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1878.



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# PROCEEDINGS

OF THE

## NATURAL HISTORY SOCIETY OF GLASGOW.

SESSION 1875-76.

THE TWENTY-FOURTH ANNUAL GENERAL MEETING, ANDERSON'S UNIVERSITY BUILDINGS, SEPTEMBER 26TH, 1875.

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

The Treasurer submitted his Annual Financial Statement, which showed a balance in favour of the Society of £104 17s. 1d. The Secretary read the report of the Council on the business of last session, and the Librarian reported on the state of the Library. The reports were considered satisfactory.

The following gentlemen were elected office-bearers for the session:—Professor John Young M.D., F.R.S.E., President; James Stirton, M.D., F.L.S., James Ramsay, and Thomas Chapman, Vice-Presidents; Robert Mason, Secretary; Thomas S. Hutcheson, Treasurer; Peter Cameron, Librarian; J. Barclay Murdoch, D. Corse Glen, F.G.S., Archibald Gilchrist, James Coutts, Hugh M'Bean, John Kirsop, Donald Dewar, M.D., James Lumsden, and Duncan M'Lellan, Members of Council.

Messrs Stephen Cooke and Joseph Robertson were elected ordinary members of the Society.

### SPECIMENS EXHIBITED.

Dr F. P. Flemyng, F.R.G.S., exhibited a fine specimen of the Calamary or Squid (*Loligo vulgaris*), which had been thrown up on the beach at Dunoon in March last. Dr Flemyng stated that this species belongs to the family of cuttle-fishes, and is believed to be the food of the porpoise, and remarked that it is not often met with on the western, although frequently seen on the eastern

coasts. He shortly described the appearance it presented when found, and contrasted its small size with the huge examples of the same family he had often seen at St Vincent and the Canary Isles. Professor Young then made a few remarks descriptive of the habits and structure of the cuttle-fish family. The specimen, which was in fine condition and had been well preserved, was presented by Dr Flemyng to the Hunterian Museum.

Mr John Young, F.G.S., exhibited some portions of the edible bird's-nest, and prepared fins of sharks, both of which are used by the Chinese in the preparation of certain soups, the specimens being sent for exhibition by Mr Alexander M'Gregor of the Clydesdale Bank, Glasgow. Mr Young stated that the edible bird's-nests are formed by a species of swallow belonging to the family *Cypselidae*, which have the power of secreting in their salivary glands the glutinous material of which the nests are composed. The sharks' fins, he stated, are prepared for the market by being subjected to a process of maceration in water.

Mr Young also exhibited some specimens of finely-preserved Carboniferous Polyzoa from Dykehead pit, High Blantyre. Two of the species belong to the genus *Ceriodora*, viz., *C. similis* and *C. interporosa*. Shrub-like fronds of the latter occur in the shale, from three to four inches in length, and show their habit of growth more clearly than any that have hitherto been met with in our limestone strata. One of the other Polyzoons belongs to a newly described species, *Hyphasmopora Buskii*. This beautiful form is rather rare. Specimens from the Blantyre shale show that it grew in little plant like fronds, the branches bifurcating from the main stem at intervals. It has hitherto been only met with in fragments in the washings of the limestone shale.

Mr Peter Cameron exhibited a number of insects captured during the excursions of the Society this season. The collection comprised examples of *Naucoris cimicoides*, a water-bug new to the Scottish list, taken in the Clyde, opposite Carmyle; two species of *Nematus*, new to the British fauna, viz., *N. apicalis*, Hartig., taken on 5th May in Cadder Wilderness, and *N. dorsatus*, Cam., bred from a birch-feeding larva got last July at Bishopton; *Cladius Brullaei*, Dahlbom, bred from larvae found feeding on the raspberry at Cadder; *Fenusia albipes*, Cam., beaten out of a rose-bush at Cadder; and *Hemichroa rufa*. The last-named specimen was very small, and was bred from a larva got at Bishopton. It

had been completely neglected, and not supplied with food, but managed to retain sufficient vitality to bore into the cork of the bottle in which it was kept, and there passed into the perfect state. *Lophyrus pini*, a very distinct variety of the larva of this species, was also taken at Bishopton, where it fed in company with the typical form. It had the upper part of the body deep black, and was considerably smaller than is usual with the larvae of this species. It was not so active and lively as the normal type, so that probably the difference in colour might be owing to disease. Mr Cameron then made a few remarks on some of the parasites of Humble Bees, and showed some living larvae of *Antherophagus glaber*, feeding on the cells of a nest of *Bombus muscorum*, discovered last week near Cambuslang.

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OCTOBER 26TH, 1875.

Mr Thomas Chapman, Vice-President, in the chair.

Mr James Marshall was elected a life member of the Society.

SPECIMENS EXHIBITED.

