , Westring.
<i>pulicaria</i> , Sund.	<i>bifrons</i> , Blackw.
<i>Drassus</i> , Walck.	<i>fuscipes</i> , Wider.
<i>lapidicolens</i> , Walck.	<i>pumila</i> , Blackw.
<i>pubescens</i> , Thorell.	<i>obscura</i> , Blackw.
<i>mysticus</i> . New to science.	<i>flavipes</i> , Blackw.
<i>Clubiona</i> , Latr.	<i>hæmalis</i> , Blackw.
<i>reclusa</i> , Cambr.	<i>latifrons</i> , Cambr.
<i>lutescens</i> , West.	<i>obtusa</i> , Black.
<i>holosericea</i> , De Geer.	<i>capito</i> , Westr. Only one
<i>comta</i> , C. L. Koch.	other British specimen.
<i>pallens</i> , C. L. Koch.	<i>Epeira</i> , Walck.
<i>Nesticus</i> , Thor.	<i>cucurbitina</i> , Clerck.
<i>cellulanus</i> , Clerck.	<i>agalena</i> , Walck.
<i>Euryopsis</i> , Menge.	<i>cornuta</i> , Clerck.
<i>flavomaculata</i> , C. L. Koch.	<i>Trochosa</i> , C. L. Koch.
<i>Neritene</i> , Blackw.	<i>leopardus</i> , Sund.
<i>atra</i> , Blackw.	<i>ruricola</i> , De Geer.
<i>longipalpis</i> , Sund.	<i>Neon</i> , Sim.
<i>nigra</i> , Blackw.	<i>reticulatus</i> , Blackw.
<i>vagans</i> , Blackw.	<i>Euophrys</i> , C. L. Koch.
<i>longimana</i> , C. L. Koch.	<i>æquipēs</i> , Cambr.
<i>retusa</i> , Westr.	<i>Hasarius</i> , Simon.
<i>Clarkii</i> , Cambr.	<i>arcuatus</i> , Clk.
<i>livida</i> , Blackw.	<i>Adansonii</i> , Savigny.

MORRIS YOUNG, The Museum, Paisley.

Note on a Bifid Worm.—Mr. Gilchrist Clark of Speddoch recently gave me one of those rare abnormalities—a worm with two tails. It had been found amongst some worms kept for angling purposes. The species was the ordinary Brandling (*Lumbricus fatidus*). Considerably less than a dozen instances of this curious malformation in worms are on record, and it so happens that, including the specimen under notice, no less than four of these have passed through my hands. So many as four having been in the possession of one individual would seem to indicate that this "freak" is not so rare as is generally supposed. I have presented this specimen to the Museum of Science and Art in Edinburgh.—ROBERT SERVICE, Maxwelltown.

BOTANICAL NOTES AND NEWS.

Chrysosplenium oppositifolium, L., in the Outer Hebrides.—In “Topographical Botany,” ed. 2, the above species stands unrecorded for five Scotch counties. I have seen specimens from Argyle and East Sutherland, and it is recorded for Wigtown in the Record Club Report for 1883.

In May of this year Mr. W. S. Duncan has sent specimens from “South of Tarbert, Harris.” This leaves only one county for which it stands unvouched, viz. Shetland. It seems quite wanting in Sweden, though occurring in Norway and Denmark, while *S. alternifolium* is distributed throughout the whole Scandinavian peninsula and about half the provinces of Finland.

In Scotland *C. alternifolium* is recorded north to Argyle, Inverness, and Elgin.—ARTHUR BENNETT.

Linnæa borealis, Gron., in Sutherland.—The receipt of specimens of the above plant from Dr. Joass, of Golspie Manse, has called my attention to the omission I made of this species in the “Annals” for 1893, p. 225. Mr. Grant sent me specimens gathered in July 1888 by Mr. Lindsay in “Little Ferry Wood,” and how I came to neglect to insert it I am unable now to say.

Dr. Joass kindly writes as follows: “I saw it a few years ago, hanging from a saucer in a cottage window in this parish, near Balblain pine-wood, and was offered a guide to show me its habitat. We missed it on the way out, my guide being a small boy; but it was found in a considerable patch on our return track. Next year my sister found a larger spread of it about half a mile off. I do not know any other locality for it in Sutherland. I am told that it grows in Novar Wood in Ross.”

Novar is about $6\frac{1}{4}$ miles north-east of Dingwall; but I suppose the note of its extinction “near Dingwall” may apply to this wood, “owing to the wood in which it grew being cut down and cultivated (T. A.)”¹ Its record in West Ross (Davidson, in “Scottish Naturalist”), has not been, I think, confirmed. The old locality of “Braham Castle” would be south of Dingwall. Is this the same locality as “Kingsmills, now destroyed by cultivation”? I have seen specimens from Inverness (V.C. 96). The Sutherland station will take it about 25 miles farther north than previous records; but there is no reason why it should not be found still more northwards, as, though not recorded for Iceland or the Faroes, it occurs throughout Scandinavia up to lat. $71^{\circ} 10''$, and in Finland in all the northern provinces. In 1883 it was found by the Swedish expedition at Ivigtut in South Greenland, and in 1884 by the Fylla expedition

¹ “Journal of Botany,” 1889, p. 362.

(Warming and Holm) at the Præstefjeld by Holstenborg, "growing with *Salix glauca*, *Empetrum*, and *Vaccinium*."

It seems to be most abundant near Braemar (Mrs. Lomax), and in Moray, where it is recorded from many stations. I have specimens from Berwick, Forfar, South Aberdeen, Inverness (Co. 96), and East Sutherland.—ARTHUR BENNETT.

[*Linnæa borealis* can scarcely be called "most abundant" in Braemar, though patches of it occur in that district in several localities. It is much more plentiful in fir woods in the middle part of the valley of the Dee. It occurs also in several localities in "North Aberdeen"; but everywhere in Scotland, if I may judge from personal observation, it is local. I have never seen it in Scotland in the profusion in which it abounds in some parts of Norway.—J. W. H. T.]

Ferns from Barra (Outer Hebrides).—I recently visited this "far distant isle of the sea," and had the privilege of observing a few of its more interesting plants; perhaps it may not be out of place if I give the names of one or two of the rarer ferns that were obtained. 1st. The Moonwort Fern, *Botrychium Lunaria*—a few plants of this fern were observed on the hills immediately behind Castlebay, but it did not appear to be very common. 2nd. The Hart's Tongue Fern, *Scolopendrium vulgare*—a single very small plant of this fern was growing in a curious gully on the east shore, over against Castlebay. This gully had been formed by the disintegration of a trap dyke. I was indebted to a friend—one of the coopers engaged in the curing of herrings at Castlebay—for the discovery of this fern. 3rd. The Beech Fern, *Polypodium Phegopteris*—a plant of this fern was obtained among some rocks above Sinclair's Loch, which is on the west side of the island, and about three-quarters of an hour's walk from Castlebay. I may mention that the beautiful *Scilla verna* recorded for Barra by Mr. A. Somerville, December 1887, was common in flower among some of the rocks here, and some plants of *Sedum Rhodiola* were also observed in full bloom.

Scilla verna appeared to be much more common in Barra than *S. nutans*, which was observed only at the north-east end of the island.—THOMAS SCOTT, Leith.

Tetraplodon bryoides, Lindb. (mnioides, B. and S.) on the Pentland Hills.—This fine moss, though common in the Highlands of Scotland, is not in my experience often met with south of the Forth. In September 1872 I found a patch, on dung as usual, near the source of the Medwyn in the Western Pentlands; and on 23rd May 1891 another patch much farther east, on the peaty flat connecting the top of Scaldlaw with the South Black-hill. A specimen from the first locality was shown at the time to the late Mr.

Sadler. The species is not mentioned in either edition of Balfour and Sadler's "Flora of Edinburgh," nor, of course, in Greville's "Flora Edinensis." There can be no doubt about the identification, which has been verified by Dr. Braithwaite.—WILLIAM EVANS, Edinburgh.

Orbilbia scotica, *Masse* (in "Grevillea" for June 1894, p. 99).— "Gregarious, at first subglobose and closed, then expanding and becoming almost plane, with a slight central depression, margin entire, glabrous, thin, almost translucent when moist, irregularly contracted when dry, deep rose red, sessile, and attached by a central point, up to $\frac{3}{4}$ mm. across; excipulum parenchymatous, cells irregularly polygonal, 5-7 μ diameter; hypothecium tinged red; asci clavate, apex rounded, base slender and usually crooked, 8-spored; spores irregularly 2-seriate above, 1-seriate below, hyaline, continuous, elliptic-oblong, ends obtuse, 4 by 1 μ ; paraphyses about 1 μ thick, tips subglobose.

On rotten wood, Aboyne, N.B.

The type specimen is in Herb. Berk., Kew, under the name of *Peziza vinosa* (= *Calloria vinosa*), from which it differs in the very much smaller, differently shaped spores, although superficially the two species closely resemble each other."

First Records of Scottish Flowering Plants.—In Mr. W. A. Clarke's "First Records" (see p. 190), the following are mentioned from Scotland:—

Melanpyrum sylvaticum, L., 1777.—"In woods, but not common," Lightf.—"Fl. Scot.," 325. "On the road going from Taymouth to the hermitage, 1775."—Lightf. Herb.

Utricularia Bremii, Heer., 1876.—"Moss of Inshoch, Nairnshire, Mr. Jas. B. Brichan, 16th August 1833."—"Journ. Bot.," 1876, 142.

Pinguicula alpina, L., 1832.—"Picked by the Rev. George Gordon in June 1831 in the bogs of Auchterflow and Shannon, Ross-shire. . . . There are two specimens in the herbarium of Sir J. E. Smith, sent to him by Mr. James Mackay, in September 1794, from the island of Skye."—"E. B. Suppl.," 2747.

Stachys ambigua, Sm., 1809.—Found "by Mr. W. Borrer and Mr. W. J. Hooker near Loch Carron and in Glen Ely in the North of Scotland in September 1808."—"E. B.," 2089.

Lamium intermedium, Fr., 1837.—Distinguished by Dr. N. Tyacke, near Edinburgh, in 1836, in first Report of Bot. Soc. Edinb.

Ajuga pyramidalis, L., 1777.—"I am assured by the Rev. Dr. Burgess of Kirkmichael that it is a native of Scotland, but I have not yet learned the particular place of its growth."—Lightf., "Fl. Scot.," 303.

CURRENT LITERATURE.

The Titles and Purport of Papers and Notes relating to Scottish Natural History which have appeared during the Quarter—April-June 1894.

[The Editors desire assistance to enable them to make this Section as complete as possible. Contributions on the lines indicated will be most acceptable and will bear the initials of the Contributor. The Editors will have access to the sources of information undermentioned.]

ZOOLOGY.

BADGER IN AYRSHIRE. Winhuls. *The Field*, 19th May 1894, p. 698.—A fine male captured at Loudoun “last week.”

NOTES ON THE INJURY DONE BY FIELD VOLES (ARVICOLA AGRESTIS) TO YOUNG PLANTATIONS ON DUNS CASTLE ESTATE. By John Ferguson.—*Proc. Berw. Nat. Club*, vol. xiv. p. 156.

ABNORMAL RED-DEER HEADS. W. A. Baillie-Grohman. *The Field*, 10th March 1894, p. 356.—Note on, and illustration of, three-horned stag shot by Mr. Douglas H. Barry, at Struy, 9th October 1893.

HORNLESS STAGS. Jock Scott. *The Field*, 17th March 1894, p. 395.—The note refers to a fine specimen killed some years ago in the Isle of Lewis.

MOVEMENTS OF BIRDS ON MIGRATION DURING THE YEAR 1892, AND OTHER NOTES ON BIRDS AND SMALL QUADRUPEDS. By Charles Stuart. *Proc. Berw. Nat. Club*, vol. xiv. pp. 171-176.—The observations were taken at Chirnside.

MIGRATION OF ROOKS. D. M'Kenzie. *The Field*, 7th April 1894, p. 487.—A letter referring to the arrival on the island of Lewis of a large colony estimated to contain from 4000 to 5000 birds.

GREAT GRAY SHRIKE IN PERTHSHIRE. P. A. N. *The Field*, 31st March 1894, p. 451.—Specimen shot on 13th March near Kirkmichael in Strathardle.

OCCURRENCE OF THE HOOPOE IN THE TAY DISTRICT. Colonel Drummond Hay. *Proc. Perthshire Soc. Nat. Sci.*, vol. i. part vii. (1892-93), p. cxlvii.—Specimen shot on the south bank of the Tay, at Birkhill, on the 8th October 1892.

MORTALITY AMONGST SEAFOWL. A. B. Fortune. *The Field*, 14th April 1894, p. 536.—Twenty-four specimens of Razorbills and Little Auks cast up within a distance of about a quarter of a mile on the Fife coast between Crail and Anstruther.

SAPPHIRINE GURNARD IN THE SOLWAY FIRTH. H. A. Macpherson. *Zoologist* (3), vol. xviii. p. 230 (June 1894).—Several

specimens taken in the spring, the largest of which was a female weighing $3\frac{3}{4}$ lb.

VARIATION OF *TÆNIOCAMPA GOTHICA*. Richard South. *Entomologist*, vol. xxvii. p. 194 (June 1894).—The note refers to a series of specimens bred from ova deposited by a female from Perthshire.

BISTON HIRTARIA AND CLEORA VIDUARIA IN SCOTLAND. Wm. Reid. *Entomologist*, vol. xxvii. p. 136 (April 1894).—A short note on the distribution of these two species in Scotland.

THE MILD SEASON. Wm. Reid. *Entomologist*, vol. xxvii. p. 146 (April 1894).—*Phigalia pedaria* taken in the Logie woods on 27th December and 7th January.

EPHESTIA KÜHNIELLA IN ABERDEENSHIRE. A. H. Horne. *Ent. Record*, vol. v. p. 96 (April 1894).—Larvæ found among flour at Monymusk in the autumn of 1893.

A SECOND HUNDRED NEW BRITISH SPECIES OF DIPTERA. By G. H. Verrall. *Ent. Mo. Mag.* (2), vol. v. pp. 76-79 (April 1894), and pp. 140-144 (June 1894).—A number of Scottish records are included in this paper.

BOTANY.

REPORT OF EXCURSIONS OF BERWICKSHIRE NATURALISTS' CLUB, 1892, in *Hist. Berw. Nat. Club*, vol. xiv. part i.—The only points of botanical interest to be noted are as follows:—

To Hawick and Wauchope, on 1st June. *Lycopodium alpinum*, var. *decipiens*, reported from near Traquair, and from Cattle-shields in the Lammermoor Hills.

To Yester, on 31st August. Measurements of several trees are given, some of them very large: e.g. a Beech 75 ft. high is $15\frac{1}{2}$ ft. in diameter; an Oak 63 ft. high is 15 ft. 2 in.; a Lime 94 ft. high is 14 ft. 8 in.; and a True or Spanish Chestnut 92 ft. high is 18 ft. All the diameters are taken at 5 ft. from the ground. [*Note*.—Should "diameter" not be *circumference* in these records?—ED. *Ann. Scot. Nat. Hist.*]

At the Anniversary Meeting, on 12th October, in Berwick Museum, Dr. Hardy showed *Milium effusum*, new to Berwickshire, found by him in Penmanshiel Wood.

MEASUREMENTS OF SOME OF THE LARGEST TREES AT NISBET HOUSE, BERWICKSHIRE. By Peter Loney, Marchmont. *Hist. Berw. Nat. Club*, vol. xiv. part i. p. 146.—Height and diameter at 1, 3, and 5 feet above ground are noted of 13 trees; but the "diameters" are so large as to suggest that they are *girths*.

FIRST RECORDS OF BRITISH FLOWERING PLANTS. Compiled by William A. Clarke, F.L.S., *continued*. *Journ. Bot.*, April-May.—Includes from *Veronica spicata* to *Ajuga Chamæpitys*.

ARABIS PETRÆA, LAM., VAR. GRANDIFLORA, DRUCE. By Ar. Bennett. *Journ. Bot.*, April, p. 114.—This form, named by Mr. Druce from Scotch examples, is shown to be the same as var. *ambigua*, Regel. Widely distributed in the Arctic regions.

COCHLEARIA GRÆNLANDICA, L., IN CAITHNESS. By Ed. S. Marshall. *Journ. Bot.*, April, p. 114.—Found on cliffs south of Wick, in July 1886, along with *C. danica*.

POTAMOGETON POLYGONIFOLIUS, VAR. PSEUDO-FLUITANS, SYME.—By Alfred Fryer. *Journ. Bot.*, April, pp. 97-100, Plate 342.—Mr. Fryer describes and figures specimens from "River Leven, Loch Lomond," in Edinburgh herbarium, named by Dr. Syme himself, and records that specimens from "Perth, Laird's Loch," and from "Tiggan, Orkney Isles," belong to this variety.

NEW OR CRITICAL BRITISH ALGÆ. By E. A. L. Batters, LL.B., F.L.S. *Grevillea*, June 1894.—Notes *Urospora collabens*, Holmes and Batters (= *Conferva collabens*, Harvey), sent in fine state from Cumbrae by Mr. David Robertson; and *Scaphospora speciosa*, Kjellm., from Cumbrae, and *Ectocarpus tomentosoides* from east coast of Scotland (Stonehaven), both the latter found by Mr. G. Brebner.

NEW OR CRITICAL BRITISH FUNGI. By G. Masee. *Grevillea*, June 1894).—Records *Orbilbia scotica*, n. sp., on rotten wood, from Aboyne. The type is in Berkeley's herbarium at Kew, under *Peziza vinosa*.

REVIEWS.

GEOGRAPHICAL DISTRIBUTION OF BRITISH BIRDS. By Henry Seebohm. (London: R. H. Porter.)

In this volume Mr. Seebohm attempts to classify British birds in three different ways: firstly, their distribution within the British Isles; secondly, their distribution during the breeding season outside the British Isles; and, thirdly, their climatic distribution in the same season.

The book concludes with a list of British birds, with as much information in connection with the geographical distribution of each species as can be given in a few lines.

The total number of birds admitted into the British list is 391. These are divided into residents or partial residents 108, summer visitors or partial visitors 48, winter visitors or partial visitors 68, spring or autumn migrants or partial migrants 32, and accidental or partial migrants 135. It must be understood that the word partial

is prefixed to those appellations which do not apply to all three kingdoms.

The work is, strictly speaking, a guide to students and others who wish to obtain a correct knowledge of the range of our British birds. We have no fault to find with the text, every page of which shows evidence of much careful thought and preparation. On the other hand, we take exception to the way in which the volume has been sent out: firstly, as regards the flimsy paper cover, which, in a work of reference and likely to be much used, necessitates sending it over to the binder; secondly, in regard to the list of British birds having been printed on one side of the paper only, so that, as the author says, it can be cut up and used as labels for collections of stuffed birds and eggs. Naturally this increases the bulk, and doubtless the price of issue. We think the instances in which it would be cut up for labels will be most exceptional; and, with all due regard for the author's intentions, his book is too good for mutilation by scissors and paste.

STIRLING NATURAL HISTORY AND ARCHÆOLOGICAL SOCIETY'S TRANSACTIONS, 1892-93.

The Stirling Society is to be heartily congratulated on the results of its scientific work during the past year, which, when recorded, forms a volume of no less than 136 pages. It is not upon the voluminosity of its publications alone that we express our great satisfaction, but, and what is far more important, upon their great merit and usefulness. The papers are very properly local in their bearing, and not only of value and interest as such, but are welcome contributions to British natural history. The Society is evidently most efficiently officered, and we look forward with confidence and pleasurable anticipation to the advent of further contributions to the natural history of Stirling and district which we know to be in preparation.

NATURAL HISTORY OF ARBROATH AND DISTRICT. By Thomas F. Dewar, M.D., B.Sc. (Arbroath: Brodie and Salmond.)

Another contribution to Scottish local natural history is Dr. Dewar's little book with the above title. This work consists of a series of extremely well-written chapters dealing with a variety of subjects,—Zoological, Botanical, Geological,—treated of in a style that is attractive and popular. Dr. Dewar proves himself to be an able naturalist, and an accurate observer who has devoted his attention to subjects varying from the mammals of the district to the life between its tides; from wild flowers to the "birth of Forfarshire." In addition to affording much useful information, especially to the zoologist, the book is well calculated to foster interest in the fauna and flora of the area upon which it treats, and this was Dr. Dewar's laudable object in penning its pages. We congratulate him on the success he has achieved.

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[OCTOBER

NOTES ON DAUBENTON'S BAT AS OBSERVED IN GLEN DOCHART, PERTHSHIRE.

By SYMINGTON GRIEVE.

DURING the last six or seven years I have had many opportunities of observing the bats that haunt certain cliffs in Glen Dochart. Here the spurs of Creag Liuragam descend at several points in precipitous rocks into the waters of Lochs Ure and Dochart, and in these particular and fissured faces are the chosen homes of Daubenton's Bat (*Vespertilio Daubentonii*). As such cracks in the rocks can only be examined from a boat, the bats are quite protected. There is, however, one colony at least, high up in a cliff the foot of which can be reached from the shore, but it is beyond the reach of human inspection.

This bat does not generally make its appearance until the shade of night has fallen. It is only to be observed on fine evenings; and during wet weather its absence was noted for a considerable number of consecutive nights. When they were about they seemed very busy, and several dashed after our artificial flies, but discovered the true nature of the lure in time to save themselves from capture, though I am assured such is not always the case. Although

I have watched these bats on many an evening since the summer of 1888, yet I had no opportunity of examining a specimen until July of the present year. On the 4th of that month, while examining a hawk's nest upon a small cliff at Loch Dochart, my attention was attracted by an animated chirping sound which proceeded from a fissure close by. On peering into the opening I saw several bats clinging to the rock, which, aided by the top-joint of my rod, I endeavoured to secure. When, however, the creatures were touched, they climbed higher, and into the more inaccessible crevices, but not before I had secured several specimens with my landing-net as they flew out. Among my captives was a female with a young one clinging to its back, but afterwards the baby bat lay rolled up in her left wing. The colony was evidently an old established one, for the droppings were numerous and the edges of the fissure were blackened by the constant rubbing against them by the bodies of the bats as they entered and departed.

A few days later I discovered, in a fissure in a cliff 70 feet high and laved by the loch, another colony. This fissure was very deep, and the smell proceeding from it indicated lengthened occupation. I found it difficult to procure specimens from it, as the bats retired during my intrusion to the innermost recesses, beyond my reach.

At 9.30 p.m. on the 26th of July, when fishing on Loch Dochart, I heard a strange wail come across the water from the other side of the loch. It seemed to ebb and flow and to proceed from the most westerly of the cliffs, about three hundred yards away. On rowing to the place I easily recognised the chirping of bats proceeding from two points in the cliff; one of them the fissure from which I had procured my last specimens, and the other from a new haunt higher up in the cliff and beyond the reach of inspection. From observations I was able to make, I have no doubt that the chirping sound proceeded from the young bats, and that the ebbing and flowing sound, which from a distance resembled a wail, was caused by the arrival or departure of the old bats, who were evidently supplying their young with food.

I found great difficulty in feeding my captives, for although at first they took some lean roast mutton chopped very fine,

they did not appear to care for the diet. Flies were not to be obtained in sufficient numbers, but any put into their cage were neglected until night set in, when they were evidently eaten,—perhaps by the mother bat only,—as they entirely disappeared.

To give any estimate of the numbers of Daubenton's Bat inhabiting Glen Dochart would be very unsatisfactory, for the greater part of the glen has yet to be examined. I am prepared, however, to say that at Lochs Dochart and Ure I saw some dozens of them, and, judging from the noise they made, they were probably in hundreds.

Knowing that Mr. Eagle Clarke was wishful to see bats from various parts of Scotland, I forwarded specimens to him, and he informed me that they were Daubenton's Bats, a water-loving species; and that the locality indicated an extension of the recorded range, carrying its distribution into the heart of the southern Highlands, and being the most northern outpost of this bat for Central Scotland.

It may be useful to remark that the locality is about 512 feet above sea-level.

ON THE PROBABLE BREEDING OF THE HAWFINCH (*COCCOTHRAUSTES VULGARIS*) IN MIDLOTHIAN.

By WM. EAGLE CLARKE.

ALTHOUGH the Hawfinch has hitherto been both rare and casual in Scotland, visiting the country most irregularly, never in more than extreme fewness of numbers, and at no particular season of the year; yet, from a knowledge of the bird's history as an English species, it seemed probable that it would eventually become a colonist in Northern Britain.

In 1678, when "Willughby's Ornithology" was issued by Ray, the Hawfinch was described as seldom coming over to England, and only in hard winters. The bird has, however, long been resident and pretty generally distributed in the more southern counties, and has for many years been

increasing in numbers and spreading in the north-eastern counties of England. It was quite unknown in Northumberland at the date (1843) when Mr. Yarrell gave to ornithologists his famous "History of British Birds"; but has, according to Mr. George Bolam, of late years been increasing its range northwards in that county, and is now known to breed somewhat regularly upon Tyneside, though in 1874, when the late Mr. Hancock wrote his "Catalogue of the Birds of Northumberland and Durham," it was but "a rare casual visitant." Its advent, therefore, in Scotland as a colonist was an extremely probable eventuality. That such an immigration has actually taken place, the following record of the capture of a particularly youthful specimen during the summer of the present year would seem to indicate as more than likely.

For the following facts relating to the taking of a young Hawfinch on his estate, I am indebted to Mr. Robert Dundas of Arniston, Midlothian, who informs me that he found the bird entangled in a net over a strawberry-bed on the 3rd of August last, and that the bird, which was alive, was killed by a terrier dog which accompanied him. From the immature state of its plumage, Mr. Dundas was of opinion that the bird must have been hatched in the neighbourhood, probably in the glen immediately adjoining the garden. That neither parents nor co-nestlings have been observed, Mr. Dundas considers is not surprising, because the nature of the locality is such that the birds would easily escape notice; and, I would add, there should be taken into consideration the well-known shyness of the species, which always makes it most difficult of observation.

I have examined the bird,—which is a very young male, with the throat pale yellow,—and I quite agree with Mr. Dundas that it was doubtless bred not far from the garden where it met with its untimely end.

Mr. Dundas has presented the bird to the Scottish National Collection in the Museum of Science and Art, Edinburgh, and has issued orders to his gamekeepers that if further Hawfinches are seen they are not on any account to be molested.

My friend Mr. Wm. Evans writes me: "I am extremely

interested in the occurrence of the Hawfinch at Arniston. It is undoubtedly a very uncommon bird in any part of Scotland. Writing from memory, and away from my notes I can only call to mind two definite records of its occurrence in the east of Scotland. Saxby mentions, in the 'Zoologist,' I think, having seen several in the hands of bird-catchers in Edinburgh, which were *said* to have been captured in the neighbourhood of the city; and there is a specimen in the Perth Museum which was shot near Murthly by Professor M'Intosh. Both records are now of a good many years' standing."

ON THE INTRODUCTION OF GROUSE TO THE TENTSMUIR IN FIFE.

By WILLIAM BERRY, B.A., LL.B.

IN the "Zoologist" for February of this year, a short account is given of what promises to be a successful attempt to introduce our Scotch Grouse into Northern Germany: a record of the introduction of this bird to the Tentsmuir in Fife, where, though formerly unknown, it has successfully established itself and is now quite at home, may not be without interest.

The Tentsmuir is a large tract of barren moorland, flat as the sea, which borders it along its entire length. It extends from the Firth of Tay on the north, to the estuary of the Eden, near Leuchars, on the south; its length being approximately five, and its average breadth two, miles. The elevation above sea-level of the whole of this area is quite inconsiderable—perhaps eight or ten feet, or even less; but it is broken up and partially sheltered from the sweep of the winds by lines or chains of sandhills, which rise to the height of thirty or forty feet, and trend, speaking generally, in the direction from east to west; a similar chain forms a continuous rampart along the sea-shore. The soil, if such it can be called, is simply blown sand, only anchored in its present position by the vegetation which has somehow established itself as a skin upon the surface: indeed, a

strong gale—particularly a Nor'-Easter such as that which carried destruction on so vast a scale to the woods and trees of our eastern counties on the 17th November of last year—sometimes makes a material alteration in the appearance and size of the sandhills, blowing tons of sand, along with the bent grass—root and stem—which formerly bound it together, to form a new and sterile area on what was before good heather ground. Herein lies a danger to which inland moors are not, of course, liable; and in order to minimise the effect of such a calamity we are compelled to leave a broad fringe of strong unburnt heather along our northern boundary, so that, on the one hand, the plant itself may not so readily be smothered, and, on the other, the sand may, by the thicker vegetation, be more speedily arrested in its march of destruction.

The Tentsmuir is shared among three estates: Scots-craig, the property of Mrs. Maitland Dougall, on the north; Kinshaldie, an extensive property belonging to Mr. Alexander Speedie, in the middle; and Earlsall, the ancient seat of the Bruces and Hendersons, now the property of R. W. R. Mackenzie, Esq., on the south. Heather grows freely on Earlsall, and also in some "districts"—as they may almost be called—of Kinshaldie; but on a large part of the latter estate there is little or none, the rough pasture being perhaps too frequently burnt, and the extensive bogs too wet. The northern, or "Shanwell" moor, extending to about 1000 acres, part of the estate of Scots-craig, of which the writer is shooting tenant, is the original home of the Grouse and the scene of their introduction. Nearly the whole of this area is heather-clad, some "hollows" bearing the true heather or ling, others the less useful bell-heather; while in most places may be found a kind of dwarf or creeping willow (*Salix repens*), to which, the gamekeeper informs me, the Grouse are very partial. Two good streams of running water cross this part of the moor from west to east—one forming the march with Kinshaldie, while a broad ditch also drains a fairly large bog lying parallel to the shore along the eastern rampart; and though these streams are all liable to be completely dried up in hot summers, water may, fortunately, be found at any season, and at almost any spot on the moor,

by digging a few feet into the sand. Good coveys are thus produced from dry tracts of heathery ground, where, were it not for the numerous water-holes, no young Grouse could exist. After long-continued wet weather, on the other hand, in autumn and winter, a large part of the moor is sometimes submerged to a depth of six or eight inches; but at this season the Grouse either entirely shift their quarters for the time to drier ground, or, remaining, seem quite at home on the now insular sandhills.

While the Tentsmuir thus presents many points of contrast to the more inland Grouse moors, it yet seems to be—as the success of the experiment has in fact proved—generally suitable as a home for this bird. Stray Grouse may have occasionally crossed the Tay from the Forfarshire moors north of Dundee: one bird, a hen, was killed by my father in September 1872, in a turnip-field on the south bank of the Tay, not more than three miles west of Tentsmuir; and the Scotsraig gamekeeper informs me that, many years ago, he saw a Grouse fired at near this same place—perhaps the same bird, or its mate, however, for, no record of the event having been preserved, I cannot ascertain the exact year in which it took place. Be this as it may, these waifs and strays, if they ever reached Tentsmuir, at all events never established themselves thereon, and it was not until the year 1876 that the late Admiral Maitland Dougall of Scotsraig decided to try an experimental introduction of the bird. Permission having accordingly been obtained from Mr. Adam of Blairadam, on the 2nd July in that year Mr. John Fowlis, the Scotsraig gamekeeper, went with the keeper from Blairadam to the moor of Outh, then rented by Mr. Adam from Mr. Lawrence Dalgleish, and succeeded in capturing a pair of well-grown young Grouse, which, being transported to Tentsmuir, were there duly set at liberty. On the 8th August of the following year eight more birds were procured from the same moor; and, as it soon became evident that the experiment was going to meet with a considerable measure of success, everything was at once done that could lighten the struggle for existence of the new colonists. A large staff of men were sent down to dig up turfs covered with the good heather, which were then carted away and relaid in

suitable spots where bell-heather or grass predominated ; and this transplanted heather continues to flourish and is spreading, though in places it can still be recognised as a more or less rectangular patch, distinct from its surroundings. Water-holes were also dug wherever the supply was insufficient, or not easily accessible ; and in the following season the reward of this forethought was reaped, for the birds not only bred, but successfully brought their young to maturity. Of these birds, on 26th August 1878 the Admiral shot five, the first-fruits of Tentsmuir.

For a good many years the Grouse now continued steadily to hold their own, and in fact considerably increased in numbers. I do not know whether any were killed in 1879, but in the seven years from 1880 to 1886 inclusive, an average bag of just 20 brace was obtained ; the best year being 1883—(28 brace)—while the largest individual bag was that of 7th August 1886, when 14 brace were killed by two guns.

On this level moor the birds, which breed early, are often packed and unapproachable by the beginning of August. Perhaps an undue proportion of old birds, whose numbers only a system of "driving" would have reduced, escaped the gun altogether, and the breeding vigour of the stock may thus have tended to deteriorate. A host of enemies were also to be reckoned with. The moor, lying as it does within the general lines of the great North and South Migration Roads, as well as near to extensive tracts of land on which there is no preservation of game whatever, is visited and inhabited by swarms of crows—hooded, carrion, and hybrid—ever on the look-out for a clutch of eggs or a brood of young birds ; and worse even than the crows are the egg-gatherers from the centres of population in the neighbourhood, whose depredations are still, I regret to say, carried on with a success which, to a bird-lover, is nothing short of heart-rending. The hot summer of 1887 must have been a trying one for the grouse ; for in such a season even constant deepening of the water-holes hardly avails to keep up the birds' supply of water. The bag this year was only $6\frac{1}{2}$ brace, and, fresh blood being desiderated, in the latter end of November nine hen birds were procured from Kirk-

cudbrightshire, which, being taken to the moor, the basket and its custodian were surrounded by lustily-crowing cocks, before even the captives were set at liberty. The cold, wet summer of 1888 which followed prevented the results of this new blood from being apparent for a time: only one covey worthy the name was to be found when the shooting season again came round, though the game list of this year is otherwise interesting from its also containing the entry of one or two sand-grouse, large flocks of which bird frequented the moor, and the sandy arable country which adjoins it, at all events from May to November. In 1889 the bag—19½ brace—was again practically up to the average of recent years.

Upon the death of the proprietor in 1890, the shootings of Scotsraig were let to Sir Walter Corbet, Bart., and later to the present writer, in whose hands they have since remained. A regular system of driving was instituted,—there being as yet no driving-butts, the guns concealed themselves as they could among the sand-hills,—and although large totals were neither expected nor secured, a proper thinning of the old cocks was thus brought about; these, in magnificent plumage, being especially conspicuous in the various bags, amounting to a little over 30 brace. In the following spring several lines of butts were erected, and a scheme of drives arranged. Very active measures were also undertaken against the marauding crows—upwards of 40 being killed, and their nests diligently sought for and destroyed; while the watchers were able at the same time to hold the egg-gatherers in check. Our bag for that year was 50 brace—a result to which this extra activity no doubt contributed; and in 1892, when the same measures were again taken, and the climatic conditions were equally favourable, the total of 73½ brace was reached.

The grouse may now be considered as thoroughly acclimatised on Tentsmuir: and were they protected on a larger extent of this waste land, no doubt their numbers would greatly increase; for the coveys, as a rule, run large—a brood of 13 young birds having twice been successfully brought to maturity within my own experience. On this subject, as it affects the southern end of Tentsmuir, Mr.

Mackenzie of Earlshall writes: "There seems to me no doubt whatever that the Grouse have fairly established themselves, and would rapidly increase to the fullest capacity of the heather on the ground, if they were properly protected from the ravages of their enemies—human as well as winged, etc. Last year I came on great numbers of their eggs which had been devoured by hoodies, which are far too numerous, and my watchers came on at least one band of nesters with Grouse eggs in their possession. It seems to me, therefore, that the Grouse must take very kindly to the place indeed, to have survived on it at all under the conditions which seem to prevail here." Mr. Mackenzie also complains that all his efforts to thin the ranks of the crows are ineffective; for whenever they are molested on his ground these wary birds simply betake themselves for the time to the large pine-woods in the neighbourhood—where, as they know, they have nothing to fear, and where they can remain secure till, the danger having passed, they may once more enter upon their persecution of the Grouse in safety. From my own experience, I can testify to the difficulty of trapping crows on ground where a plentiful supply of their natural food in the shape of young, or—in wet weather—drowned rabbits can almost always be obtained. Shooting them in the open is practically impossible. As for a pole-trap, for my part, I cannot on any terms tolerate that almost inhuman engine; and in any case where owls, terns, and other harmless and interesting birds so abound, the crows hunting the moor would seldom find the trap unoccupied, and no good would result from the use of one.

The protection of the northern part of the moor has been most beneficial, not to the Grouse only, but to those wild birds which nest there as well. Sheldrakes, eiders, etc., breed, I think, in increasing numbers. By "protection" is here meant entire prohibition and, so far as is practicable, prevention of all unauthorised egg-gathering, together with rigorous persecution of the crows, but not, let me add, of owls and kestrels, or of the merlins or the rarer and larger Raptores which may occasionally visit the moor at migration time, and which are in general sedulously preserved. Where the ground is protected, some species of wild birds at least

are in any season able to nest and rear their young in comparative security; and, further, except in unusually cold summers such as that of 1888, or when, as happened in June 1893, the heat is so excessive that the underground water-level sinks faster than it is possible to deepen the pits, a good bag of grouse may confidently be relied on; for "disease" is, so far, absolutely unknown on the moor.

The Tentsmuir Grouse and their fortunes in the future will perhaps be as much the immediate concern of the sportsman as of the naturalist; but it is from the point of view of the latter only, so far as possible, that I have attempted to give their history in the past: others may, I trust, be interested to learn some of the details of this experiment in practical ornithology which the late Admiral Maitland Dougall so shrewdly undertook, and, with the able assistance of his gamekeeper, Mr. John Fowlis, so successfully carried out.

THE BIRDS OF THE ISLAND OF BARRA.

By JOHN MACRURY, M.B.

(Continued from page 145).

SPARROW-HAWK, *Accipiter nisus*, L.—I am very doubtful if this bird occurs at all on the island, but if it does visit us occasionally, it certainly is rather rare.

GREENLAND FALCON, *Falco candicans*, J. F. Gmelin.—A beautiful specimen of this species is in the collection at Eoligary, which was shot by Mr. Murdo Macgillivray about ten years ago. Another specimen was got in a rabbit-trap on the farm about five years ago. These are the only records of its occurrence that I can trace.

PEREGRINE FALCON, *Falco peregrinus*, Tunstall.—A few are seen all the year round, and at least 3 or 4 pairs breed in the southern islands.

MERLIN, *Falco aesalon*, Tunstall.—Fairly common all the year. Several pairs breeding.

KESTREL, *Falco tinnunculus*, L.—A few occasionally seen, but not at all common, and I do not think it nests on the island.

- COMMON CORMORANT, *Phalacrocorax carbo*, L.—Very plentiful all the year round, nesting in the rocky caves and precipices of the surrounding small islands; but the rocks used for roosting during the rest of the year are seldom, if ever, used for nesting, the latter being more secluded and inaccessible.
- SHAG, *Phalacrocorax graculus* (L.)—More abundant than the larger species, and breeding in rocky caves.
- GANNET, *Sula bassana* (L.)—Very plentiful round the coast in summer and autumn, but only a few seen in winter. None nest or roost on any of the surrounding islands—the whole apparently going to St. Kilda.
- COMMON HERON, *Ardea cinerea*, L.—Abundant at all times, except during the breeding season; and although a few birds remain through the entire summer, these no doubt are barren birds, as none breed here.
- SPOONBILL, *Platalea leucorodia* (L.)—In a copy of Macgillivray's "British Birds," vol. 4, which belonged to the late Dr. Macgillivray of Eoligary, I find the following marginal pencil note by the late Mr. Charles Gordon, who was a brother of the late proprietor of South Uist and Barra, and lived for some years in South Uist:—
- "Dr. D. Macgillivray, half-brother to the author, showed me a skin of a Spoonbill which he related had been shot by himself on the farm of Ormiclate, South Uist. Two other specimens were got in Barra at the same time. C. G."
- Dr. Macgillivray's sons confirm the above note, as they often heard their father speak of his having shot the bird. This would be forty-five or fifty years ago, but there is no record of the occurrence of the Spoonbill in Barra or South Uist since that time.
- GRAYLAG GOOSE, *Anser cinereus*, Meyer.—A few come across occasionally from South Uist during severe winters, but never remain longer than a few days.
- WHITE-FRONTED GOOSE, *Anser albifrons*, Scopoli.—In January 1891 five or six birds were seen on this island, and on 16th April 1893 a flock of nine appeared at Eoligary and stayed for a week. These are the only records of its occurrence in Barra I can get.
- BERNICLE GOOSE, *Bernicla leucopsis*, Bechstein.—Very plentiful in the winter, especially on the islands of the Sound, arriving in October and leaving about the end of April.
- BRENT GOOSE, *Bernicla brenta*, Pallas.—A flock of about twenty birds frequent the big strand at Eoligary, arriving and departing about the same time as the Bernicles.

- WHOOPEE SWAN, *Cygnus musicus*, Bechstein.—Small flocks of this, and probably also of Bewick's Swan, pass over the island occasionally, but seldom alight, owing to the absence of lakes of any size.
- MUTE SWAN, *Cygnus olor*, J. F. Gmelin.—A couple of young birds were taken to Eoligary from North Uist last year. They feed in the marshes and pools through the day, and at night generally come to the house to be fed.
- COMMON SHELDUCK, *Tadorna cornuta*, S. G. Gmelin.—Fairly numerous and permanently resident, nesting in rabbit-holes.
- MALLARD WILD DUCK, *Anas boschas*, L.—Breeding and permanently resident; but, owing to the small number of lakes and suitable feeding-grounds, the number of the species is very limited.
- GADWALL, *Anas streperus*, L.—Three years ago, in the month of September, I shot a couple of this species at Eoligary, when flying across the island from the west. There were three or four other birds, but this was the only time I ever saw the Gadwall in Barra.
- TEAL, *Querquedula crecca* (L.)—A few are seen in the winter, and probably a pair or two nest, as I came across a brood one autumn very early in the season; but it is not at all a common bird on the island.
- WIGEON, *Mareca penelope* (L.)—Fairly common in the winter, but does not stay to breed.
- SCAUP DUCK, *Fuligula marila*, (L.)—On 18th February 1892 I shot a Scaup Duck on the sea not far from my house. This was the only bird of the species I saw in Barra.
- GOLDEN-EYE, *Clangula glaucion* (L.)—A small flock of a dozen or so visit one of the lochs of the island every winter, but leave early in the spring.
- LONG-TAILED DUCK, *Harelda glacialis* (L.)—Very common on the west side of the island in the winter, arriving early in October and leaving late in April. In July 1891 I saw a male of the species at a spot much frequented by the birds in the winter, but it was probably a straggler.
- EIDER DUCK, *Somateria mollissima* (L.)—Very plentiful all the year round, nesting principally within easy reach of the sea; but it is gradually extending its breeding range farther inland some considerable distance from the sea.
- RED-BREASTED MERGANSER, *Mergus serrator* (L.)—Very common in the winter, but only a limited number remain to breed, probably owing to unsuitable localities, as they generally prefer to nest on islands of fresh-water lakes, where they feed on trout.

- RING DOVE or WOOD PIGEON, *Columba palumbus* (L.)—The Ring Dove has been met with on several occasions in Barra. The first record is 15th October 1887: a single bird shot by Mr. M'Elfish, Lochmaddy. Last year, and this year, I saw two or three birds several times; but it is a very uncommon visitor, and never stays very long on the island.
- ROCK DOVE, *Columba livia*, J. F. Gmelin.—Very plentiful all the year, roosting and breeding in the numerous rocky caves along the coast.
- RED GROUSE, *Lagopus scoticus*, Latham.—Very limited in numbers, probably owing to the abundance of their natural enemies, chiefly the hooded crows.
- QUAIL, *Coturnix communis*, Bonnaterre.—Several birds of this species, probably five or six pairs, visited the island last summer. About the middle of June I first heard the notes of two or three in a field of hay on the minister's glebe. From this time up to the middle of August their notes could always be heard about the same place, so that they must have nested there. Several times I attempted to put them up, but never succeeded, the cover being too thick. The Rev. Archibald M'Donald, who often accompanied me on these occasions, succeeded, however, one day, when alone, in putting up one, and described it to me.
- Many persons were struck by the strange notes which they had never heard before. I think Quail were more abundant than usual throughout Scotland last year.
- WATER RAIL, *Rallus aquaticus*, L.—Occasionally seen in the winter, but it is rather rare.
- LAND RAIL, *Crex pratensis*, Bechstein.—Very abundant in the summer, arriving early in May and leaving in September.
- MOOR HEN, *Gallinula chloropus*, L.—A few pairs permanently resident in swamps, but in winter some are seen on the sea.
- COOT, *Fulica atra* (L.)—A pair or two seem to reside permanently on St. Clair Loch, but I have not met with them elsewhere on this island.
- SIBERIAN CRANE, *Grus leucogeranus*.—One was shot by me on the island on 19th August 1891. This bird was afterwards supposed to have escaped from England.
- RINGED PLOVER, *Ægialitis hiaticula* (L.)—Common, breeding and permanently resident.
- GOLDEN PLOVER, *Charadrius pluvialis*, L.—A small flock visits the island in winter, but it does not stay to breed.

- GRAY PLOVER, *Squatarola helvetica* (L.)—A few birds have been noticed occasionally in the winter, but this is rather a rare species throughout the whole of the Outer Hebrides.
- LAPWING, *Vanellus vulgaris*, Bechstein.—Fairly common, breeding and permanently resident.
- TURNSTONE, *Streptilas interpres* (L.)—Pretty common at all times, except during the breeding season; and even then a few individuals may be found almost, if not quite, through the entire summer. I have seen birds on the 27th of May and also on the 18th of July 1893, but on both occasions in small flocks of about half a dozen. I have been looking out carefully for any appearance of nests, but found none. The Purple Sandpiper is also found very late in the summer, but still there is no evidence of their having nested in the outer islands. Probably those birds that remain late, or through the entire summer, are barren birds, like the individuals of the Curlew and Heron species that may be seen every summer at their old winter quarters, but never nest here.
- OYSTER CATCHER, *Haematopus ostralegus* (L.)—Very abundant in autumn and winter, and a considerable number breed, but only a small proportion compared with the numbers met with in winter.
- GRAY PHALAROPE, *Phalaropus fulicarius*, L.—Two birds were caught on the island during a gale on 26th September 1891. I think this was the only occasion on which any of the species occurred in any part of the Outer Hebrides.
- WOODCOCK, *Scolopax rusticula*, L.—Not very uncommon in the winter.
- COMMON SNIPE, *Gallinago caelestis*, Frengel.—Rather plentiful, breeding and resident.
- JACK SNIPE, *Gallinago gallinula*, L.—Common in the winter.
- DUNLIN, *Tringa alpina*, L.—Common on the shores in the winter; and I think a few pairs nest, as I saw pairs in midsummer, although I did not get eggs.
- PURPLE SANDPIPER, *Tringa striata*, L.—Very common in the winter, and a few met with till June, but there is no proof of their having nested here yet.
- KNOT, *Tringa canutus*, L.—I met a small flock of this species on the island in the autumn of 1892, the first seen by me in the Outer Hebrides. Since then they have been visiting in autumn and winter in larger numbers and as there are excellent feeding-grounds they will probably become regular winter visitors.
- RUFF, *Machetes pugnax*, L.—One bird was seen by me on 2nd September 1889. This is the only record from Barra.

SANDERLING, *Calidris arenaria* (L.)—Very common in the winter, but leaves earlier than the Turnstone and Purple Sandpiper.

COMMON SANDPIPER, *Totanus hypoleucus*, L.—A few pairs arrive punctually about the 1st of May, nest, and leave with their young as soon as they are fledged.

REDSHANK, *Totanus calidris*, L.—Common in the winter, but does not stay to breed.

GREENSHANK, *Totanus canescens*, J. F. Gmelin.—One or two birds are occasionally met with in winter, but it is decidedly very rare at present in the southern half of the Long Island, although in Macgillivray's time it seemed to have been more common. In their notes of this bird by Messrs. Harvie-Brown and Buckley in "Vertebrate Fauna of Outer Hebrides," I think they mistake Macgillivray's meaning when they state that "he speaks of their numbers in Uist, Harris, and Lewis as *astonishing*." Now the term "*astonishing*" was applied by Macgillivray to the number of the *lakes* in these islands, which certainly are very numerous, and not to the *birds*, as may be seen from his words, which are as follow: "Many individuals remain during the summer, when they are to be found by the lakes in the interior, of which the number in Uist, Harris, and Lewis is *astonishing*," vol. iv. p. 322. Further on he mentions having *once* found the nest of this bird in Harris, and then states that "although in summer these birds may be seen in many parts of these islands, they are yet very rare, a pair being to be met with only at the interval of several miles." A little attention to the text would have prevented this mistake.

BAR-TAILED GODWIT, *Limosa lapponica* (L.)—Plentiful in winter, arriving in September and leaving in April.

WHIMBREL, *Numenius phaeopus* (L.)—Small flocks arrive at the beginning of May and leave at the end of the month. A few birds are seen on the return autumn migration. One bird has to my certain knowledge been permanently resident on the island since I came five years ago, as I have already recorded in the "Annals." I saw it when last in the locality a few weeks ago; and as it is not a wounded bird, its staying on the island is very remarkable.

CURLEW, *Numenius arquata*, L.—Common, except at the breeding season, when only a few birds remain; but it has never been known to breed on the island.

ARCTIC TERN, *Sterna macrura*, Naumann.—Common as a breeding species, arriving about the middle of May. I have never seen the Common Tern in Barra.

- BLACK-HEADED GULL, *Larus ridibundus*, L.—Not uncommon during greater part of year, but I am not sure if any breed on the island: certainly not large colonies.
- COMMON GULL, *Larus canus*, L.—Abundant at all times, and breeding.
- HERRING GULL, *Larus argentatus*, J. F. Gmelin.—Plentiful all the year, and breeding.
- LESSER BLACK-BACKED GULL, *Larus fuscus*, L.—Common all the year, but not very abundant.
- GREAT BLACK-BACKED GULL, *Larus marinus*, L.—Common at all times. On an island near Mingalay I counted at least twenty pairs breeding last season.
- GLAUCOUS GULL, *Larus glaucus*, O. Fabricius.—Occasionally seen during severe winters. I have met with three or four of them.
- ICELAND GULL, *Larus leucopterus*, Faber.—One young bird, which I examined, was got here in the winter of 1893.
- KITTIWAKE GULL, *Rissa tridactyla* (L.)—Large colonies breed in the rocks of Mingalay and Bernera, and a few birds remain round the coast all the year.
- GREAT SKUA, *Stercorarius catarrhactes* (L.)—A Great Skua was identified early last summer (1893) at Barrahead by Miss Edgar, daughter of the principal light-keeper. It flew quite close to the lighthouse, but seemed to be only passing, as she did not see it again.
- POMATORHINE SKUA, *Stercorarius pomatorhinus*, Temminck.—Seen occasionally round the coast in summer and autumn.
- RICHARDSON'S SKUA, *Stercorarius crepidatus*, J. F. Gmelin.—Regular summer and autumn visitors, but I do not think they breed here.
- MANX SHEAR-WATER, *Puffinus anglorum*, Tem.—Occurs round the coast, and a few are said to breed in one of the southern islands; but they have deserted their old breeding-places at Mingalay some years ago, and the Common Fulmar is seldom or never seen about the coasts.
- FORK-TAILED PETREL, *Oceanodroma leucorhoa*, Vieillot.—Occurs round the coast, and a few may be breeding in the southern islands.
- STORM PETREL, *Procellaria pelagica* (L.)—A few are seen about the coast; but it is doubtful if it breeds anywhere on the islands of Barra at present, although at one time it seems considerable numbers of them bred in Mingalay Island.
- RAZORBILL, *Alca torda*, L.—Very abundant at the southern islands during the breeding season, and a few birds remain on

the coast all the winter. There is one point in connection with this bird and the Common Guillemot which, as I have seen no reference made to it in books, I think of sufficient interest to mention here. When hatching, the Razorbill, as is well known, lies alongside of the egg, whereas the Guillemot sits right over it. Now on each side of the Razorbill, under the wing, is a circular spot about two inches in diameter, quite denuded of feathers, and with the skin round its circumference considerably thickened. The egg is held in this spot by the wing, and must be kept much warmer by coming directly in contact with the skin than would be the case were the feathers to intervene. The Guillemot has a spot exactly similar in the lower third of its breast, in the middle line. These spots must be carefully searched for, even when the birds are in the hand, as the surrounding feathers, which are very thick, completely cover them, which probably is the reason why they have been overlooked. They are found only on the sitting birds, as I have examined several during the breeding season which showed no trace of them.

I have one Razorbill's egg which is pure white. Two of this colour were got at Barrahead in 1893, at the same spot, at about ten days' interval, and were supposed to have been laid by the same bird.

COMMON GUILLEMOT, *Uria troile* (L.)—Immense colonies breed in the southern islands, and a few birds remain round the coast during the winter. The bridled variety number about one in five, and are of both sexes, pairing with each other and with the common variety indifferently, as I have frequently observed in the rocks.

BLACK GUILLEMOT, *Uria grylle* (L.)—This species is moderately plentiful during the breeding season at various localities round the islands. In winter, too, it is not uncommon, although I believe the bulk of those that remain with us are young birds in the grayish white plumage. A few old birds are, however, met with, and these are in the black or summer plumage. I have already in the "Annals" drawn attention to the fact that this Guillemot always retains the black plumage in winter once it has attained it, when about a year or ten months old. I have met with birds in the full summer or black plumage early in February, when the young are in the gray—the latter not changing to the black till the beginning of May; and Mr. Malcolm Macaulay, the Lighthouse boatman, who knows the bird perfectly well, tells me that he meets with numbers of them every winter in the black plumage, when visiting the Lighthouse at Barrahead.

LITTLE AUK, *Mergulus alle* (L.)—A number of this species were washed ashore dead on the west side of Barra this winter, probably owing to the severe and long-continued gales. One of them was preserved by Mr. Macgillivray. It is rather rare on the coast.

PUFFIN, *Fratercula arctica* (L.)—Very abundant as a breeding species at Mingalay and Barra Head; but few, if any, remain through the winter. Numbers of the Puffin, Razorbill, and Guillemot used at one time to be salted and stored up for winter use by the natives of the southern islands, but at present this practice is not so common. There is a story related of a former minister of Barra who was one day visited by a native of the island of Mingalay. The minister asked the man what kind of birds they had in the islands, when he got the following reply—in the native language of course: “Dh’itheadh tu tri dhe na seumais ruadha, dha dhe’n duibheanach, ach dheanadh a langach sath do chridhe dhut;” which means, “You could eat three Puffins, two Razorbills, but the Guillemot would satisfy you to your heart’s content.” The minister felt rather offended, especially as the singular pronoun was used; but of course the man had given a graphic description of the birds from his own point of view.

GREAT NORTHERN DIVER, *Colymbus glacialis*, L.—Common all round the coast, remaining till the beginning of June.

BLACK-THROATED DIVER, *Colymbus arcticus*, L.—Rather rare, but a few are seen in winter on the sea.

RED-THROATED DIVER, *Colymbus septentrionalis*, L.—More common than the last, but does not breed on the island.

SLAVONIAN GREBE, *Podiceps auritus* (L.)—Not uncommon on the Sound of Barra in winter.

LITTLE GREBE, *Podiceps fluviatilis* (Tunstall).—A few are seen in sheltered bays of the sea in winter, but it does not breed on the island, probably owing to the want of suitable lakes, although it breeds in large numbers in Uist.

ADDENDUM.

CROSSBILL, *Loxia curvirostra*, L.—A few of these birds appeared in my garden on June 30th, 1894, and remained for fully a week. Two were fully adult males; the rest were in female plumage.

REPORT ON THE MOVEMENTS AND OCCURRENCE OF BIRDS IN SCOTLAND DURING 1893.

By LIONEL W. HINXMAN, 'B.A.

(Continued from page 153).

PHYLLOSCOPUS TROCHILUS (Willow Wren).

Orkney.—N. Ronaldshay, April 27, Aug. 11, Oct. 4.

Moray.—Strathspey, April 18.

Dec.—Fyvie, April 20—Sept. 16.

Forth.—Brig o' Turk, April 8; Dalmeny, April 15; Edinburgh, April 19—Sept. 18.

Tweed.—Chirnside, April 18.

Outer Hebrides.—Barra, Nov. 13, 14, one caught, and another seen a week later; Barra Head, April 21; Monach, Oct. 7.

Argyll and Isles.—Tiree, April 8; Skerryvore, May 11, in rush, S.E.

Clyde.—Giffnock, April 9—Sept. 16.

Earliest, April 8, Trossachs and Tiree; latest, Nov. 20, Barra. Principal movements, April 15-19.

PHYLLOSCOPUS SIBILATRIX (Wood Wren).

Tay.—Struan, May 7.

Forth.—Dreghorn, April 30; Dalmeny, April 30.

ACROCEPHALUS SCHÆNOBÆNUS (Sedge Warbler).

Moray.—Cabrach, May 12.

Dec.—Fyvie, April 28.

Forth.—Menteith, April 30; Edinburgh, April 30—Sept. 3.

Tweed.—Hallmyre, May 1.

Clyde.—Mearns, April 23.

Earliest, April 23, Mearns; latest Sept. 3, Edinburgh.

LOCUSTELLA NÆVIA (Grasshopper Warbler).

Argyll and Isles.—Observed at Loch Creran in May and June—"Field."

ACCENTOR MODULARIS (Hedge Sparrow).

Orkney.—N. Ronaldshay, Oct. 4, "rarely seen here."

Outer Hebrides.—Barra Head, a pair, May 3.

AMPELIS GARRULUS (Waxwing).

Sutherland.—Tongue, Jan. 11; Wick, Feb. 4.

Moray.—Golspie, Jan. 27.

Dec.—New Pitsligo, Jan. 2; Tough, Jan. 7; Rhynie, Feb. 25; Arbuthnot, March 25.

Tay.—Carse of Gowrie and near Errol, Jan. 9; Invergowrie during February in considerable numbers, and in August a pair with young. This pair was seen all the spring at the same place, and must have nested.¹

Tweed.—Roxburgh.

West Ross.—Inverewe, end of April.

Solway.—Mugdoch, Feb. 5.

MUSCICAPA PARVA (Red-breasted Flycatcher).

Outer Hebrides.—Young ♂ captured at Monach L.H. by William Tulloch, Oct. 22. The first record of this bird for Scotland.

MUSCICAPA ATRICAPILLA (Pied Flycatcher).

Orkney.—N. Ronaldshay, May 16, one; Oct. 4, one, with Red-starts.

MUSCICAPA GRISOLA (Spotted Flycatcher).

Forth.—Dreghorn, May 5.

Clyde.—Thornliebank, May 9; Queen's Park, Aug. 30.

HIRUNDO RUSTICA (Swallow).

Shetland.—N. Unst, May 23; Bressay, May 22.

Moray.—Strathspey, April 24.

Dec.—Girdleness, May 4; Fyvie, April 21—Oct. 6; Peterhead, Sept. 29—main body left on 17th.

Tay.—Arbroath, April 19; Bell Rock, April 28, 29.

Forth.—Dalmeny, April 18—Oct. 30; Gosford, April 23; Edinburgh, Oct. 17.

Tweed.—Hallmyre, April 18; Chirside, April 24—Nov. 4.

Outer Hebrides.—Barra, April 22.

Argyll and Isles.—Skerryvore, May 19.

Clyde.—Mallsmire, April 22—Oct. 17.

Solway.—Loch Ryan, April 17.

Earliest record, April 17, Loch Ryan; latest, Chirside, Nov. 4.

¹ This is a most surprising statement. Were the birds seen in August satisfactorily identified?—EDS.

CHELIDON URBICA (House Martin).

Orkney.—N. Ronaldshay, June 4, 9, 18.

Moray.—Strathspey, April 24.

Dee.—Fyvie, April 22-Sept. 18; Girdleness, Sept. 28, flying S.,
“seldom seen.”

Tay.—Bell Rock, May 15, 17; Arbroath, Sept. 29.

Forth.—Gosford, April 23; Edinburgh, Oct. 17.

Tweed.—Hallmyre, April 29; Chirnside, Oct. 10.

Outer Hebrides.—Barra Head, April 22; Monach, May 17.

Earliest, April 22, Fyvie and Barra Head; latest, Oct. 17,
Edinburgh.

COTILE RIPARIA (Sand Martin).

Moray.—Rothes, April 19; Golspie, April 22.

Dee.—Fyvie, April 22.

Tay.—Tayfield, April 18; Arbroath, April 19.

Forth.—Burtisland, April 9; Duddingston, April 19.

Tweed.—Allanton, April 8-Oct. 6.

Argyll and Isles.—Skerryvore, March 19, six, wind S.

Clyde.—Gryfe Water, April 15.

Earliest, March 19, Skerryvore; latest, Allanton, Oct. 6.

FRINGILLINÆ (Finches).

Shetland.—N. Unst, Oct. 9, Chaffinches; Oct. 13, Linnets; Oct. 18,
Redpoles. Dunrossness, Oct. 5, Chaffinches.

Orkney.—N. Ronaldshay, Oct. 11, 25, small flocks of Greenfinches,
“not seen here before”; large flocks of Chaffinches, with a
few Bramblings, Oct. 4, after strong winds from S.E.; fresh
flocks during this month, and in large numbers on 9th. Pentland
Skerries, Feb. 10, eight Mealy Redpoles; Feb. 23, pair of
Bullfinches; Oct. 4, 5, rush of Chaffinches and Linnets, with
Redwings, Redstarts, and other birds, S.W.-N.E., light.

Dee.—Girdleness, Oct. 9, Chaffinches; Nov. 10, flock of Chaffinches,
Greenfinches, and Linnets; Dec. 21, large flock of Greenfinches.

Tay.—Bell Rock, March 24, Chaffinches and Siskins; April 18, 19,
Siskins and “other small birds”; July 5, Siskins; Sept. 3, 4,
10-12, Siskins and Linnets.

Outer Hebrides.—Monach, Oct. 10, Chaffinch; Nov. 2, Chaffinches
and Goldfinch; Nov. 4, seven Greenfinches; Nov. 13,
Chaffinches and Bramblings in rush with *Turdidæ*, E.S.E.
I. Ghlais, April 1, large flock of Linnets. Barra, Oct. 7,
Greenfinches; Oct. 13, Chaffinches; Nov. 10, flock of 100
Greenfinches, “very seldom seen here previously.”

Argyll and Isles.—Tiree, Oct. 23, flocks of Greenfinches. Skerryvore, Sept. 17, Linnets; Chaffinches singly at intervals, Oct. 9-21; in rush with *Turdideæ*, Nov. 12.

Clyde.—Mount Florida, Dec. 31, three Goldfinches.
Principal movements, Oct. 4, 5, 9-13; Nov. 10-13.

PASSER DOMESTICUS (House Sparrow).

Outer Hebrides.—Barra, Nov. 26, 3 ♂, 2 ♀. First time seen here, though *P. montanus* is abundant and resident.

PLECTROPHANES NIVALIS (Snow Bunting).

Shetland.—N. Unst, May 28, one; Sept. 19, two. Dunrossness, Sept. 16, one; Sept. 23, in flocks; Oct. 25-Nov. 6, in rushes.

Orkney.—N. Ronaldshay, last seen May 1, in full breeding plumage; first seen Sept. 19, three; small flocks after Sept. 22; Oct. 9, flock of 1000. "Nothing like the numbers seen last year."

Moray.—Glenavon, Nov. 2; Eastern Cairngorms, several localities, June and July.

Dee.—Fyvie, March 30, Oct. 28.

Forth.—Aberlady Bay, April 23.

Outer Hebrides.—Barra, April 6, "increasing here and remaining for the winter." Barra Head, Oct. 6. Monach, Oct. 2, one; Oct. 16, in flock with Larks.

Argyll and Isles.—Ardnamurchan, Sept. 22; Tiree, Oct. 4, 24, in numbers.

Earliest record, Sept. 16, Dunrossness; latest, N. Unst, May 28 (possibly remaining to breed). Principal movements, Sept. 22, 23; Oct. 24-Nov. 6.

MOTACILLINÆ (Wagtails).

Orkney.—N. Ronaldshay, Aug. 22, small flocks of *M. lugubris* (Pied Wagtail). Pentland Skerries, March 23, *M. lugubris*; Sept. 4, *M. melanope* (Gray Wagtail).

Dee.—Girdleness, Oct. 9, *M. lugubris*.

Forth.—*M. alba* (White Wagtail), two; Aberlady Bay, April 23; North Berwick, August 27.

Outer Hebrides.—Barra, *M. alba*, May 1; *M. melanope*, Oct. 6, "first record here." Monach, April 19, "Wagtails."

Argyll and Isles.—Tiree, parties of *M. alba* travelling N.E., April 7, May 1; and again passing S. in small flocks, Aug. 24, 25, 29.

ANTHUS PRATENSIS (Meadow Pipit).

Orkney.—N. Ronaldshay, a few during September and early October
"Does not breed here."

- Argyll and Isles.* Skerryvore, "Titlarks," March 26, April 24; May 15, in rush with Warblers; Sept. 14; Oct. 5, a flock, flying N.; Oct. 8, with Warblers and Thrushes.
Clyde.—Sanda L.H., Nov. 11, 13, in rushes with Blackbirds, etc., N.E.-E.

ANTHUS TRIVIALIS (Tree Pipit).

- Moray.*—Strathspey, April 24.
Forth.—Midlothian, April 24; Dalmeny, April 29.
Tweed.—Hallmyre, April 29.
Clyde.—Giffnock, April 23.
 Earliest record, April 23, Giffnock.

LANIUS EXCUBITOR (Great Gray Shrike).

- Tweed.*—Willnage, Duns, Sept. 10 (an early date).

ORIOIUS GALBULA (Golden Oriole).

- Orkney.*—Sanday, May 20.

ALAUDA ARVENSIS (Skylark).

- Orkney.*—Pentland Skerries, Oct. 5, in rush with Linnets and Redbreasts.
Tay.—Bell Rock, March 13; April 19, with Siskins and other small birds.
Forth.—Inchkeith L.H., Feb. 3, 5, 12, single birds.
Outer Hebrides.—Monach, Aug. 26, six; Oct. 16, in flock with Snow Buntings; Nov. 7, flock of 100.
Argyll and Isles.—Skervuile, Oct. 8, wind S.E., strong. Skerryvore Jan. 6, Feb. 18, March 19, April 15; Nov. 12, in rush with *Turdidæ*.

STURNUS VULGARIS (Common Starling).

- Shetland.*—Bressay, Oct. 9, 16, at Light.
Orkney.—N. Ronaldshay, Oct. 10, flock of several thousands. Hoy Sound, March 26, 200; May 3, forty. Pentland Skerries, Oct. 18.
Tay.—Bell Rock, March 16, a few; Oct. 15-17, in numbers with Thrushes and others, S.W., haze.
Outer Hebrides.—Monach, Nov. 4, about 100; I. Ghlais, Feb. 27, large flocks.
Argyll and Isles.—Skerryvore, March 7, 20, April 15; Nov. 12, in rush with *Turdidæ* and Larks, E., haze.

CORVUS FRUGILEGUS (Rook).

Shetland.—Dunrossness, Nov. 1-13, in large flocks.

Orkney.—N. Ronaldshay, numbers seen during latter half of February and first half of March.

Outer Hebrides.—Barra, Oct. 20, in unusual numbers, and on Nov. 2 with Jackdaws (first of the latter seen here). Barra Head, Oct. 30, in flock, with Jackdaws. Monach, Jan. 7, March 18, Oct. 27-30, in large flocks during W.N.W. gale; Nov. 1-9, in hundreds, with some Jackdaws, going towards St. Kilda, gale to strong breeze, W.N.W.-N.E.; a few observed returning Nov. 10, 11, and some found dead on shore.

Argyll and Isles.—Skerryvore, Nov. 1, "Crows" and Jackdaws, W.N.W. gale.

CYPSELUS APUS (Swift).

Moray.—Rogart, May 15; Helmsdale, Sept. 7.

Tay.—Arbroath, May 3-Aug. 13; Tayfield, May 13.

Forth.—Leith, May 6; Edinburgh, Aug. 25.

Tweed.—Chirnside, May 14.

Outer Hebrides.—Barra Head, May 15.

Argyll and Isles.—Skerryvore, May 15, 16, Nov. 17, N. gale.

Clyde.—Mount Florida, May 2-Aug. 17.

Earliest, May 2, Mount Florida; latest, Nov. 17, Skerryvore.

CAPRIMULGUS EUROPÆUS (Nightjar).

Orkney.—N. Ronaldshay, June 4, "first time seen here."

Dee.—Fyvie, last seen Aug. 24.

West Ross.—Kinloch, Shieldaig, May 13.

ALCEDO ISPIDA (Kingfisher).

Moray.—Delfur, Strathspey, Oct. 22.

Argyll and Isles.—Mull, Nov. 17.

UPUPA EOPS (Hoopoe).

Orkney.—One shot in Eday, "autumn."

CUCULUS CANORUS (Cuckoo).

Moray.—Cabrach, April 28; Rogart, May 2; Aviemore, May 4.

Dee.—Fyvie, May 6-August 7.

Tay.—Struan, May 6.

Forth.—Edinburgh, Dalmeny, April 26; Callander, April 27.

Tweed.—Hallmyre, April 26-August 15.

West Ross.—Shieldaig, May 3.

Outer Hebrides.—Barra, May 1.

Argyll and Isles.—Earraid, Mull, May 2.

Earliest record, April 26, Edinburgh, Hallmyre; latest, Aug. 15, Hallmyre.

STRIGIDÆ (Owls).

Shetland.—N. Unst, Dec. 10, Snowy Owl. Dunrossness, Oct. 15, Snowy owl, flying S.; Oct. 6, one Long-eared Owl; Oct. 15, Short-eared Owl.

Orkney.—N. Ronaldshay, Snowy Owl shot Feb. 27, another seen; Short-eared Owl shot Oct. 9, six seen Oct. 13, after S.S.W. gale. Pentland Skerries, Oct. 17, pair of Short-eared Owls shot, S.W.

Sutherland.—Snowy Owl, Strathmore, Thurso; Short-eared Owls “plentiful about Thurso this season.”

Argyll and Isles.—Tiree, Oct. 17, two Short-eared Owls.

FALCONIDÆ (Hawks and Falcons).

Orkney.—N. Ronaldshay. Merlins unusually plentiful in autumn.

Outer Hebrides.—Barra Head. Hen Harrier, Aug. 27.

BOTAURUS STELLARIS (Bittern).

Sutherland.—Lochend, Thurso, Nov. 22, ♂ caught, after severe gale.

ANSERINÆ (Geese).

Shetland.—N. Unst, “Geese” on Loch Cliff, Oct. 18; Brent Geese passing W., Dec. 21. Dunrossness, Oct. 9, one Bernicle Goose passing N.W.; Oct. 12, three Greylag; Oct. 16, ten Greylag.

Orkney.—N. Ronaldshay, Oct. 23, two Brent Geese.

Tay.—Newport, Fife, “Geese” left on April 22.

Tweed.—Pink-footed Geese (*Anser brachyrhynchus*) on tarns on Coldingham Moor during migration in March and November.

Outer Hebrides.—Monach, “Geese,” April 19, Oct. 10; Bernicle Geese, Oct. 15. Barra, Bernicle Geese on the island till April 26; White-fronted Geese (*Anser albifrons*), nine, April 16; Brent Geese, Dec. 13, 14, “later than usual.” Barra Head, Jan. 7, 10, fifty Bernicle Geese.

Argyll and Isles.—Tiree, May 2, flock of over 100 *A. albifrons* flying N.; Oct. 8, large flock of *A. albifrons*; Oct. 11, flock of 200 “Geese” passing S.E.; Oct. 29, five Bernicle Geese; Nov. 29, thirty Bernicle Geese. Earraid, Mull, Oct. 22, 29, flocks of “Geese” passing S.

Principal movements—April 16-26, Oct. 8-16, 22, 29.

CYGNINÆ (Swans).

- Shetland*.—N. Unst, numbers of "Swans" about Loch Cliff and flying S. during January and February; Dec. 9, one; Dec. 10, twelve. Dunrossness, Oct. 11, six "Swans"; Oct. 23, one shot, none seen since.
- Outer Hebrides*.—Barra Head, Jan 11, 12, flocks of Whoopers (*Cygnus musicus*) flying S.
- West Ross*.—"Swans" left Loch Loin March 15.
- Argyll and Isles*.—Tiree, Jan 30, Feb. 20, "large flocks of Whoopers on the lochs, never so many seen on the island before," mostly gone by March 9; Nov. 13, flock of eighteen Whoopers.

ANATINÆ (Ducks).

- Shetland*.—Dunrossness, Sept. 12, Wigeon (*Mareca penelope*); Sept. 23, Wigeon; Sept. 30, 100 Wigeon; Oct. 11, Long-tailed Duck (*Harelda glacialis*).
- Orkney*.—N. Ronaldshay, Shoveller (*Spatula clypeata*), breeding in Sanday in considerable numbers, scarce after Aug. 1; Pintail (*Dafila acuta*), latter end of May, young ♂ shot Oct. 23; Wigeon breeding in Sanday in flocks, Oct. 2; Tufted Duck (*Fuligula cristata*), April 24; Long-tailed Duck, Sept. 26.
- Sutherland*.—Long-tailed Duck, Keiss, Mar. 15; Loch of Stemster, Dec. 5. Common Scoter (*Edemia nigra*) nesting at Alltnabreac, June 7.
- Forth*.—Wigeon, Pentlands, Sept. 24; Shelduck (*Tadorna cornuta*), Dalmeny, Sept. 29; Golden Eye (*Clangula glaucion*), Firth of Forth, Oct. 14. Great increase of Shoveller as a breeding species about Doune.
- Tweed*.—Tufted Duck breeding at Duns Castle.
- Outer Hebrides*.—Barra, April 16, flocks of Long-tailed Duck; Wigeon left April 28. Barra Head, Teal, Sept. 3; Eider Duck (*Somateria mollissima*) arrived Oct. 26.
- Argyll and Isles*.—Tiree, Pintail, March 7; Shoveller, Sept. 3; Smew (*Mergus albellus*), Sept. 30; Gadwall (*Chaulelasmus streperus*) and Shoveller, Dec. 2. Skerryvore, Eiders arrived Oct. 8.
- Clyde*.—Golden Eye, numerous on Brother Loch, Mearns, May 20-28.

COLUMBA ÆNAS (Stock Dove).

- Shetland*.—Dunrossness, one killed Nov. 13; first record for Shetland.
- Tay*.—Arbroath, two killed Dec. 14.

TURTUR COMMUNIS (Turtle Dove).

Tay.—Longforgan, one shot “spring.”

Solway.—One shot in Wigtownshire Oct. 25.

COTURNIX COMMUNIS (Quail).

Shetland.—Breeding in Unst in some numbers.

Moray.—Dunrobin, Sept. 7; several shot at Strathpeffer, present all summer; in unusual numbers in Elginshire during September and October; Beauly, Fortrose, and Clach-na-harry in August.

Tay.—Meigle, September; Auchengarroch.

Forth.—Heard in many localities in Midlothian throughout the summer, nest taken at Tranent; Preston; Leven, Fife.

Outer Hebrides.—Barra, heard from mid-June to September (first record here).

Solway.—Nesting in Dumfriesshire, June; Brocklehurst, Oct. 3.

RALLUS AQUATICUS (Water Rail).

Orkney.—N. Ronaldshay, Oct. 4, two shot; one or two seen in November.

Outer Hebrides.—Monach, Oct. 24.

CREX PRATENSIS (Land Rail).

Orkney.—N. Ronaldshay, last seen Oct. 14.

Dee.—Fyvie, May 6.

Tay.—Arbroath, May 9; Bell Rock, May 16.

Forth.—Edinburgh district, April 25.

Tweed.—Hallmyre, April 24-Sept. 19.

Outer Hebrides.—Barra, April 26; I. Ghlais, April 30.

West Ross.—Shieldaig, May 15.

Argyll and Isles.—Tiree, May 5; Earraid, May 9; Skerryvore, May 5, 6, S.E.

Clyde.—Giffnock, April 23.

Earliest record, April 23, Giffnock; latest, Oct. 14, N. Ronaldshay.

SQUATAROLA HELVETICA (Gray Plover).

Orkney.—N. Ronaldshay, Oct. 12, one young bird shot, with Turnstones.

CHARADRIUS PLUVIALIS (Golden Plover).

Orkney.—N. Ronaldshay, first seen end of June (an early date); very abundant Aug. 1-10, scarce after.

Outer Hebrides.—Monach, Oct. 2, Nov. 5. Barra Head, April 6, Sept. 16. I. Ghlais, large flock, Feb. 27, N.; Nov. 11, large flocks.

Argyll and Isles.—Tiree, Oct. 12, in large numbers; Skerryvore, Sept. 12, 14, resting on rock, W.S.W.

Clyde.—Cathcart, reappeared for winter Sept. 14.

EUDROMIAS MORINELLUS (Dotterel).

Moray.—Nesting on Eastern Cairngorms, June; Strathspey, on migration, Sept. 27.

VANELLUS VULGARIS (Lapwing).

Shetland.—Dunrossness, Oct. 6; Oct. 10, very large flock passing W.; Oct. 12, flock; Oct. 13.

Orkney.—Hoy Sound, April 2, small flock.

Tay.—Returned to coast, Arbroath, Feb. 13; in flocks, June 29. Bell Rock, first seen March 12, in flock.

Outer Hebrides.—Monach, March 8, Oct. 24; Barra Head, Jan. 7.

STREPSILAS INTERPRES (Turnstone).

Orkney.—N. Ronaldshay, "seen in small numbers during every month of the year."

Outer Hebrides.—Barra, May 27, small flock; July 18, eight, "doubtful if these ever left." Barra Head, Aug. 19, a pair; Monach, very numerous during winter; I. Ghlais, Aug. 12.

PHALAROPUS FULICARIUS (Gray Phalarope).

Argyll and Isles.—Skerryvore, one killed at Light, Oct. 19, S.S.W.

SCOLOPAX RUSTICULA (Woodcock).

Shetland.—N. Unst, "November"; Dunrossness, Nov. 14.

Orkney.—N. Ronaldshay, Oct. 10.

Moray.—Strath Brora, Sept. 20; Strathspey, Sept. 27, on migration.

Tay.—Arbroath, Sept. 22, on migration.

Forth.—Breeding in unusual numbers near Stirling, twenty-two nests found on one hill; very abundant in July; left early in August.

Outer Hebrides.—Monach, Oct. 19. I. Ghlais, Jan. 18, one at Light; Nov. 2.

GALLINAGO CÆLESTIS (Common Snipe).

Orkney.—N. Ronaldshay, unusually scarce, most present in August.

Outer Hebrides.—Barra Head, Oct. 1; I. Ghlais, Oct. 9, great numbers, S.W.

Argyll and Isles.—Tiree, Sept. 30, in large numbers, "unusually early."

GALLINAGO GALLINULA (Jack Snipe).

Orkney.—N. Ronaldshay, first seen Sept. 16; very plentiful during October.

Dee.—Fyvie, Oct. 12—April 19.

Outer Hebrides.—Monach, Oct. 15.

Argyll and Isles.—Tiree, Sept. 30.

Earliest, Sept. 16, N. Ronaldshay; latest, April 19, Fyvie.

CALIDRIS ARENARIA (Sanderling).

Orkney.—N. Ronaldshay, first seen Aug. 21.

Argyll and Isles.—Tiree, May 6, large flocks; Aug. 5, twenty.

TRINGA STRIATA (Purple Sandpiper).

Orkney.—N. Ronaldshay. “Comparatively scarce up to November; a few probably remain all the year.”

Outer Hebrides.—Barra, June 2, small flock still here; Monach, Oct. 9, two at Light.

TRINGA SUBARQUATA (Curlew Sandpiper).

Sutherland.—Thurso, Sept. 6, two killed.

[The occurrence of this species in N. Ronaldshay, Orkney, in 1892, was by inadvertence omitted from last year's Report. Mr. Allan Briggs records: “Aug. 24, two; Aug. 30, Sept. 1, numerous.”]

TRINGA MINUTA (Little Stint).

Orkney.—N. Ronaldshay, Sept. 8, 9; Oct. 14, 16.

TRINGA CANUTUS (Knot).

Orkney.—N. Ronaldshay, Aug. 15, 22, flock of forty; Sept. 11. Pentland Skerries, Sept. 6, flock of forty, three caught at Light, S., light.

Sutherland.—Thurso, Aug. 24, 29.

Forth.—Dalmeny, Sept. 23.

Outer Hebrides.—Barra, Aug. 19.

Argyll and Isles.—Tiree, Aug. 27-Sept. 4.

Earliest observed, Aug. 15, N. Ronaldshay.

MACHETES PUGNAX (Ruff).

Orkney.—N. Ronaldshay, numerous, first seen Aug. 24, four, and after in numbers up to Sept. 22.

Argyll and Isles.—Tiree, Sept. 4.

TOTANUS HYPOLEUCUS (Common Sandpiper).

- Moray*.—Rothes, April 19.
Forth.—Duddingston Loch, April 19.
Tweed.—Hallmyre, April 22.
Outer Hebrides.—Monach, April 23-Aug. 20; Barra, May 2.
West Ross.—Kinloch, Shieldaig, April 19.
Argyll and Isles.—Tiree, May 11; Skerryvore, May 20; Skervuile, Jura, Aug. 27.
Clyde.—Rutherglen, April 18.
 Earliest, April 18, Rutherglen; latest, Aug. 27, Skervuile.

TOTANUS CANESCENS (Greenshank).

- Orkney*.—N. Ronaldshay, Aug. 18-29, four or five single birds.
Argyll and Isles.—Tiree, Aug. 7, on migration.

TOTANUS CALIDRIS (Redshank).

- Tay*.—Arbroath, on the coast by June 29.

LIMOSA LAPPONICA (Bar-tailed Godwit).

- Orkney*.—N. Ronaldshay, a few single birds about Aug. 4-Sept. 20.
Forth.—Firth of Forth, Sept. 3, "Godwits."
Argyll and Isles.—Tiree, Aug. 27, two.

NUMENIUS ARQUATA (Curlew).

- Outer Hebrides*.—Monach, unusually numerous; in hundreds after June 3, and in lessening numbers after Aug. 25. Barra Head, Sept. 10, on migration.
Argyll and Isles.—Skerryvore, March 20, April 20, 21, 27, May 2, 3, 8; May 15, in large flock; Aug. 27-30, numbers; Oct. 8.

NUMENIUS PHÆOPUS (Whimbrel).

- Orkney*.—N. Ronaldshay, seen from May 14 to end of August, and plentiful during latter month.
Outer Hebrides.—Barra, May 2, in small flocks.
Argyll and Isles.—Tiree, May 4; May 15, plentiful passing N.; Aug. 10.

STERNINÆ (Terns).

- Shetland*.—Bressay, "Terns," June 7.
Orkney.—*S. cantiaca* (Sandwich Tern) nesting in N. Ronaldshay,

first record as a breeding species (see "Annals," 1894, p. 87).
Pentland Skerries, "Terns," May 10, Sept. 5.

Moray.—"Terns," Golspie, April 28.

Tay.—*S. minuta* (Little Tern), Edenmouth, April 24. *S. fluviatilis*
(Common Tern), April 27; Arbroath, May 18.

Forth.—Three *S. cantiaca*, Dunbar, Aug. 7.

Outer Hebrides.—Monach, "Terns" arrived May 16, left Sept. 13;
Barra, "Terns" arrived May 15.

Argyll and Isles.—Tiree, April 22, Little Terns passing; May 8,
Arctic and Little Terns arrived; May 18, pair of Sandwich Terns;
Arctic Terns left Sept. 19. Skervuile, Jura, "Terns" last
seen Oct. 7.

LARUS GLAUCUS (Glaucous Gull).

Shetland.—Dunrossness, Oct. 14, one flying S.W.

Orkney.—N. Ronaldshay, Oct. 23.

LARUS LEUCOPTERUS (Iceland Gull).

Sutherland.—Young ♂ killed at Shurrery, Nov. 11.

Outer Hebrides.—Barra Head, Sept. 24; Barra, Dec. 13; Monach,
Sept. 29, Oct. 2, 11 (young birds).

STERCORARIUS PARASITICUS (Buffon's Skua).

Orkney.—Eday, Sept. 4; Rendall, about same date.

MERGULUS ALLE (Little Auk).

Shetland.—Dunrossness, Dec. 8, S.W. gale.

Outer Hebrides.—Monach, June 24.

FRATERCULA ARCTICA (Puffin).

Outer Hebrides.—I. Ghlais, commenced to fly past the L.H. in
countless numbers at 8 p.m. on Aug. 1, and continued without
intermission for two days, all travelling S.

PODICIPEDIDÆ (Grebes).

Orkney.—N. Ronaldshay, *P. fluviatilis* (Little Grebe), Oct. 23.

Argyll and Isles.—Tiree, *P. cristatus* (Great Crested Grebe), Feb. 9
18; March 30, pair on Loch Vasapol, in intermediate plumage.
P. auritus (Slavonian Grebe) abundant on fresh-water lochs
during January and first week of December.

ON *PSAMMOSTEUS TAYLORI*, A NEW FOSSIL FISH FROM THE UPPER OLD RED SANDSTONE OF MORAYSHIRE.

BY R. H. TRAQUAIR, M.D., LL.D., F.R.S.

AMONG the large detached plates occurring in the Upper Old Red Sandstone of the neighbourhood of Elgin, which used to be slumped together by collectors under the name of "*Pterichthys major*," is one form which has never been found perfect, nor has it ever been described.

The most complete specimen which I have seen is represented in outline in the accompanying figure, one-fourth the natural size. It is from Newton Quarry, and belongs to the Edinburgh Museum, to which it was presented by Mr. William Taylor of Lhanbryde. Portions of still larger specimens were collected by the late Rev. Dr. Gordon, and belong to the Museum at Elgin.

These plates are tolerably thick, smooth internally, and as to their contour are gently hollowed in boat-like fashion. The complete outline has not yet been seen; but one extremity, presumably the posterior, is bluntly angulated in the manner shown in the figure. The outer surface appears to be incomplete in all the specimens from Morayshire; but in a fragment from the red sandstone of Balnagown, Ross-shire lent to me by Mr. Hugh Miller, and which, if not identical with those from the former district, is undoubtedly closely allied, shows a few



Outline of a specimen of *Psammosteus Taylori*, sp. nov., one-fourth natural size.

small patches of a superficial sculptured layer. Here the ornament, as seen under a lens, consists of small closely set tubercles with stellate bases, which remind us at once of the sculpture of the fragmentary plates from the Devonian of Russia described and figured by Agassiz as *Psammosteus paradoxus*,¹ though the tubercles are rather coarser as well as more irregular in shape.

The microscopic structure of the Elginshire plates also closely resembles that of the Russian *Psammosteus paradoxus*; there being first a thin non-vascular basement layer, above which the thickness is occupied by a very close network of Haversian canals, while the intervening substance shows only dentinal tubules without bone lacunæ.²

Everything connected with these plates being highly suggestive of *Psammosteus*, I decided to refer them to that genus on being shown by Mr. Smith Woodward certain papier-maché casts of tolerably entire plates of *P. paradoxus* from Russia. These casts, contained in the British Museum, represent concave boat-like plates much like the Elgin fossil in general aspect, though smaller in size; so that I cannot doubt that the Morayshire plates now under consideration are generically identical with them. As my friend Mr. Taylor of Lhanbryde has rendered me great assistance in procuring material for the study of these relics, I have pleasure in adopting for the creature the name of *Psammosteus Taylori*.

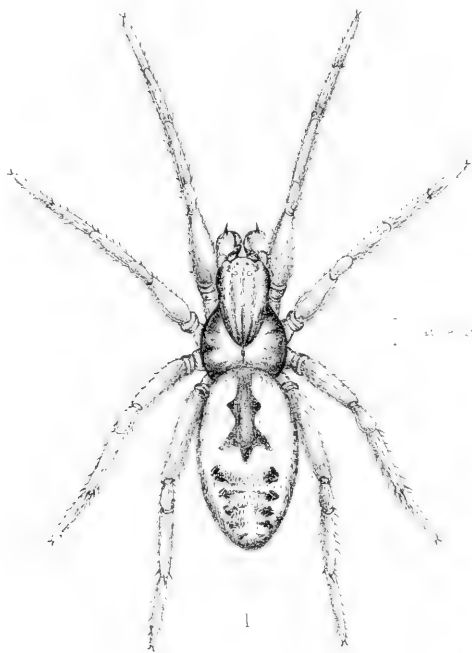
The microscopic structure of the remains which have been assigned to *Psammosteus*, suggests that they were Selachian in their nature, though it is indeed difficult to imagine what the appearance of such a Selachian could have been when entire.

This is the first record of the occurrence in Scotland of plates referable to Agassiz's genus *Psammosteus*; for though in the British Museum there are two fragments of *P. arenatus*, Ag., said to be from the Old Red Flagstones at Wick, I feel quite convinced, after carefully examining the specimens in question, that there is a mistake here, and that they are from a Russian locality.³

¹ "Poiss. Foss. v. grès rouge," pl. 27, figs. 2-4.

² Some of the microscopic sections which I have examined were made and kindly lent me by Dr. Mackie of Elgin.

³ These specimens are in the Peach collection, and are referred to by Mr. Smith Woodward in his "Cat. Foss. Fishes Brit. Mus.," part ii. p. 127.



A LIST OF SPIDERS COLLECTED IN THE NEIGHBOURHOOD OF AVIEMORE, INVER- NESS-SHIRE.

By GEORGE H. CARPENTER, B.Sc., and WILLIAM EVANS, F.R.S.E.

PLATE VII.

[INTRODUCTORY NOTE BY W. EVANS.—In 1893 I had occasion to spend the months of May and June at Aviemore in Strathspey; and being at the time much interested in Spiders, they naturally received a considerable share of my attention. Most of the specimens then collected, together with a few which I obtained in the same neighbourhood while staying at Kincaig in August 1889, have kindly been examined for me by Mr. Carpenter, and from his notes and my own field and other memoranda the following list has been drawn up by us.

Of the locality it may safely be said that there are few in Scotland more likely to possess a richer spider fauna. The mere mention of the fine forests of Rothiemurchus, Glenmore, and Abernethy, the profusion of luxuriant heather, juniper bushes, etc., the banks and shingles of the Spey and its tributaries, the surrounding mountains (the Cairngorms and the Monadhliath range), will be sufficient to make this apparent.

The number of species obtained by me was 109—a small proportion, no doubt, of what we may expect to be recorded when the district has received the attention it deserves. One of the species now recorded—namely, *Cnephalocotes elegans*—is new to Britain, and other five or six are believed to be additions to the Scottish list. The collection has also supplied the type specimen of the female of *Trochosa biunguiculata* which the Rev. O. P. Cambridge recently described and figured in this journal (see p. 23 of the present vol.) This specimen, I ought to say, was kindly brought to me, along with some other Lycosids, from Cairntoul by Mr. Alex. Robertson, a member of the Scottish Mountaineering Club. A number of the other species included in the list have only been taken in Scotland on one or two previous occasions.

These facts clearly indicate how rich a harvest remains to be reaped in this branch of our fauna.

Many of the species were present in great abundance,—indeed the wealth of spider life generally in the district struck me as well pronounced in comparison with other Scottish localities I have collected in. Of course the exceptionally fine weather of the spring and summer of 1893 must be borne in mind.

The arrangement and nomenclature followed in this list are the same as in our paper on the Spiders of the Edinburgh District recently published in the "Proceedings of the Royal Physical Society," vol. xii. p. 527.

We have again to thank Mr. Cambridge for assistance in the identification of a number of the more difficult species.]

SYSTEMATIC LIST OF SPECIES.

DYSDERIDÆ.

SEGESTRIA SENOCULATA (*Linn.*)—Adult and immature ♀s fairly common.

DRASSIDÆ.

MICARIA PULICARIA (*Sund.*)—Several ad. and imm. ♀s running on road at Aviemore, and a few under stones at Loch-an-Eilan, Loch Gamhna, etc.

GNAPHOSA ANGLICA, *Cambr.* = *Drassus lucifugus*, Bl.—Three ♀s—one ad., the others imm.—found under stones on moor between Alt-na-gaber and Loch Morlich, 5th June 1893. The first and only previously recorded Scottish habitat is in Berwickshire, where an adult ♂ was found by Dr. Hardy twenty years ago ("Proc. Berw. Nat. Club," 1873-75, p. 310).

DRASSUS TROGLODYTES, *C. L. Koch*—Not common; a few ♀s about Aviemore.

DRASSUS LAPIDOSUS (*Walck.*)—♀s (mostly imm.) fairly common and widespread; one ad. ♂ in May.

CLUBIONA TERRESTRIS, *Westr.*—Ad. and imm. ♀s common.

CLUBIONA RECLUSA, *Cambr.*—A few ♀s under bark on old paling at Aviemore.

CLUBIONA TRIVIALIS, *L. Koch*—Common in heathery places—Alt-na-gaber, Kinncraig, etc. On 14th June ad. ♂s and ♀s were fairly numerous at from 2000 to 3000 feet on the side of Braeriach above Loch Eunach.

CHIRACANTHIUM CARNIFEX (*Fabr.*)—Small colonies found in a number of spots, but not common,—Alt-na-gaber, Loch Morlich, Rothiemurchus, etc. ; ad. ♂s and ♀s in cocoons on heather during June.

AGROËCA BRUNNEA (*Blackw.*)—An ad. ♀ at Loch Vaa, 27th May, and an imm. ♀ at Altdruie, 6th June. The egg-cocoons of an *Agroëca* were not uncommon on heather by the roadside near Colyumbridge. The *A. brunnea* of Dr. Hardy's list of Berwickshire spiders ("Proc. Berw. Nat. Club," 1856-62, p. 94) probably belonged to the form since separated and described by Mr. Cambridge under the name of *A. proxima*.

DICTYNIDÆ.

DICTYNA ARUNDINACEA (*Linn.*)—Very common on heather: a few on young conifers.

DICTYNA ARENICOLA, *Cambr.*—In the Royal Physical Society's "Proceedings" for July last (vol. xii. p. 589) this species is described (and figured) by the Rev. O. P. Cambridge from specimens obtained by me on the sandhills at Luffness, East Lothian, the previous month. Since then it has occurred to me that in June 1893 I observed a similar pale *Dictyna* on the sands of Loch Morlich at the foot of the Cairngorms and 1040 feet above sea-level. A search through my Aviemore collection has resulted in the detection of two specimens, both adult males. These were at once shown to Mr. Cambridge, who, in a letter dated 4th August 1894, writes confirming my identification. The discovery of this inland habitat for the species—where, as at Luffness, it is found in company with *Trochosa picta*—is of much interest. At the request of the editors of this journal and with the approval of the Secretary of the Royal Physical Society, the original figure of the species is here reproduced.—W. E.

DICTYNA UNCINATA, *Thor.*—Adults of both sexes obtained in abundance in June by beating young conifers at Inverdrue, etc. This is its first record for Scotland. Identification confirmed by Mr. Cambridge.

AMAUROBIUS FENESTRALIS (*Str.*)—Common,³ both in the ad. and the imm. state.

AMAUROBIUS SIMILIS (*Blackw.*)—A number in outhouses.

AGELENIDÆ.

ARGYRONETA AQUATICA (*Clerck*).—A number of ad. ♀s and imm. examples obtained in mossy pools at Loch Pithulais, May 1893.

CRYPHŒCA SYLVICOLA (*C. L. Koch*).—Ad. ♀s and imm. examples abundant on conifers, etc. : ad. ♂ and numerous ♀s under stones on side of Braeriach—elevation 2000 to 3000 feet—14th June.

TEGENARIA DERHAMII (*Scop.*)—A few taken in houses.

TEXTRIX DENTICULATA (*Oliv.*)—Obtained several times, but not numerous : a few at about 2000 feet on Braeriach.

HAHNIA NAVA (*Blackw.*)—A few adults at Carrbridge, etc.

HAHNIA MONTANA (*Blackw.*)—Ad. ♀, Craigellachie, Aviemore.

THERIDIIDÆ.

ERO FURCATA (*Vill.*)—A few imm. examples.

NESTICUS CELLULANUS (*Clerck*).—♂ and several ♀s ad. at Loch-an-Eilan, May.

THERIDION SISYPHIUM (*Clerck*).—Very abundant on heather, juniper, etc. : eggs, 10th June onwards.

THERIDION VARIANS, *Hahn*.—Abundant on conifers at Inverdrue.

THERIDION PALLENS, *Blackw.*—Three ad. ♀s near top of Craigellachie.

PHOLCOMMA GIBBUM (*Westr.*)—A few ♀s.

ASAGENA PHALERATA (*Panz.*) = *Theridion signatum*, Bl.—Fairly common in several localities—near Loch Gellachie, Inverdrue, Loch Vaa, etc. Ad. ♂s running in the sunshine on dry bare spots throughout May ; ♀s with their egg-cocoons in slight cells under stones and moss, common in same localities end of May and beginning of June. A few ♀s were obtained near Kincaig in August 1889. An ad. ♀ taken in Berwickshire by Dr. Hardy about twenty years ago appears to be the only previous Scottish record.

PEDANOSTETHUS LIVIDUS (*Blackw.*)—Adults of both sexes fairly common. Taken at nearly 3000 feet on Braeriach.

BOLYPHANTES LUTEOLUS (*Blackw.*)—Immature examples common on the lower parts of Braeriach from Loch Eunach up to about 2500 feet. A few only about Aviemore.

DRAPETISCA SOCIALIS (*Sund.*)—A few obtained by beating young conifers : all imm.

LINYPHIA INSIGNIS (*Blackw.*)—Immature examples common in June.

LINYPHIA LINEATA (*Linn.*)—One ad. ♂ ; a few others imm.

LINYPHIA CLATHRATA, *Sund.*—A single example among leaves near the Doon.

- LINYPHIA MONTANA (*Clerck*).—Very common on spruce and juniper: both sexes adult.
- LINYPHIA TRIANGULARIS (*Clerck*).—Young and half-grown examples very common about Aviemore on broom, etc., in end of May and during June. Adults common at Kincaig in August 1889.
- LINYPHIA PELTATA, *Wid.*—Fairly common on firs and juniper: ad. and imm.
- LINYPHIA PUSILLA, *Sund.*—Two ad. ♂s and many ♀s: common on webs at the mouths of rabbit-burrows close to Aviemore.
- LABULLA THORACICA (*Wid.*)—Rothiemurchus Forest, Loch Morlich, Craigellachie, etc., but not common: all imm.
- LEPTYPHANTES MINUTUS (*Blackw.*)—A few taken in August 1889.
- LEPTYPHANTES ALACRIS (*Blackw.*)—A few ad. ♂s and ♀s near Aviemore.
- LEPTYPHANTES LEPROSUS (*Ohl.*)—Several ad. ♀s.
- LEPTYPHANTES OBSCURUS (*Blackw.*)—Two ♂s and three ♀s.
- LEPTYPHANTES EXPUNCTUS (*Cambr.*)—Fairly common in June on young conifers at the Dell, near Aviemore,—a few of the males adult, all the others immature. The previously recorded Scottish localities are Dunkeld and near Glasgow.
- LEPTYPHANTES PALLIDUS (*Cambr.*)—The collection has yielded one ad. ♀ of this interesting species. The only previous Scottish record is that of a specimen taken near Hamilton by Mr. H. C. Young in August 1878.
- LEPTYPHANTES CRISTATUS, *Menge.*—One ad. ♀
- LEPTYPHANTES ZEBRINUS, *Menge.*—About a dozen in the collection, some of them from the mountain side above Loch Eunach.
- LEPTYPHANTES TENEBRICOLUS (*Wid.*)—Common, but nearly all immature, on mountain side immediately above Loch Eunach. A few only detected in the lower parts of the valley.
- LEPTYPHANTES ERICÆUS (*Blackw.*)—Two ad. ♀s only obtained; but, like most of the other species of the genus here recorded, probably common enough later in the year.
- BATHYPHANTES VARIEGATUS (*Blackw.*)—obtained on several occasions, and up to 2500 feet, but not common.
- BATHYPHANTES CONCOLOR (*Wid.*)—One ad. ♂.
- BATHYPHANTES APPROXIMATUS (*Cambr.*)—One ad. ♀.
- BATHYPHANTES NIGRINUS (*Westr.*)—A few adults in meadow at Aviemore.
- TMETICUS ABNORMIS (*Blackw.*)—One ♀ on mountain side above Loch Eunach.

- TMETICUS RUFUS (*Wid.*)—One ♀ under stone near Aviemore.
- TMETICUS HUTHWAITH (*Cambr.*)—On 14th June about a dozen ♀s of this rather scarce spider were found under stones at from 2000 to 3000 feet on Braeriach, immediately above Loch Eunach. There is also an ad. ♂ in the collection.
- TMETICUS PRUDENS (*Cambr.*)—One ♀ of this rare species was obtained.
- MICRONETA CONIGERA (*Cambr.*)—Two obtained—♂ and ♀ ad.
- MICRONETA SUBTILIS (*Cambr.*)—Among the “micros” collected was an ad. ♀ of this species. It is an addition to the Scottish list.
- GONGYLIDIUM DENTATUM (*Wid.*)—A few ad. ♀s.
- GONGYLIDIUM TUBEROSUM, (*Blackw.*)—One ad. ♂; an addition to the Scottish list.
- GONGYLIDIUM RETUSUM (*Westr.*)—Three ♂s and two ♀s ad.
- TISO VAGANS (*Blackw.*)—Ad. ♂ and ♀.
- EREGONE DENTIPALPIS (*Wid.*)—Ad. ♂ and ♀.
- GONATIUM RUBENS (*Blackw.*)—In several localities, but not numerous. A few on the side of Braeriach, immediately above Loch Eunach. Females only obtained.
- GONATIUM BITUBERCULATUM (*Wid.*)—Two ad. ♂s and several ♀s.
- DISMODICUS BIFRONS (*Blackw.*)—Common on young spruces, etc., at Inverdrue.
- DIPLOCEPHALUS CRISTATUS (*Blackw.*)—One ad. ♂ in collection.
- DIPLOCEPHALUS FRONTATUS (*Blackw.*)—An ad. ♂ and a few ♀s.
- ENTELECARA ERYTHROPUS (*Westr.*)—An ad. ♂ off spruce at Aviemore.
- CNEPHALOCOTES ELEGANS (*Cambr.*)—Among the “micros” obtained was an ad. ♂ of this rarity. It has been shown to Mr. Cambridge, who confirms our identification. The species has not hitherto been detected in Britain. Mr. Cambridge’s type was taken at Nuremberg, and the species has been found also in Denmark and Northern France.
- STYLOCTETOR PENICILLATUS (*Westr.*)—*Neriene penicillatus*, *Cambr.*, “Spid. Dorset.” Two—ad. ♂ and ♀—in the collection. First record for Scotland.
- WALCKENAËRA ACUMINATA (*Blackw.*)—One ♀ only obtained.
- CERATINELLA BREVIS (*Wid.*)—A few ♀s.
- PACHYGNATHA DEGEERII, *Sund.*—Two under stones at widely separated localities were all that were noticed.

EPEIRIDÆ.

- META SEGMENTATA* (*Clerck*).—Common on juniper bushes, etc. Both adults and young examples observed in May—some of the former large and prettily marked.
- META MERIANÆ*, *Scop.*—Fairly common in holes under the roots of trees and pieces of fallen rock.
- TETRAGNATHA EXTENSA*, *Linn.*—Common in a few spots, but not generally dispersed. Marshy ground near Loch-an-Eilan, Loch Gellachie, and Carrbridge, on webs suspended from twigs of bog myrtle, over small ditches.
- CYCLOSA CONICA* (*Pall.*)—One ad. ♂ shaken off a young conifer at Inverdrue on 13th June.
- EPEIRA CUCURBITINA*, *Clerck*.—Fairly common on young conifers and wire fences about Inverdrue. Adults of both sexes in May and June; young ♀, Kinraig, in August.
- EPEIRA DIADEMATA* (*Clerck*).—Young examples common in May and June; adults in August.
- EPEIRA AGALENA*, *Walck.*—Adults of both sexes. Not uncommon on wire fences about Inverdrue during June: a few also obtained off conifers. Has already been recorded from Aviemore ("Proc. Glas. Nat. Hist. Soc." 1878-80, p. 79).
- EPEIRA CORNUTA* (*Clerck*).—*Epeira apoclista*, Blackw.—Abundant on heather, bog myrtle, etc. Numerous very large ♀s, apparently on the point of depositing their eggs in marsh at Loch Alvie, 9th May; ad. ♂s at Loch Gamhna on 17th June; ad. ♀s also in August; imm. examples common in May and June.
- EPEIRA QUADRATA* (*Clerck*).—Common on bog myrtle, heather, etc., chiefly in marshy spots. Immature examples only (mostly quite small) in May and June; adults of both sexes in August.
- EPEIRA UMBRATICA* (*Clerck*).—Ad. ♂s and ♀s and imm. examples (some quite small) common during May and June on the Aviemore and Inverdrue bridges; also about old palings and under the bark of dead trees at Aviemore, Loch Gellachie, Loch-an-Eilan, etc. An ad. ♂ and several ♀s were taken from under the bark of an old birch near Feshie Bridge in August 1889. Strictly nocturnal.

THOMISIDÆ.

- XYSTICUS CRISTATUS* (*Clerck*).—Common both ad. and imm.
- XYSTICUS SABULOSUS* (*Hahn*).—On 5th June 1893 about a dozen immature examples were obtained on a bare spot on the open

moor between Alt-na-Gaber and Loch Morlich. This is the first record of the species for Scotland. We are obliged to Mr. Cambridge for identifying our specimens.

XYSTICUS BIFASCIATUS (*C. L. K.*)—An ad. ♂ and three ♀s obtained near Kincaig in August 1889.

OXYPTILA TRUX (*Blackw.*)—Ad. ♂, Loch Gellachie, June; ♀, Kincaig, August.

OXYPTILA ATOMARIA (*Panz.*)—Ad. ♂ and two ♀s, Loch-an-Eilan, June.

PHILODROMUS AUREOLUS (*Clerck*).—Very common; many ♀s beside their egg-cocoons on palings, etc., in June.

LYCOSIDÆ.

OCYALE MIRABILIS (*Clerck*). = *Dolomedes mirabilis*, Bl., "Spid. Gr. Brit. and Irel."—Ad. ♀s of this fine spider were found in considerable numbers in June, on tall heather near Alt-na-gaber, and behind the keeper's house at the Doon. Most of them were either carrying their egg-cocoons or guarding them after having placed them within a slender web.

PIRATA PIRATICUS (*Clerck*).—Common in marshy places.

TROCHOSA BIUNGUICULATA, *Camb.*—Among a few Lycosids kindly obtained for us in the middle of June 1893 by Mr. Alexander Robertson, at an elevation of about 3400 feet on Cairntoul, was a large well-marked *Trochosa*, since described and figured by Mr. Cambridge in this magazine (p. 23) as the female of *T. biunguiculata*, of which the male only—taken by Prof. Trail near Braemar a number of years ago—was previously known.

TROCHOSA PICTA, *Hahn*.—On 3rd June 1893 half a dozen ad. ♂s and ♀s were obtained on the sandbank at the eastern end of Loch Morlich, right at the foot of Cairngorm, and 1040 feet above sea-level. The habitat is an interesting one, seeing the species is in this country practically confined to sandhills on or near the coast.

TROCHOSA TERRICOLA, *Thor*.—Craigellachie, Loch Vaa, etc., both ad. (with egg-cocoons) and imm.

TROCHOSA PULVERULENTA (*Clerck*).—Adults of both sexes very common. One on Braeriach at about 3000 feet; several on Cairntoul at 3400 feet.

TROCHOSA ANDRENIVORA (*Clerck*).—One ad. ♂ and many imm. ex. amples in June; adults more common in August.

LYCOSA AMENTATA (*Clerck*).—Exceedingly common. Was several times observed crouching on the flowers of *Caltha palustris* and pouncing on the flies as they settled on the sepals.

- LYCOSA LUGUBRIS, *Walck.*—A few ad. ♂s were captured in the woods at Inverdrue.
- LYCOSA PULLATA (*Clerck.*)—Extremely common. ♀s carrying egg-cocoons by 13th May.
- LYCOSA NIGRICEPS, *Thor.*—Only detected at Loch-an-Eilan, where two adults (♂ and ♀) and several imm. ♀s were secured in the beginning of June.
- LYCOSA HERBIGRADA, *Blackw.*—Common on the shingle by the Spey and the Druie, and also at Loch Gamhna. Adults in May and June. Mr. Cambridge informs us that he has received it from Perthshire and also from Ross-shire.
- LYCOSA PALUSTRIS (*Linn.*)—Common in many places; ♀s carrying egg-cocoons as early as 13th May.

ATTIDÆ.

- EPIBLEMUM SCENICUM (*Clerck.*)—Not uncommon on walls, palings, etc.
- HELIOPHANUS FLAVIPES, *C. L. K.*—One at Loch Vaa in May, and another (a ♂ which has been shown to Mr. Cambridge) at the Dell in June. Has been recorded for the neighbourhood of Glasgow.
- HASARIUS FALCATUS (*Clerck.*) = *Salticus coronatus*, *Blackw.*, “*Spid. Gr. Brit. and Irel.*”—Two ad. ♀s at Loch Vaa, 27th May.
- NEON RETICULATUS (*Blackw.*)—Fairly common among stones at foot of Craigellachie, near Aviemore; a few also at Loch-an-Eilan and Altdruie.
- EUOPHRYS ERRATICUS (*Walck.*)—A good many under stones at foot of Craigellachie.

ON SOME FORMS OF *RANUNCULUS*
FLAMMULA, LINN.

By P. EWING.

HAVING devoted some time to the study of this plant and its allied forms on the shores of Loch Leven in Kinross and elsewhere, I read a paper, and exhibited a series of forms to illustrate it, before the “Glasgow Natural History Society” in 1884, with the object of trying to prove that six of the forms that I will shortly refer to were all variations of the

same species. I was compelled to admit then, and, although I have added other three forms, I must admit yet, that when you take extreme forms some of them seem almost to warrant a claim to specific rank. I have read from time to time the remarks by a few able English botanists on the species. Some of these remarks agree very well with my own observations, while some do not.

It seems to me, if some one with authority would fix upon a type, and give a description of it that would not apply to all the forms, then we might arrive at some means of resolving the species into distinguishable extreme forms ; and then by filling in the intermediates, collectors could at least satisfy themselves as to whether all the following forms were different states of the same plant.

My experience would lead me to take them thus :—

- (a) *R. Flammula*.—A tall slender form having a smooth stem, with all its internodes straight, the swelling at the nodes inconspicuous, and leaves glaucous. This form is common in Scotland, grows well up on mountain sides, and may be found growing with other forms.
- (b) *R. pseudo-reptans*.—This seems to come very near (a), only it is repent and roots at the nodes. It may be easily distinguished from the following forms by its glaucous leaves, and by the stems not swelling much at the nodes, and seldom bearing more than two lateral branches.
- (c) *R. suberectus*.—A much-branched form, seldom rooting at the nodes, although the stem is prostrate, and rises only when the flower-buds begin to develop. This gives the flowers an umbellate appearance. This form also has glaucous leaves, of which the blade is much longer than the petiole.
- (d) *R. petiolaris*.—That strong-stemmed form described by Mr. Marshall in the "Journal of Botany," vol. 27, p. 230. If I understand this form aright, it is nearly erect, and differs from form *suberectus* in having much thicker stems, strongly ribbed, leaves not glaucous, with channelled petioles, is found only in muddy situations, and grows strongest on peat. I have seen it only in one or two places on the shores of Loch Leven.
- (e) *R. serratus*.—Almost identical with *suberectus*, but the stems are proportionately shorter and stouter, never rooting, while the leaves are not glaucous, and are strongly serrated, and very long.

- (f) *R. natans*.—A form with floating leaves mostly ovate, or at least broadly elliptical, often found growing in muddy-bottomed lakes and pools. It has never been seen in flower to my knowledge. I once sent this to Mr. Bennett of Croydon, asking if he thought it was *Alisma ranunculoides* with floating leaves. He suggested that it was a form of *R. Flammula*; and since then I have had ample proof that it is so.
- (g) *R. radicans*.—A form that, although agreeing very well with the descriptions given of *R. reptans*, is yet a very different plant. It does radiate for a few times from a common root, but not from the stems more than once. It has the flowers, and nearly the arching habit, of *R. reptans*; but the rooting nodes and constricted and very perceptibly tapering stem show at once its *Flammula* relation. The leaves as a rule are obtuse. This is what I consider the form sent out by the Bot. Ex. Club of the British Isles in 1886 as *R. reptans*, Linn. It seems to me to be a hybrid between *R. reptans* and *R. pseudo-reptans*, and grows plentifully among them on the shores of Loch Leven. The great objection to this opinion is that it is common where *R. reptans* is not found.
- (h) *R. reptans*.—This form differs from all the preceding in that, when a well grown plant is taken up, it is difficult to tell which root is the primary one, the roots being fibrous, not succulent, every rooted node supporting in appearance an independent plant, which cannot be disengaged without destroying the parent stem. The stems are round, never erect, and never swollen above the node; and the difference in thickness between adjoining nodes is scarcely perceptible. The leaves as a rule are acute. The achenes are compressed, with a short, broad beak.
- (i) *R. tridenticulatus*.—This is, so far as I know, a new form. It is not at all common, and is possibly confined to Scotland. It differs from all the others shown by having a rosette of leaves at its primary root, which leaves have long petioles. The lamina is linear-elliptical, and has on either margin, as a rule, from one to three very prominent teeth. Its stems are decumbent, then erect, not rooting at the nodes. The stem-leaves also have long petioles and linear-lanceolate laminae, except in the root-leaves. This form is almost identical with the form above named *R. suberectus*. It was found beside Loch Leven in 1878, and beside Loch Tay in 1893.

Generally speaking, these forms, excluding *R. reptans*, are treated by botanists as beneath special notice. Hence it is commonly stated that when the stems are too weak to support themselves they fall down, root at the nodes, and become

forms of *R. pseudo-reptans*; entirely overlooking the fact that the repent forms often root at the nodes when growing erect among other vegetation, and as a rule have the thickest stems, and that *R. Flammula* proper has, for its length, the most slender stem of all the forms, yet stands up to the wind on the margin of an exposed lake, or in the rill on the mountain side. *R. petiolaris* has possibly the thickest stems; but, if the fluting and thickness are taken into consideration, the stems of *R. suberectus* should be the strongest of all the forms. Yet although found growing in muddy situations among *Juncus communis* and similar plants, which would help to support it, it only raises its head as it comes into flower. These creeping forms seem to creep "because it is their nature so." Situation has no more to do with these forms than it has with the forms of other plants. In fact, one of my typical *Flammula* forms was got growing within three feet of one of my typical *suberectus* forms.

As to *R. reptans* proper, with the exception of the form named *R. radicans*, it has very little in common with any of the above forms, and is easily distinguished from all of them—so much so that it is well worthy of specific rank. There is no doubt in my own mind that the plant sent out as *R. reptans*, Linn., by the Botanical Ex. Club of the British Isles, with Mr. Bailey's name attached to it, is not the same as the Loch Leven *R. reptans*, but is the form mentioned above as *R. radicans*. This form is not uncommon in Scotland. There is a patch of it on the shore of Loch Tay, about one hundred yards west of Lawers Pier, that I have had great difficulty in convincing myself is not *R. reptans*; and if it had not been for the fact that after carefully taking up a plant or two I was able to take off the adventitious shoots and leave the stem whole, I would have sent it to Mr. Bennett as *R. reptans*.

There is one good bay in Loch Leven, about one mile from Kinross, where the finest specimens of *reptans* are to be got growing among the forms above named *Flammula*, *pseudo-reptans*, and *radicans*; but *reptans* seems to prefer to grow among *Littorella lacustris*. Specimens growing farther inland are always small: it took me about an hour to lift my specimen of *reptans*, and even then I had the bad fortune to

break it into two or three pieces. This may give an idea of its habit of growth.

So much is said of the cultivation of forms that I did my best to try this ; but under glass in a box of sand, and outside in the garden border, I could never establish the plants or grow them from seed. The plants in their native situations are under water from autumn until well on in spring.

In my opinion, this plant has been brought to Loch Leven by northern water-fowl that have frequented the Loch during the winter season from time immemorial.

At the East of Scotland Naturalists' Conference at Kirkcaldy in July 1893, these views were stated, and specimens of the forms above mentioned were exhibited.

ORIGIN OF *SALIX GRAHAMI*.

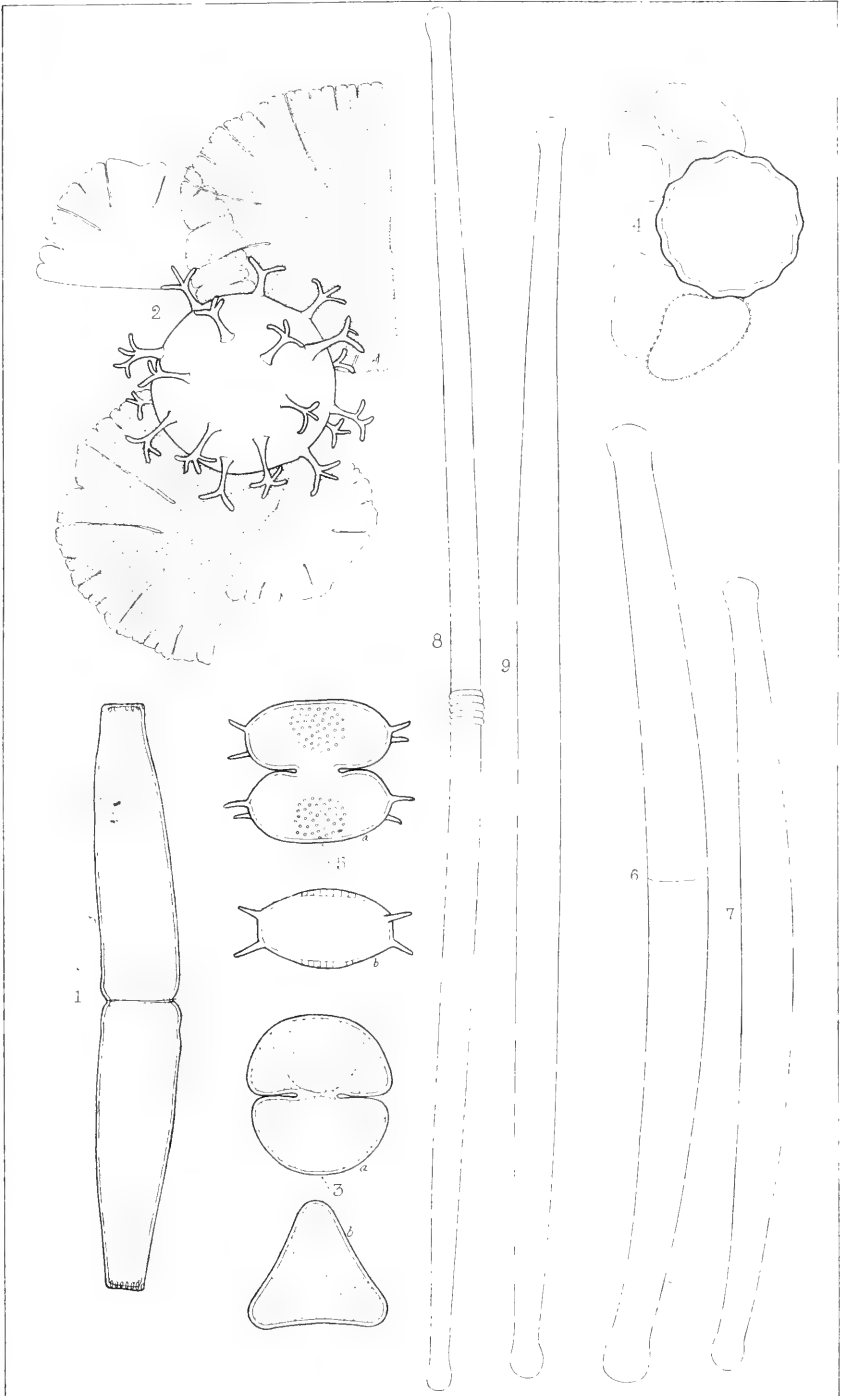
By EDWARD F. LINTON, M.A.

Salix Grahami (Borr. MSS.) Baker, was suspected by the late Dr. Boswell ("E. B.," viii. p. 258) to be a hybrid between *S. herbacca* and *S. phyllicifolia* or *nigricans*; and Dr. F. B. White, in his "Revision of the British Willows," favours the view that it owes its origin to a union between *S. herbacea* and *S. phyllicifolia*. Never quite satisfied with the suggested parentage, and less so now that I have succeeded in producing the hybrid between these two species artificially, I lately tested *S. Grahami* carefully on the hypothesis that *S. Myrsinites* was the unknown parent, being struck by the glossy appearance of the green under-side of the young leaves.

The leaves beneath are of too good a green and too shining for a combination with *S. phyllicifolia*, and the pubescence also too persistent. The scales of the catkin bear no resemblance to those of *S. phyllicifolia*, but have a close resemblance to those of *S. Myrsinites*, and the same pinkish-red colouring which the latter have before they blacken in the upper part. The stout red style, rather rigid and persistent, with large bifid stigmas, is just that of

Myrsinites. The ovaries are fairly intermediate, on my theory; but they present one objection to it in being glabrous or only slightly pubescent near the base, whereas the ovaries of *S. Myrsinites* are more or less pubescent. But since *S. Myrsinites* \times *nigricans* has in some cases glabrous ovaries, owing to the influence of a *nigricans* form with that character, there is no reason why *herbacea* should not have had a similar effect in the production of *S. Grahami*. The only other objection that has occurred to me against its derivation from *herbacea* and *Myrsinites* is in the crenation and pubescence of the leaf: one would have expected the leaf to be glabrescent, and its margin serrate rather than crenate. But there is much variation of both these leaf characters in *S. Myrsinites*, and *S. herbacea* has sometimes a leaf that is rather crenate than serrate; consequently no real objection to the theory I have worked out is to be found in the leaf of *S. Grahami* having a crenate margin and some persistent silky hairs on its under side. One has only to suppose that the *Myrsinites* parent had crenate leaves rather more silky than usual beneath; and I have specimens of just such a plant, collected by Mr. F. J. Hanbury at Inchnadamff, Sutherland, the very county in which *S. Grahami* was discovered. The stipules of this hybrid, when they occur, are much like those which *S. Myrsinites* bears on its stronger shoots.

My only female plant of *S. herbacea* \times *Myrsinites* does not match *S. Grahami* in every particular, the ovary being pubescent and the leaves more glabrous and serrate; but I think there are only such differences between them as might be expected between two forms of the same hybrid. My plant of *S. herbacea* \times *phylicifolia* has not yet flowered; but so far as foliage and habit go, it is evidently *not* the same hybrid as *S. Grahami*. On the whole, I believe my observations furnish not only evidence, but all reasonable proof that the trailing, prostrate plant known as *S. Grahami* emanates from a union between *S. herbacea* and *S. Myrsinites*.



J.P. Bisset, Del in part

R. & R. Clark imp

ON SCOTTISH DESMIDIEÆ.

By the late JOHN ROY, LL.D., and J. P. BISSET.

[Continued from page 178.]

PLATE VIII.

DOCIDIUM, Breb. (*PLEUROTÆNIUM*, Näg.)

1. *D. Baculum*, Breb.—General.
2. *D. clavatum*, Kg.—Not common. Sutherland, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Kirkcudbright.
3. *D. coronatum*, Breb. — Rare. Inverness—Brin and Loch Ruthven; Aberdeen—Scotston Moor, Slewdrum, near Aboyne, Birsemore, Koynach Moor, and Bilbo in Cromar; Forfar—Barrelwell near Brechin, Findhaven Hills, and Canlochan; Perth—Folotry in Fowlis Wester, and Craig-an-Lochan; Fife—Tent's Moor.
 β *nodulosum* (Breb.), Roy (F. W. Algæ of Enbridge Lake, Hants, "Journ. Bot.," Nov. 1890, p. 335).—General.
 Both forms, and various intermediates, occur in a large marsh south of Birsemore, near Aboyne.
4. *D. dilatatum* (Cleve), Lund.—Very rare. Ross—Poolewe; Forfar—Glen Dole (Mr. Scott); Perth—Rannoch (Dr. B. White).
5. *D. Ehrenbergii*, Ralfs.—General. Several distinct forms appear to be included in this species, differing considerably in the basal swellings and apical granules, while the length ranges from 240μ to 655μ .
 β *granulatum*, Ralfs.—Rare. Aberdeen—near Springhill, moss by Skene Road, moraine pools near Cambus-o'-May.
6. *D. Farquharsonii*, Roy (F. W. Algæ of Enbridge Lake, Hants, "Journ. Bot.," Nov. 1890, p. 335). (*Our* Plate IV. fig. 1.)
 —The mucous sheath in which this species is usually enveloped often appears to be regularly punctate. Rare. Aberdeen—near Springhill; Kincardine—Muchalls, on wet rocks by the sea, where it was first observed in 1877; Forfar—Balquhadly Hill in Fern, 1878; Fife—Tent's Moor; Perth—Sheriffmuir near Dunblane, Bracklin near Callander.
7. *D. hirsutum*, Bailey (?).—Rare. Aberdeen—Powlair, Cambus-o'-May, Dalbagie.
8. *D. maximum*, Reinsch.—Very rare. Kincardine—Scolty near Banchory (once only).

9. *D. minutum*, Ralfs.—General, but scarce.
10. *D. nobile* (Richter), Lund. — Rare. Ross — Poolewe; Aberdeen — Cambus-o'-May; Kincardine — moraine pool near Bishop's Dam and Dalbrake in Strachan; Argyle — near Kingshouse.
11. *D. rectum* (Delp.), Wolle.—General.
12. *D. Trabecula* (Ehrb.), Näg.—Not common. Ross — Garve; Inverness — Loch Ruthven; Aberdeen — various localities; Kincardine — Blackhall, Curran, Muchalls; Perth — Glas Mhoel; Arran — Corrie, Glen Sannox.
13. *D. tridentulum*, Wolle, 1884.—Rare. Ross — Poolewe; Inverness — Brin; Argyle — head of Glen Coe and in Mull.

In July 1883 one of the present writers published a list of Desmids found in Mull, in the "Scottish Naturalist." The gathering contained a number of examples of this species, or of something very near it. The specific name *sceptrum*, which had been given by Kützing to *Baculum*, was resuscitated, and applied to this species as a suitable name. If *tridentulum* was not published by Wolle previous to its appearance in his "Desmids of the United States," our name *sceptrum* will claim priority. Scottish and Irish specimens are slightly more prominently swollen at the base, taper more towards the apex, and are quite smooth, not roughly punctate, or even finely granulated, as in South American examples in our possession.

Length, 280-320 μ ; breadth, constrict., 14 μ ; basal swelling, 16 μ ; close above, 11-13 μ ; close to apex, 6½-8 μ ; apex, 8-9½ μ ; length of tooth, 2½ μ .

14. *D. truncatum*, Breb.—General.
 Var. *granulatum*, West.—Very rare. Perth — Ben Laoigh (Mr. W. West).

TETMEMORUS, Ralfs.

1. *T. Brebissonii* (Menegh.), Ralfs.—General.
 β *turgidus*, Ralfs.—Not uncommon.
 γ *minor*, De Bary.—Common.
2. *T. granulatus* (Breb.), Ralfs.—Abundant.
 Has been collected with zygospores at Fyvie and Birsemore in Aberdeen, and in Glen Dye in Kincardine.
3. *T. lævis* (Kg.), Ralfs.—General.
 Collected with zygospores in Aberdeen in Whitestripes Moss, and Heughhead near Aboyne; and in Kincardine at Cammie, in Strachan.
4. *T. minutus*, De Bary.—Not uncommon on wet rocks.

CLOSTERIUM, Nitzsch.

1. *C. acerosum* (Schrank), Ehrb.—Widely distributed, but scarce.
 β Ralfs.—Rare. Aberdeen—Little Don, Alford, and Achnerran, Cromar; Kincardine—near Caterline, in brackish water; Forfar—Balquhadly Hill, Fern; Renfrew—near Greenock.
2. *C. aciculare*, West.—Very rare. Ross—near Tain; Aberdeen—Dinnet Moss, plentiful.
3. *C. acutum* (Lyngbye), Breb.—Pretty common. With zygospores at Craigendinnie in Aberdeen; Kincardine—on Kerloch and near Portlethen. (See under *C. linea*.)
4. *C. angustatum*, Kg.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling, Argyle, Renfrew, Kirkcudbright.
5. $\frac{1}{4}$ *C. angustum*, Hantzsch.—Very rare. Aberdeen—near Slains Castle, Bourtie, Little Don at Haughton Alford.
6. *C. antiacerosum*, De Notaris.—Apparently very rare; perhaps overlooked. Aberdeen—Whitestripes Moss near Aberdeen, marsh west from the Ord near Dinnet.
7. *C. Archerianum*, Cleve.—Somewhat rare. Ross—near View Rock, Strathpeffer; Aberdeen—Scotston Moor, Brimmond, moss on Skene Road, Powlair, Forest of Birse, Slewdrum, Birsemore, Black Moss, Birkhill, and Presswhin in Cromar; Kincardine—Raemoir, Cammie; Forfar—Barrellwell near Brechin, Findhaven Hills, Glen Clova; Perth—Durdie Moor; Stirling—Fintray Hills; Argyle—near Kingshouse.
8. *C. arcuatum*, Breb.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Fife.
 With zygospores at Fyvie in Aberdeen, and Cammie in Kincardine. They are globular, 27-29 μ in diameter; conjugating fronds crossed.
9. *C. attenuatum*, Ehr.—Widely distributed, but not observed in the following counties: Orkney and Shetland, Caithness, Sutherland, Nairn, Moray, Banff, Stirling, Dumbarton, Renfrew, Arran, Argyle—but occurs in Mull.
10. *C. Balmacarense*, W. B. Turner (Desmid. Notes in the "Naturalist," Nov. 1893).—"Of medium size, slightly and regularly curved, gently attenuate, ends expanded and rotundo-truncate. Suture not central. Membrane smooth and colourless. Endochrome in indistinct fillets" (eight in number, p. lit.), "vesicles scattered." Long., 315-322 μ ; lat., 20-21 μ ; lat. apic., 16 μ (W. B. T.) (*Our* Plate IV. fig. 6.)

β *minor*, Turner.—Long, 260 μ ; lat., 16 μ ; lat. apic., 12 μ .
Endochrome in six fillets (W. B. T.) (*Our Plate*
IV. fig. 7.)

Very rare. Ross—Balmacarra, *legit.* A. W. Wills
(W. B. T.)

11. *C. calosporum*, Wittr.—General. With zygospores in Aberdeen—west from the Ord near Dinnet; and in Kincardine—near the schoolhouse in Glen Dye.
12. *C. ceratium*, Perty.—General, but scarce. With zygospores in Aberdeenshire—at Scotston Moor and Slewdrum. Zygospore small, smooth, orbicular, placed between the conjugating fronds; very like to that of *C. gracile*, Breb.
13. *C. cornu*, Ehr.—General.
 β Ralfs.—Very rare. Aberdeen—in a ditch at Whitehaugh near Alford.
14. *C. costatum*, Corda.—General.
15. *C. cynthia*, De Notaris.—In numerous localities, but usually very scarce. Noted from the following counties: Orkney, Sutherland, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Dumbarton.
16. *C. decorum*, Breb.—Very rare. Perth—pools near Loch Mharc in the Forest of Athole; Argyle—head of Glen Coe.
17. *C. Delpontii*, Klebs. (*crassum*, Delp.)—Rare. Inverness—at Brin; Aberdeen—at Bourtie and Slewdrum; Forfar—in Glen Clova between Clova and Rottall.
18. *C. Dianae*, Ehr.—General. With zygospores at Coull in Ross; Aberdeen—in a marsh between Loch Kinnord and Cambus-o'-May; Perth—Loch Lundie.
19. *C. didymotocum*, Corda.—General.
 β *Baillyanum*, Breb.—General, but usually scarce.
20. *C. directum*, Archer.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran.
21. *C. eboracense*, Turner.—Very rare. Aberdeen—at Little Don, Haughton (Mrs. Farquharson).
22. *C. Ehrenbergii*, Menegh.—Not common. Ross—near Tain; Inverness—near Brin; many localities in Aberdeen and Kincardine; Perth—Durdie, Moncreiffe, near Scone, near Loch Mharc, Ben Lawers; Fife—Tent's Moor.
23. *C. gracile*, Breb.—Not uncommon. Sutherland, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Argyle.
With zygospores on the S.E. side of Brimmond Hill, and the Ord, both near Aberdeen. Zygospore thick-walled,

yellowish, globular; between the conjugating fronds; diameter $22\frac{1}{2}\mu$.

24. *C. incurvum*, Breb.—Pretty common. Sutherland, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Stirling, Dumbarton, Fife.
25. *C. intermedium*, Ralfs.—Widely distributed, but usually scarce. Orkney, Sutherland, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Stirling, Dumbarton, Argyle, Renfrew, Arran, Kirkcudbright.
26. *C. Jenneri*, Ralfs.—Not common. Sutherland, Ross, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran.
27. *C. juncidum*, Ralfs.—General. Three forms of this species are common:—

a Ralfs.—Empty frond colourless, striæ very faint, slightly tapering towards the tips. Length, 110-200 μ ; breadth, $6\frac{1}{2}\mu$; diameter of smooth, globular, brownish zygospore, $22\frac{1}{2}\mu$.

β Ralfs.—Stouter in proportion to its length, brownish, striæ more prominent, slightly tapering. Length, 185-275 μ ; breadth, 13 μ ; diameter of globular, thick-walled, yellowish zygospore, 40-44 μ . This form seems as closely connected with *C. intermedium*, Ralfs, as with the present species, but we have not observed it with more than three sutures, and the striæ are fewer.

γ *elongatum*, n. var.—Much elongated, slender, not tapering, brown, striæ distinct, few. Length, 355-400 μ ; breadth, 11.2 μ . Zygospores not seen.

a was found conjugated in a little marsh on the ascent of Glas Mhoel from the Cairnwell, on the Perthshire side. *β* was gathered with zygospores at Fyvie in Aberdeenshire.

28. *C. Kützingii*, Breb.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Fife.
- A single conjugated example of this species was found in a marsh near Gillan in Strachan, Kincardine. Unfortunately it was lost. The zygospore resembled that of *C. rostratum*, Ehr., more than that of *C. setaceum*, Ehr.
29. *C. lanceolatum*, Kütz.—Very rare. Sutherland—near the Falls of Kirkaig; Aberdeen—near Haughton, Alford, and Koynach Moor in Cromar.

30. *C. Leibleinii*, Kütz.—Common from Orkney to Arran. Frequently found in conjugation. The smaller form is more abundant.
31. *C. linea*, Perty.—General, but not abundant. The zygospore is subquadrate, longer than broad, sides and ends a little concave, angles drawn out into acute processes, strongly resembling the zygospore of the form of *C. acutum* given by Ralfs on Plate XXXIV. fig. 5; so strongly indeed as to suggest that they belong to one species!
 Plate XXX. figs. 5e and 5f accurately represent the zygospores of *C. acutum* as seen by us. Length of zygospore of *C. linea*, without processes, $19-22\frac{1}{2}\mu$; do. with processes, $32-41\frac{1}{2}\mu$; breadth, $13-16\mu$. They occur frequently.
32. *C. lineatum*, Ehr.—Not common. Sutherland—Loch Inver near Falls of Kirkaig; Ross—Pool near View Rock, Strathpeffer; Inverness—Loch Ruthven; many localities in Aberdeen, Kincardine, Forfar, and Perth. Not seen from other counties.
 β Forma *striis longitudinalibus spiralibus*, Rabenh.—Extremely rare. Aberdeen—in a pool a short distance north from Loch Dawan.
33. *C. Lundellii*, Lagerh.—Very rare. Sutherland—Loch Inver; Aberdeen—Fyvie, Whitely Marsh near Alford, and Marsh S.W. from Loch Kinnord.
34. *C. Lunula* (Müller), Nitz.—General.
35. *C. macilentum*, Breb.—Not common. Ross—Poolewe, near Tain, and Strathpeffer; Inverness—Loch Ruthven; Aberdeen—Fyvie, Little Don and Whitely Marsh near Alford, Bourtie, Scotston Moor, Tomachar and Homehead in Cromar, south of the Ord near Dinnet; Forfar—Lundie Bog, Monroman Moor, Findhaven Hills; Perth—Durdie, Balboughty, Taymount, Buchanty.
36. *C. malinvernium*, De Notaris.—Rare. Inverness—near Brin; Aberdeen—Bourtie; Kincardine—Loch of Park, near Crathes; Perth—in Athole Forest near Loch Mharc, and East from Falar.
37. *C. moniliferum* (Bory.), Ehr.—Not common. Caithness—Loch Hempriggs; Ross—Coul, Loch Kinnellan, and near Tain; Inverness—Glen Urquhart, and Brin Pond; Nairn; Banff—Glen Avon; Aberdeen and Kincardine—many localities; Forfar—Menmuir, Monroman Moor, and Easter Ogil; Perth—east from Falar, Durdie, Hill of Moncreiffe, Buchanty; Fife—Kemback and Mt. Melville.

38. *C. obtusum*, Breb. — Somewhat rare. Ross — Achnasheen ; Inverness—Glen Urquhart ; Aberdeen—Longside, Whitely Marsh near Alford, Heughhead, Aboyne, and near Ballater ; Kincardine—Clunie, by the Dee at Durris Bridge, Den of Garrol, Scolty Dam, Cammie, Dalbrake, Kerloch, Glen Dye, Slack of Birnie ; Perth—Buchanty ; Argyle—Mull.
39. *C. parvulum*, Näg.—Not common. Ross — Loch Kinnellan and Falls of Rogie ; Inverness—Glen Urquhart, Cairngorm ; Aberdeen — Whitely Marsh, Howford and Bourtie near Inverurie, Kintore, Springhill and Summerhill near Aberdeen with zygospores, Slewdrum, Mosstown, Tomachar, and Koynach Moor in Cromar, in marsh S.W. of Loch Kinnord with zygospores ; Kincardine—Raemoir, Glen Dye, Clochnaben, Loch of Lumbair ; Perth—Durdie, and Arnbathie ; Stirling—Alloa Glen ; Fife.
40. *C. pralongum*, Breb.—Very rare. Aberdeen—Moss of Logie in Cromar ; Kincardine—Scolty Dam near Banchory.
41. *C. Pritchardianum*, Archer.—Not common. Ross—Achnasheen ; Aberdeen—Auchterless, Alford, Kintore, Scotston, Springhill, Brimmond, Aboyne, Tomachar, and Bilbo in Cromar ; Kincardine—Loch of Park, Upper Balfour, Paldy Hill, near Cowie, Stonehaven ; Forfar—Balquhadly Hill in Fern, Menmuir ; Perth — Durdie, Buchanty ; Stirling — Fintray Hills.
42. *C. pronom*, Breb.—Very rare. Caithness—Loch Hempriggs ; Ross—near Tain ; Aberdeen—south end of Scotston Moor.
43. *C. pseudoclosterium*, n. sp., Roy.—Almost straight, very slender, forty to sixty times as long as broad ; breadth uniform ; ends slightly rounded, with a small colourless space, but no vacuole proper or moving granules ; frond smooth and colourless, no suture ; chlorophyl in one pale green band reaching close to the ends, and having at the middle of the frond a semielliptical colourless space, as if scooped out of one side, similiar to what is seen in *C. obtusum*, Breb. ; starch granules 4-6 in one row. Length, 128-192 μ ; breadth, 3 μ .
- This curious little species forms one of a small group of which *C. obtusum*, Breb., may be taken as the type. They do not accord well with *Closterium*, and undoubtedly should be placed in a new genus. This it was my intention to do, but there are other two species, also new, which I was anxious to include, and at the time of writing specimens are not available (the slide containing them having gone wrong !), therefore I have made no change in the meantime.—J. R.

[I am not acquainted with the species here described, and having no authenticated specimen, am unable to give a figure.—J. P. B.]

Rare. Aberdeen—Slewdrum, and Upper Powlair in Birse; Kincardine—Cammie, Kerloch, Muiryhaugh, and Dalbrake; it is also found in North Wales, and in the west of Ireland.

44. *C. pseudodiana*, Roy. (Desmids of the Alford District, "Scottish Naturalist," 1890, p. 199.)

Resembles *Diana*, as given by Ralfs, in form and colour, arrangement of chlorophyl, starch granules, and moving granules; but differs in being much smaller, in the outer curve being an arc of a larger circle, and in the inner curve being almost straight for a short distance on each side of the middle. Frond quite smooth, with a single suture at the centre. Tips slightly thickened with an apparent notch on the outside, as in *C. Diana*. Fourteen to twenty times longer than broad. Length (tip to tip), 192-253 μ ; breadth, 12-14 μ ; do. at tip, 2-3 μ . (*Our Plate I. fig 4.*)

We have had this pretty little species under observation many years, and find it maintaining its characteristics with perfect constancy, whether it is collected in the north-east of Scotland, or in the west of Ireland. We have not been so fortunate as to find it conjugated. Not common. Ross—near Tain; many localities in Aberdeen, Kincardine, Forfar, and Perth; Argyle—near Kingshouse.

45. *C. pusillum*, Hantzsch.—Rare. Ross—at Achnasheen; Aberdeen—Auchterless, Longside, Towie, Whitely near Alford, Birse, and Birsemore; Kincardine—Loch of Park, Clunie, Cammie; Perth—at Buchanty; Argyle—near Tobermory in Mull.

β major, n. var.—Very rare. On wet rocks. Similar to the type, but about twice as large; smooth and colourless; six times as long as broad. Length, 96-100 μ ; breadth, 16 μ ; do. of obtuse, rounded end 7 μ . Aberdeen—"Break Neck Fall" at the head of Glen Callater, and in the Corrie of Loch Kandor; Forfar—at the "Reeky Linn" on the Isla.

46. *C. Ralfsii*, Breb.—Rare. Ross—near Falls of Connon; Aberdeen—New Pitsligo, Bourtie, Corbie Loch, Scotston Moor, Cornhill, Springhill and Hazelhead near Aberdeen, Slewdrum in Birse; Kincardine—at Torry; Forfar—near Menmuir; Argyle—near Kingshouse.

47. *C. regulare*, Breb.—Very rare. Argyle—near Kingshouse.

48. *C. rostratum*, Ehr.—General; conjugation not uncommon.

49. *C. Scoticum*, W. B. Turner (Desmid. Notes, in the "Naturalist," Nov. 1893).—"Frond long and narrow, for about $\frac{7}{8}$ ths

of the length of nearly the same diameter, tapering a little at the ends, which are expanded into rounded or rotundo-truncate 'knobs'" ("between the frond and its apical 'knob' there seems to be usually a more or less pronounced narrow 'neck' or contraction," p. lit.) "Suture 1, rarely 2, not central and often complex, of 4-7 transverse striæ. Membrane smooth, variable, either colourless, or from pale yellow to red-brown in tint. The frond is straight, or but slightly curved; very variable in size. Endochrome axillary, with a central line of corpuscles. Long., 260-489 μ ; lat., 10-13 μ ; lat. apic., 8.5-12.5 μ ." (Our Plate IV. fig. 8.)

Var. *fusiforme*, Turner.—"Almost straight, frond not so even in diameter, decidedly fusiform. Long., 295-415 μ ; lat., 12.5-15 μ ; lat. apic., 9-11.5 μ . (Our Plate IV. fig. 9.) (This species seems nearest to *C. biclavatum*, Boerg. W. B. T.) Very rare. Ross—Balma-carra, legit. A. W. Wills (W. B. T.)

50. *C. setaceum*, Ehr.—Not so common as *C. rostratum*. Ross—near Tain; Inverness—Loch Ruthven; many localities in Aberdeen and Kincardine; Forfar—Clova Tableland, and Tannadice Curling Pond; Perth—Durdie, Moncreiffe, Birnam, Buchanty; Argyle—near Kingshouse.
51. *C. strigosum*, Breb.—Rare. Ross—near Tain, and Strathpeffer; Inverness—Brin; Aberdeen—St. Fergus Canal, Mintlaw, Alford, Whitestripes, Danestone, and near Springhill; Kincardine—Lochs of Park and Lumgair.
52. *C. striolatum*, Ehr.—General.
 β *orthonotum*, Roy. (F. W. Algæ of Enbridge Lake, Hants, in "Journ. Bot.," Nov. 1890, p. 336.)—Not uncommon.
 In a gathering made at about 2000 feet on Lochnagar the cell-contents were observed, in numerous instances, condensed into brown, elliptical, spore-like bodies. The same state has been noticed in *C. directum*, Arch., and some others, at considerable elevations.
53. *C. subulatum* (Kütz.)* Breb.—Very rare. Inverness—Brin; Aberdeen—"Old Road," Aboyne; Argyle—head of Glen Coe.
54. *C. turgidum*, Ehr.—Not very common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Stirling.
55. *C. Venus*, Kütz.—Probably general. Caithness, Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Dumbarton, Argyle, Bute, Fife.

GONATOZYGON, De Bary.

1. *G. Brebissonii*, De Bary.—General. Very variable in appearance, from roughly granulated to perfectly smooth, as at Dalbrake, Kincardine. When smooth it is the *G. læve*, Hilse (Rabenh. "Algæ Europ," 1962, January 1867). This form, taken by itself, looks distinct, but in this district every intermediate state occurs.
2. *G. Kinahani* (Archer), Rab.—Not common. Aberdeen—at Scotston Moor, Whitestripes Moss, Tillyfour, Powlair, Slewdrum; Kincardine—at Crathes.
This is a much larger and stouter form than *G. Ralfsii*, and always occurs in long filaments.
3. *G. Ralfsii*, De Bary.—General.
A smooth form of this species also occurs.

SPIROTÆNIA, Breb.

1. *S. acuta*, Hilse.—Very rare. Aberdeen—at Upper Powlair, Slewdrum, Culblean; Kincardine—at Den of Garrol, and Dalbrake; Stirling—Fintray Hills.
2. *S. bryophila* (Breb.), Rab. (*muscolola*, De Bary).—Very rare. Aberdeen—Braes of Gight, Scotston Moor, Dalbagie; Kincardine—at Muchalls.
3. *S. closteridia*, Kütz.—Very rare. Kincardine—at Muchalls, near the mill.
4. *S. condensata*, Breb.—General. Occasionally with zygospores.
5. *S. minuta*, Thuret.—General, never abundant.
β minutissima, Kirch.—Rare. Ross—near View Rock, Strathpeffer; Aberdeen—head of Glen Cattie, between Loch Kinnord and Cambus-o'-May; Kincardine—pool on Scolty; Perth—Fendoch Hill, forming lines of from 20 to 30 individuals, in pairs, with a little distance between each pair, enveloped in mucus.
6. *S. obscura*, Ralfs.—Not common. Ross—near Tain and Coul; Inverness—at Brin; Aberdeen and Kincardine—many localities; Perth—at Kilgraston,* and Bracklin; Stirling—Fintray Hills.
Zygospores have been observed at Cammie in Kincardine. They are similar to those of *S. condensata*.
7. *S. parvula*, Archer.—Not common. Nairn—in a quarry near the town; Aberdeen and Kincardine—many localities; Forfar—Balquhadly Hill in Fern, Clova Tableland; Perth—Durdie, Birnam, Folotry in Fowlis Wester.

8. *S. truncata*, Archer.—Not common. Inverness—head of Glen Sligachan in Skye; Aberdeen and Kincardine—many localities; Forfar—Clova Tableland; Perth—Birnarn; Argyle—head of Glen Coe.

PENIUM, *Breb.*

1. *P. adelochondrum*, Elfv.—Very rare. Ross—Poolewe; Inverness—head of Glen Sligachan in Skye; Aberdeen—head of Glen Cattie.
2. *P. Clevei*, Lund. Kirkcudbright—New Galloway.
3. *P. crassiusculum*, De Bary.—Not uncommon on wet rocks. Conjugated near Kyles of Bute in Argyle. Zygospore similar to that of *P. phymatosporum*, but the angles less prominent and more rounded.
4. *P. cucurbitinum*, Bisset.—Not common. Sutherland—Loch Inver; Ross—near Strathpeffer; Aberdeen and Kincardine—many localities; Forfar—Canlochan, and Reeky Linn; Perth—Bracklin near Callander; Argyle—near Kyles of Bute; Renfrew—near Greenock; Kirkcudbright—New Galloway.
 Var. *minor*, West.—Very rare. Perth—Craig-an-Lochan (Mr. W. West).
5. *P. curtum*, *Breb.*—Rare. Aberdeen—Brimmond, and near Old Mill Reformatory; Kincardine—Cammie, Glen Dye, and near Cowie; Perth—Rannoch, and near Tyndrum.
 β *minor*, Wille.—Aberdeen—Ben Muichdhuì, above Loch Etchachan.
6. *P. Cylindrus*, Ehr.—General. With zygospores in a pool a little north of Loch Dawan in Aberdeen.
7. *P. didymocarpum*, Lundell.—General. Conjugation not uncommon.
8. *P. Digitus* (Ehr.), *Breb.*—General and abundant. Zygospore globular, smooth, thick walled; contents dense, faintly yellowish green. Diameter, 73.6μ ; thickness of cell membrane, 3.2μ . Seen once only, in a wet hollow near Cambus-o'-May, on Deeside, Aberdeen.
9. *P. interruptum*, *Breb.*—Not common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth.
10. *P. Jenneri*, Ralfs.—Rare. Inverness—Ben Nevis; Aberdeen—Hazelhead, Craigendinnie, Dinnet with zygospores, Homehead in Cromar, Dalbagie, "Break Neck Fall" in Glen Callater; Kirkcudbright—New Galloway.

11. *P. lagenaroides*, Roy.—Not common. Ross—near Tain; Aberdeen—Slewdrum, Aboyne, Dawan, Presswhin, Dalbagie, Glen Clunie; Kincardine—Scolty Dam, Curran, Bishop's Dam; Forfar—Glen Clova, Glen Dole; Perth—Bracklin, Coilantogle.
12. *P. lamellosum* (Breb.), Kütz.—Not uncommon. Sutherland, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling, Arran.
13. *P. Libellula* (Focke, 1847), Nord. (*P. closterioides*, Ralfs, 1848).—Not rare. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle.
 β *intermedium*, n. var. Precisely similar to the type, but only half as large, or rather less. Length, 118-128 μ ; breadth, 25 $\frac{1}{2}$ -29 μ . This form appears to connect *Libellula*, Focke, with *Navicula*, Breb. If so, these two might be supposed to be extreme forms of one species. It is to be observed, however, that this new var. is very uniform in size and appearance in such widely separated regions as Britain and South Africa, that no other intermediate forms have been noted, and that the mode of conjugation of *Libellula* and var. β is not known. It may be worth remarking that while *Navicula* and this var. β are abundant in South Africa, *Libellula* has not been seen as yet.
 Not common—may have been overlooked. Ross, Inverness, Perth, Aberdeen, Kincardine, Argyle, Arran.
14. *P. Margaritaceum* (Ehr.), Breb., and vars. β and γ .—Common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling, Arran, Kirkcudbright.
15. *P. minutissimum*, Nord.—Apparently rare. Ross—at Poolewe; Inverness—at Brin; Aberdeen—at Heughhead, Aboyne, with zygospores, and at "The Colonel's Bed" in Braemar.
16. *P. Mooreanum*, Archer.—Rare. Inverness—near Loch Coruisk in Skye; Aberdeen—Ben-na-chie, and Birsemore Loch; Kincardine—at the source of the Cowie; Forfar—Glen Clova, and Clova Tableland; Perth—Forest of Athole.
17. *P. Nægellii*, Breb.—General.
18. *P. Navicula*, Breb.—Common, often with zygospores. Orkney, Ross, Inverness, Nairn, Aberdeen, Kincardine, Forfar, Perth, Stirling, Argyle, Arran.
19. *P. oblongum*, De Bary.—Not common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Argyle, Arran.

20. *P. phlymatosporum*, Nord.—Very rare. Kincardine—on a wet rock near Mill of Muchalls, with zygospores.
21. *P. polymorphum*, Perty.—Not uncommon. Shetland, Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling, Argyle, Arran.
22. *P. Ralfsii*, De Bary (*P. minutum*, Cleve; certainly not *Docidium minutum*, Ralfs).—Somewhat rare. Sutherland—near Loch Inver; Ross—abundant at Poolewe; Inverness—in Skye near Loch Coruisk; Aberdeen—head of Glen Tannar; Forfar—Glen Clova, and Clova Tableland; Perth—in Rannoch; Arran—Glen Sannox, Glen Ranza, and Goatfell.
23. *P. Royanum*, Turner (“*Algæ Aquæ Dulcis Indiæ Orientalis*,” Stockholm, 1892).—Very rare. Perth—near Loch Earn (Mr. W. B. Turner).
24. *P. rufescens*, Cleve (*P. rufo-pellitum*, Roy, 1877).—Not common. Inverness, Aberdeen, Kincardine, Perth, Argyle.
25. *P. spinospermum*, Joshua.—Probably common. Inverness, Aberdeen, Kincardine, Stirling, Argyle, Renfrew.
26. *P. spirostriolatum*, Barker.—Not common. Ross, Inverness, Aberdeen, Kincardine, Perth, Dumbarton, Argyle.
27. *P. truncatum* (Breb.), Ralfs.—Not rare. Sutherland, Ross, Inverness, Aberdeen, Kincardine (with zygospores at Muiryhaugh), Perth, Argyle, Arran.

MESOTÆNIUM, Näg. (*PALMOGLÆA*, Kütz.)

1. *M. chlamydosporum*, De Bary.—Not uncommon. Ross, Inverness, Aberdeen, Kincardine, Perth.
2. *M. Endlicherianum*, Näg.—Common. Sutherland, Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Stirling, Renfrew.
3. *M. de Greyii*, Turner.—Not common. Inverness—Braeriach; Aberdeen—Tough, Glen Derry, and “Colonel’s Bed”; Argyle—Kyles of Bute.
4. *M. macrococcum*, Kütz. (*M. Braunii*, De Bary).—Common. Ross, Inverness, Aberdeen, Kincardine, Forfar, Perth, Renfrew.
5. *M. micrococcum* (Kütz.), Kirch.—Rare or overlooked. Inverness—on Cairngorm; Aberdeen—Dalbagie.
6. *M. violascens*, De Bary.—Not common. Inverness, Nairn, Aberdeen, Forfar, Perth.

CYLINDROCYSTIS, Menegh.

1. *C. Brebissonii*, Menegh.—General, and frequently conjugated.
2. *C. crassa*, De Bary.—General.
3. *C. diplospora*, Lundell.—Pretty common, and often conjugated. Orkney, Sutherland, Ross, Inverness, Aberdeen, Kincardine, Perth, Argyle.

Sub-sp. *major*, W. West (F. W. Algæ of West of Ireland, in "Journ. of Lin. Soc.," vol. xxix. p. 131, Plate XX. fig. 5).—Very scarce and rare. Aberdeen only, found at the following localities on Deeside:—Birsemore Loch, and south of Birsemore, Dinnet (where it was first found about twenty years ago, and distributed as a new species under the MS. name of *C. valida*), Birkhill in Cromar, and Dalbagie near Ballater. Length, 104-119 μ ; breadth, 49-58 μ .

Dr. Nordstedt thought it might be reduced to a form of *C. diplospora*, Lund., and in the absence of conjugated examples it has been thought well to adhere to that view for the present. It differs, however, in certain points; notably, it is more acutely rounded at the ends, and is not narrowed, however slightly, towards the middle. Further, there is a small form, just half the size, which it was proposed to name *C. valida*, β *minor* (length, 56 μ ; breadth, 25 μ). This is the counterpart, in every particular, of the larger form, except size, and when seen side by side in the same gathering with *C. diplospora* it looks very different from that species. It is very local and rare, but is usually to be found in some quantity in Kincardine at Dalbrake in Strachan.

COSMOCLADIUM, Breb.

1. *C. constrictum* (Arch.), Josh. (= *Dictyosphærium constrictum*, Arch.)—Length, 17-20 μ ; breadth 10-12 μ . Zygospore globose, with rather short stout spines. Diameter, *ex. sp.*, 17-20 μ . (*Our* Plate II. fig. 7.) Very rare. Probably often overlooked. Aberdeen—"Old Road" and Heughhead near Aboyne; Kincardine—Dalbrake in Strachan; Perth—Buchanty.
2. *C. perissum*, n. sp.—Very minute; nearly as broad as long; constriction tolerably deep and opening widely; sides semicircular; ends rather flattened; cell-walls very pellucid, and sometimes brownish in colour. Zygospore large in proportion to the fronds, extremely irregular in shape, and reddish-brown in

colour. Grows apparently in free groups. Length, 12-13 μ ; breadth, 10-12 μ ; isthmus, 6-7 μ . Zygospore, 15-20 μ . (*Our Plate II. fig. 14.*)

Very rare. Aberdeen—Blackmoss, Craigendinnie, Aboyne; Kincardine—Cammie in Strachan.

3. *C. pulchellum*, Breb.—Very rare. Aberdeen—Aboyne; Kincardine—Bogandreep in Glen Dye; Forfar—Clova Tableland.
4. *C. Saxonicum*, De Bary.—Very rare. Kincardine—Dalbrake and Heughhead in Strachan.

SUPPLEMENTAL.

EUASTRUM (Ehr.), Ralfs.

(23.) *E. oblongum* (Grev.), Ralfs.

Var. *cephalophorum*, West.—Very rare. Perth—Spital of Glen Shee (Mr. W. West).

STAURASTRUM (Meyen), Ralfs.

2/1. *S. amphidoxon*, West.—Very rare. Kirkcudbright—New Galloway (Mr. W. West).

(57.) *S. grande*, Bulnh.

Var. *parvum*, West.—Very rare. Perth—Glen Shee (Mr. W. West).

2/2. *S. pyramidatum*, West.

Var. *coilon*, West.—Very rare. Aberdeen—Corrie of Loch Kandor (Mr. W. West).

ARTHRODESMUS (Ehr.), Archer.

(2.) *A. conergens*, Ehr.

Forma *membrana irregulariter punctata*, West.—Very rare. Aberdeen—Corrie of Loch Kandor (Mr. W. West).

COSMARIUM (Corda), Ralfs.

2/1. *C. asperum*, West.—Very rare. Kirkcudbright—New Galloway (Mr. W. West).

2/2. *C. furcatospermum*, West.—Very rare. Orkney (Mr. W. West).

(72.) *C. Holmiense*, Lundell.

Var. *undatum*, West.—Very rare. Perth—Glen Shee (Mr. W. West).

- 2/3. *C. Lundellii*, Delp.
 Var. *ellipticum*, West.—Very rare.
- 2/4. *C. Scoticum*, West.—Very rare. Perth—Craig-an-Lochan
 Glas Mhoel, (?) Ben Laoigh (Mr. W. West).
- (165.) *C. tetragonum* (Näg.), Archer.
 Var. *pumilum*, West.—Very rare. Perth (or Argyle)—Ben
 Laoigh (Mr. W. West).
- (167.) *C. Thwaitesii*, Ralfs.
 Var. *Scoticum*, West.—Rare. Kirkcudbright—New Galloway
 (Mr. W. West).

POSTSCRIPT.

Dr. Roy having unfortunately died when about half of this work had appeared in print, leaving his notes for the rest in an unfinished state, more especially as regards descriptions of new species and varieties, it fell to me, as having been long closely associated with him in the study of the *Desmidiææ*, and having in my possession authentic specimens of most of the new forms, to endeavour to supply what was wanting, and to revise the MS. very carefully transcribed by his daughter, Miss Mary Roy.

To bring the record up to date, there have been included, with the author's consent, some new species and varieties published since Dr. Roy's death by Mr. William West.

It was Dr. Roy's special desire that my name should be associated with his in all the new species now published, except where otherwise indicated; because, as he put it, we had worked so much together that it would have been difficult to have made a fair division,—but by far the greater part of the work is the fruit of Dr. Roy's patient investigation.

J. P. BISSET.

Sept. 1894.

ERRATA.

- Under STAURASTRUM, 36, for *S. cornigerum* read *S. cornutum*, Archer.
 „ COSMARIUM, 31. *C. corbula*, for Plate III. read Plate II.
 „ „ 57. *C. flavum*, after “frond smooth” read “and yellow
 in colour.”

DESCRIPTION OF SCOTTISH DESMIDIEÆ, PLATE IV.—Fig. 1. *Docidium Farquharsonii*, Roy, $\times 200$. Fig. 2. *Micrasterius angulosa*, Hantz., zygospore, $\times 200$. Fig. 3. *Staurastrum Farquharsonii*, Roy: *a*, front; *b*, end; $\times 400$. Fig. 4. *St. dilatatum*, Ehr., zygospore, $\times 400$. Fig. 5. *Xanthidium quadricornutum*, R. and B.: *a*, front; *b*, end; $\times 400$. Fig. 6. *Closterium Balmacarense*, Turner, $\times 400$. Fig. 7. *C. Balmacarense*, β minor, Turner, $\times 400$. Fig. 8. *C. Scoticum*, Turner, $\times 400$. Fig. 9. *C. Scoticum*, var. *-fusiforme*, Turner, $\times 400$. (Figs. 5-9 after Mr. W. B. Turner.)

ZOOLOGICAL NOTES.

Crossbills in Foula, Shetland.—A solitary Crossbill (*Loxia curvirostra*) made its appearance here on the 16th of August, after a strong breeze from N.W., N., N.E., on the two preceding days; and I saw five more on the 3rd of September. The islanders tell me they have never seen these birds here before.—FRANK TRAIL, Foula.

[A bird of the same species, a female, was captured at the Monach Lighthouse, Outer Hebrides, on the 7th of August, and was sent to us for identification by Mr. W. A. Tulloch. On the 2nd of July a flock of Crossbills appeared at the Skerryvore Rock Lighthouse, as we are informed by Messrs. Nicol and Charleson.—EDS.]

Kingfisher in Mull.—The Kingfisher (*Alcedo ispida*) is sufficiently unfamiliar in all the Hebrides to make its occurrence of some interest. I observe in the "Evening Times" of the 12th of September that a fine specimen killed itself the other day by flying against the windows of Aros House, Tobermory.—JOHN PATERSON, Glasgow.

Nesting of the Tufted Duck in Renfrewshire.—I was surprised to see under the above heading, in the "Annals" for July, the Tufted Duck (*Fuligula cristata*) at Eaglesham recorded as a new addition to the birds of East Renfrewshire. During my residence in Glasgow in the years 1888-91 I always considered the Tufted Duck to be by far the most common of the various species of duck which frequent the lochs around Eaglesham, Mearns, and Neilston. I never remember during my frequent excursions to these lochs, both in summer and winter, ever to have missed seeing several pairs of these handsome birds; the males, in their conspicuous black and white plumage, being usually more numerous than the females. During the latter end of May and the first half of June I found many of their nests every year, and still have one of them in my collection taken in 1889. The keepers at that time informed me that it was only during the last four or five years they had noticed the Tufted Duck remaining to breed in that district, and it was then rapidly on the increase. Not only here, however, but in many other parts of England and Scotland this bird appears to be greatly increasing in numbers. In 1890, when, through the kindness of my friend Mr. Montgomery, I had an opportunity of thoroughly exploring the islands on Loch Leven, I met with upwards of thirty nests of the Tufted Duck in one day, containing from two to fifteen, and in one instance twenty eggs in a nest. The last-mentioned number were apparently the layings of two females; but the fifteen were not, although nine and ten appeared as a rule to be the full set. I have no doubt that the Scaup Ducks said to have been seen by a Mr. Stark on Loch Leven during the breeding season really belonged to

the present species. I consider the Wild Birds Protection Acts of 1880-81, which have largely put a stop to the carrying of fire-arms during the breeding season, to be in a great measure the cause of this satisfactory increase in what was only a few years ago a comparatively rare species.—ROBERT H. READ, Westminster.

Green Sandpiper in Argyll.—On the 8th of August, while passing near a small lochan two miles inland, a solitary bird rose off the bog and settled by the side of the water. My gamekeeper said, "That's a bird I never saw before"; and as I was equally unable to say what it was, we went after it and I shot it, and found it to be a Green Sandpiper (*Totanus ochropus*), which proved on dissection to be a female. As this species has no place in the "Vertebrate Fauna of Argyll," its occurrence may be worthy of record.—A. BURN MURDOCH, Edinburgh.

Notidanus griseus captured off the Orkney Islands.—A fine female specimen of the Six-gilled Shark was brought into Aberdeen Market upon 1st August 1894, which had been taken to the north-west of Orkney. Its stomach contained haddocks and common dab. This is by no means a common form for the Scottish coasts. One was caught off Banff in 1857, and is now in the Museum there.

Upon 9th August three more—two females and one male—of this species were caught by the same fisherman in the same locality. These were also brought to Aberdeen. Their stomachs contained Fishing Frog (*Trophius piscatorius*), Picked Dog-fish (*Acanthias vulgaris*), and Plaice (*Pleuronectes platessa*).—GEORGE SIM, Aberdeen.

Mollusca from the Islands of Barra and North Uist.—I recently obtained *Planorbis nautilus*, Linn., and *Planorbis glaber*, Jeffreys, from the Island of Barra, and *Ancylus fluviatilis*, Müller, from North Uist. The two former are from Sinclair Loch, Barra, where they were obtained in tow-net gatherings from that loch, and both were moderately frequent. The *Ancylus* was frequent on stones in the bed of a small stream that flows out of the east end of Loch Fada, North Uist.—T. SCOTT, Leith.

Macroglossa bombylifformis in the island of Jura.—In the "Annals" for 1892, p. 141, I recorded the occurrence of the narrow-bordered Bee Hawk-moth in the island of Jura. I have this season actually captured a specimen in the same locality.—HENRY EVANS, Jura Forest.

Diaptomus serricornis, Lilljeborg, in Lochs in Barra and North Uist.—This Copepod was added to the British fauna in 1891, from specimens obtained in a tow-net gathering from Loch Mullach-Corrie, Sutherlandshire, collected by W. S. Caine, Esq., M.P. (see "Scottish Naturalist" for October 1891, p. 172; also "A Revision of the British Species of Fresh-water Cyclopidae and Calanidae," by Prof. G. S. Brady, p. 36). It had been taken in a loch in Shetland

in 1867 by Mr. David Robertson, F.L.S., but was not recorded till after its discovery in Sutherland. These two localities were the only British habitats known to me previous to my visit to Barra in May last; it was therefore interesting to find that this was the only *Diaptomus* in the gatherings from the various Barra and North Uist lochs examined. *Diaptomus serricornis* was obtained in nearly all of the lochs visited, and was quite a common species in some of them.—THOMAS SCOTT, Leith.

Neomysis (Mysis) vulgaris, J. V. Thompson, in Barra, Outer Hebrides.—*Neomysis vulgaris* was common both in Sinclair Loch and in Loch Dorrinn—two small neighbouring lochs on the west side of Barra. A small stream from Sinclair Loch, joined by a branch from Loch Dorrinn, carries the overflow water of both lochs to the sea. Both lochs are not much above the high-water level of the sea, and it is reported that sometimes during very high spring tides the sea flows into them. Whether that be the case or not, the water in Sinclair Loch was quite fresh at the time of my visit. I and Mr. Robert Duthie, Fishery Officer,—who assisted me to examine these and other Barra Lochs,—tasted the water and found it pleasant and free from any trace of brackishness. It has been considered that this Schizopod does not live in fresh water, but requires the water to be more or less brackish; its occurrence in these Barra lochs where the water was quite fresh is therefore of interest. It may also be of interest to state that *Neomysis vulgaris* was quite common in a fresh-water loch near Wick in 1891 (see remarks in "Ninth Annual Report of the Fishery Board for Scotland," part iii. p. 285). The water of the Wick loch was tested with one of our improved hydrometers and found to be as fresh as the water hat was being used for domestic purposes.—T. SCOTT, Leith.

CURRENT LITERATURE.

The Titles and Purport of Papers and Notes relating to Scottish Natural History which have appeared during the Quarter—July-September 1894.

[The Editors desire assistance to enable them to make this Section as complete as possible. Contributions on the lines indicated will be most acceptable and will bear the initials of the Contributor. The Editors will have access to the sources of information undermentioned.]

ZOOLOGY.

A CONTRIBUTION TO THE VERTEBRATE FAUNA OF WEST ROSS-SHIRE. By Lionel W. Hinxman, B.A., and William Eagle Clarke, F.L.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 377-415.—Deals with 27 species of Mammalia, 132 Birds,

3 Reptilia, and 3 Amphibia. A general sketch is also given of the leading zoological and geological features of the area.

THE SQUIRREL IN THE SOUTHERN HIGHLANDS. R. Service. *Zoologist* (3), vol. xviii. p. 260 (July 1894).—Observed in Glenrazie Woods; the first notice of their occurrence westwards of the Cree.

THE PRESENT STATUS OF THE HOODED CROW IN SOUTHERN SCOTLAND. Harold Raeburn. *Zoologist* (3), vol. xviii. p. 261 (July 1894).

GREATER SPOTTED WOODPECKER NESTING IN SCOTLAND. H. A. Macpherson. *Zoologist* (3), vol. xviii. p. 344 (September 1894).—A pair nested in 1888 at Canobie.

SHORT-EARED OWLS IN SOLWAY. Robert Service. *Zoologist* (3), vol. xviii. p. 264 (July 1894).—Four pairs noted on 24th May between Lochs Trool and Dec.

DOTTEREL IN HADDINGTONSHIRE. Harry F. Witherby. *Zoologist* (3), vol. xviii. p. 266 (July 1894).—A flock of eight seen on 22nd May at Dirleton.

POLISH SWAN IN ELGINSHIRE IN AUGUST. *The Field*, 18th August 1894, p. 292.—A pair of this race was shot at Pitgavney on 2nd August 1894.

THE REPTILES AND BATRACHIANS OF THE EDINBURGH DISTRICT. By William Evans, F.R.S.E. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 490-526.—Deals with four species of Reptilia and six of Batrachia.

ACHANARRAS REVISITED. By R. H. Traquair, M.D., LL.D., F.R.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 279-286.—On the fossils found in the Old Red Sandstone at Achanarras Quarry in Caithness.

ON CEPHALASPIS MAGNIFICA, A NEW FOSSIL FISH FROM THE CAITHNESS FLAGSTONES. By R. H. Traquair, M.D., LL.D., F.R.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 269-273, Plate VII.

A STILL FURTHER CONTRIBUTION TO OUR KNOWLEDGE OF PALÆOSPONDYLUS GUNNI, TRAQUAIR. By R. H. Traquair, M.D., LL.D., F.R.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 312-321, Plate IX.—This paper is based on specimens obtained at Achanarras in Caithness.

CAPTURES [LEPIDOPTERA] IN ARGYLESHIRE. (Miss) M. L. Cottingham. *Entomologist*, vol. xxvii. p. 223 (July 1894).—The species mentioned are *Melitæa artemis*, *Thecla rubi*, *Argynnis euphrosyne*, *Macroglossa stellatarum*, *Phlogophora meticulosa*, *Numeria pulveraria*, *Panagra petraria*, *Melanippe hastata*, *Arctia fuliginosa*, and *Bombyx quercus*.

NOTES [LEPIDOPTERA] OF THE SEASON 1894. A. Horne. *Ent. Record*, vol. v. p. 182 (July 1894).—Records from Tain, Ross-shire, Aberdeenshire, and Orkney.

A COMPARATIVE SKETCH OF THE BUTTERFLIES OF ELGIN AND SURREY. By Henry H. Brown. *Trans. Northern Assoc. of Literary and Scientific Societies*, vol. ii. part ii. (1894), pp. 13-16.

THE TYPICAL *EREBIA EPIPHRON* IN SCOTLAND. Chas. G. Barrett. *Ent. Mo. Mag.* (2), vol. v. p. 211 (September 1894).—Note on a specimen recently obtained by Mr. Salvage in Sutherlandshire.

OCCURRENCE OF THE YELLOW MALE OF *HEPIALUS HUMULI*, L., IN LANARKSHIRE. Kenneth J. Morton. *Ent. Mo. Mag.* (2), vol. v. p. 212 (September 1894).—Specimen captured on 18th July in a small patch of bog land in South Lanarkshire, at an elevation of between 700 and 800 feet.

CIRRHEDIA XERAMPELINA IN AYRSHIRE. William C. S. Ferguson. *Entomologist*, vol. xxvii. p. 273 (September 1894).—One specimen bred from a larva taken at Glencoy on 20th April. Specimens also taken of *Nisoniades tages*, *Plusia bractea*, *Strenia clathrata*, and *Euclidia glyphica*.

ABUNDANCE OF CATERPILLARS OF THE ANTLER MOTH, *CHARÆAS GRAMINIS*, LINN., IN THE SOUTH OF SCOTLAND. By Eleanor A. Ormerod, F.E.S. *Ent. Mo. Mag.* (2), vol. v. pp. 169-171 (August 1894).—In this paper it is stated that considerable damage has been caused by these caterpillars to the grasses on the hill pastures in the western part of Roxburghshire and the adjoining counties of Dumfries and Selkirk. A short account is given of its history as an agricultural pest.

A SECOND HUNDRED NEW BRITISH SPECIES OF DIPTERA (*continued*). G. H. Verrall. *Ent. Mo. Mag.* (2), vol. v. pp. 145-146 (July 1894).—A number of Scottish records are included in this paper.

A LIST OF SPIDERS (*ARANEIDEA*) COLLECTED IN THE NEIGHBOURHOOD OF EDINBURGH. By George H. Carpenter, B.Sc., and William Evans, F.R.S.E. *Proc. Roy. Phys. Soc.*, vol. xii. part ii. (1893-94), pp. 527-588, Plate XII.—In this paper 175 species are recorded, including several new to Scotland, and one new to science.

DESCRIPTION OF A NEW SPIDER [*DICTYNA ARENICOLA*] FROM EAST LOTHIAN. By the Rev. O. P. Cambridge, M.A., F.R.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), Appendix, pp. 589-590, Plate XII.

THE LAND AND FRESH-WATER CRUSTACEA OF THE DISTRICT AROUND EDINBURGH. PART III. THE CLADOCERA. By Thomas Scott, F.L.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 362-377.—The species mentioned are twenty-nine in number, and belong to twenty-two genera. A list is given of twelve Scottish species not yet observed in the district dealt with.

ON SOME FOSSIL PHYLLOPODA. By Prof. T. Rupert Jones and Dr. Henry Woodward. *Geol. Mag.*, N. S., Dec. IV. vol. i. pp. 289-294 (July 1894).—Treats of *Discinocaris Browniana* and *Aptychopsis Wilsoni* from Moffat.

ON SOME FRESH-WATER ENTOMOSTRACA FROM THE ISLAND OF MULL, ARGYLESHIRE, COLLECTED BY THE LATE Mr. GEORGE BROOK. By Thomas Scott, F.L.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 321-329.

BOTANY.

FIRST RECORDS OF BRITISH FLOWERING PLANTS. By Wm. A. Clarke, F.L.S. *Journ. Bot.*, August.—Covers from *Plantago major* to *Rumex Acetosella*.

ON SOME HIGHLAND PLANTS OBSERVED IN 1893. By Rev. E. S. Marshall, M.A., F.L.S., and W. A. Shoolbred, M.R.C.S. *Journ. Bot.*, June 1894.—Treats of the plants observed on the borders of Perthshire (Mid-Perth, 88) and Argyle (98). Several new vice-comital records are given.

A TENTATIVE LIST OF BRITISH HIERACIA (*Journ. Bot.*, July), and NOTES ON BRITISH HIERACIA (*l.c.* August). Both by Frederick J. Hanbury, F.L.S.—These are both indispensable to the students of Hieracia. A fuller notice will appear in January.

NEW VARIETY OF HIERACIUM DOVRENSE, FRIES. By Rev. E. S. Marshall, *Journ. Bot.*, July.—Found near the Lochsie Burn, in Glen Shee, East Perth. It is described fully under the varietal name *spectabile*.

LEDUM PALUSTRE, L., IN SCOTLAND. By Ar. Bennett, F.L.S. *Journ. Bot.*, September.—Gives an account of the discovery and record of the plant as growing in a moss near Bridge of Allan.

SALIX AURITA × HERBACEA IN EAST PERTH. By Rev. E. S. Marshall. *Journ. Bot.*, June.—Found by the Lochsie, Glen Shee.

TWO NEW WILLOW HYBRIDS. By Ed. F. Linton, M.A. *Journ. Bot.*, July.—*S. Caprea* × *Myrsinites*, from Glen Fiagh, Forfarshire; and *S. cernua* (? *herbacea* × *repens*), from Little Craighindal, Braemar.

WHAT IS THE TRUE RANK OF SALIX SADLERI, SYME? By Rev. E. S. Marshall, M.A., F.L.S. *Journ. Bot.*, July.—Suggests that the Willow is a hybrid between *S. lanata* and *S. herbacea*.

SEA-WEEDS. By John Hogben. *United Presbyterian Magazine*, August.—A popular sketch, in which the best localities on the Firths of Forth and Clyde are enumerated.

REMARKS ON TWO TRANSVERSE SECTIONS OF CARBONIFEROUS WOOD FROM BABERTON NEW QUARRY, MIDLOTHIAN. By J. Bennie

and J. A. Johnston. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 359-361.

ON THE VARIOUS DIVISIONS OF BRITISH CARBONIFEROUS ROCKS AS DETERMINED BY THEIR FOSSIL FLORA. By Robert Kidston, F.R.S.E., F.G.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 183-257.—Contains much valuable information on the Carboniferous Flora of Scotland.

ON SOME NEW SPECIES OF FOSSIL PLANTS FROM THE LOWER CARBONIFEROUS ROCKS OF SCOTLAND. By Robert Kidston, F.R.S.E., F.G.S. *Proc. Roy. Phys. Soc. Edin.*, vol. xii. part ii. (1893-94), pp. 258-268, Plates IV.-VI.—Descriptions of six new species, one of which is referred to a new genus.

REVIEW.

THE BOOK OF ANTELOPES. By P. L. Sclater, M.A., F.R.S., and Oldfield Thomas, F.Z.S., F.R.G.S. Illustrated by Joseph Wolf, F.Z.S., and J. Smit. (London: R. H. Porter.)

Mr. Porter has just issued the first part of a work that will assuredly rank as *secundus nulli* of the magnificent volumes devoted to the depiction and description of Natural History subjects.

“The Book of Antelopes” is indeed an exceptionally attractive and valuable work. Written by the highest authorities, it becomes indispensable to the student of mammals. Illustrated with exquisite coloured plates, chiefly by the master of present day animal painters, Joseph Wolf, and by Mr. J. Smit, who is greatly to be congratulated on the excellence of his pictures, it appeals irresistibly to all lovers of nature and fine art. The naturalist and the sportsman will find its pages teeming with interesting matter relating to a group of creatures which for variety and gracefulness of form and beauty of coloration stand unrivalled in the animal kingdom, and have justly rendered them favourites of the first order.

The work is also embellished with many useful woodcuts of heads, horns, skulls, etc., is excellently printed, and of convenient size.

The part before us treats of the Hartebeests (*Bubalis*), eight in number, and Hunter’s Antelope (*Damaliscus hunteri*), to which six coloured plates are devoted. The work will be completed in 12 or 13 parts.

We recommend it most unreservedly to all who are interested in the subject upon which it treats so admirably both with pen and pencil.

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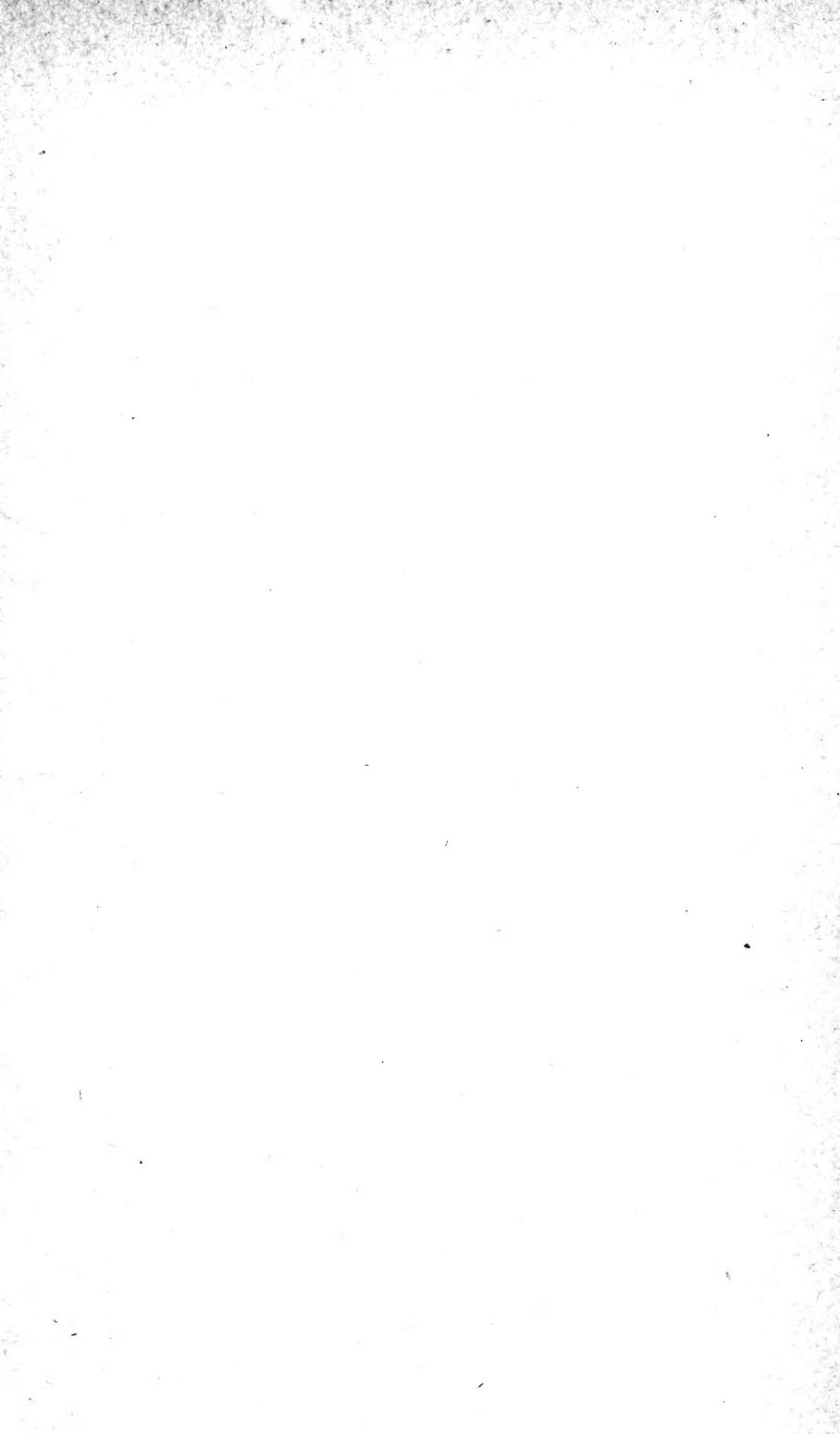
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