Mr James Lumsden, F.Z.S., exhibited a living specimen of the Osprey (*Pandion haliaëtus*), captured on the 16th of this month on board the s.s. Ethiopia, about 200 miles from the coast of Ireland. It had alighted on one of the yards of the ship during a gale from the S.E., and was taken by one of the sailors at night when it was asleep. Mr Lumsden also drew the attention of the meeting to a notice in the *Field* of the previous week, which stated that a bird of this species had been shot near the village of Drumore, County Waterford, in the end of September. The specimen exhibited had since its capture been forcibly fed upon fish, which it refused to take voluntarily. The Osprey at one time bred on the islets of Lochlomond and the lake of Menteith, but it has long since deserted these localities, and, like most of our large Raptores, is now rare, and seldom met with in this country, except in instances like the present, when driven by storms from its usual haunts. A conversation ensued, in which Dr F. P. Flemyng, F.R.G.S., Mr John Young, F.G.S., and others took part.

Mr John Kirsop exhibited two cases of insects from Berbice,

which had been sent by Mr Robert Hill, resident there. The collection, which was much admired for its variety, consisted of butterflies, beetles, spiders, and dragonflies, and contained several rare species, which were pointed out and described by the chairman.

Mr George Donaldson described the beautifully-formed nest, with its ingenious entrance, of the Tarantula or Trap-door Spider, which he had often seen in the State of Kentucky; and Dr Flemyng gave some interesting particulars regarding it and some of the species which he had frequently observed in South Africa.

The chairman exhibited a case of fine butterflies from Western Africa. Several of the specimens were of rare species, among which were *Papilio hesperus*, *P. latreillianus*, *Charaxes ameliae*, and *C. eupale*—two of these Mr Chapman had not seen before.

Mr George Donaldson exhibited several objects of interest which he had obtained during a residence in the United States of America, and in visits to the Polynesian Islands. Among these were—I. A series of specimens of the remarkable stony operculum of the Repton shell-fish, *Turbo petholatus*, from the Samoa Islands. II. The skin of a Turkey Snake, about four feet in length. This snake, which is common in the central States, is quite harmless, and receives its name from the habit of feeding on the eggs of the Wild Turkey. The specimen exhibited was obtained in the nest of a Turkey, where it had swallowed three of the four eggs which the nest contained; the fourth was found at the bottom of the nest, covered with saliva, and ready for swallowing, which it no doubt would have been had the reptile not been disturbed during its repast. III. A spine of the Sting-ray (*Raja pastinaca*), the serrated hooklets of which are very dangerous, a wound from them often proving fatal. Mr Donaldson had himself experience of the serious effects they produce, having received from one of them a slight wound on the hand. It had produced excessive sickness, with severe spasms, which continued for some time. Mr John Young stated that spines nearly identical with that now shown were from time to time found in the Carboniferous strata of the district, from which it would seem that fishes similar to the Sting-ray had existed during that period, although the species had not been determined.

Mr Peter Cameron exhibited a number of insects from different localities in Scotland, amongst which there were, of Tenthredinidae,

two new species of *Nematus*,—*N. flavipennis* and *N. baccurum*, Cam.; the latter probably the smallest species of this genus, and bred from hairy pea-shaped galls sent from Dunkeld by Dr Buchanan White; an *Eriocampa*, reared from yellow larvae, feeding on the upper surface of rose leaves, which is either a new species or the true *Tenthredo aethiops* of Fabricius, and appears to be quite unknown on the Continent. Of Ichneumonidae, a new species of *Bassus*, bred from the larvae of *Nematus cadderensis*, Cam.; a species of *Ichneutes*, bred from the larvae of *Nematus viminalis*; a specimen of *Ichneutes reunitor*, reared from the larvae of *Cladius padi*, and the male of the rare *Eumesius crassicornis*, from Kingussie. This is the first indication of the life history of *Ichneutes*, and as there are only four species, it is probable that they are all attached as parasites to the Tenthredinidae. Both the species of *Ichneutes*, as well as the *Bassus*, were found in Cadder Wilderness. Mr Cameron also enumerated several other interesting species from stations in the neighbourhood, and showed the cast-off skins of the larvae of *Phaenusa pygmaea*, retaining completely their forms and markings, a very unusual occurrence with larvae of saw-flies, and perhaps in this instance owing to disease, as the larvae died shortly after moulting.

## PAPERS READ.

I.—*A Monograph of the British species of Phaenusa.* By Mr PETER CAMERON.

In continuation of my paper on the British leaf-mining saw-flies, Vol. ii., pp. 315–321, I propose here to monograph the more obscure and perplexing species of *Phaenusa*. The species belonging to this genus are amongst the smallest of the family; they have short thick bodies, generally of a deep black colour, with the feet more or less relieved with testaceous or white. The antennae are 9-jointed (in *P. hortulana* according to Hartig they are apparently 10-jointed); the maxillary palpi 7-jointed; the eyes touch the base of the mandibles; the wings have 2 marginal and 3 sub-marginal cellules, the first and second of the latter receiving each a recurrent nervure; the lanceolate cellule is petiolate; the posterior wings have no middle cellule; and the feet have no patellae. The larvae resemble those of *Phyllotoma*, and the description given at pages 315, 316 (*l.c.*) will apply here, the only

difference being a slight one in the markings and in the manner of pupation: as already remarked, they do not pupate in the mine.

I have had great trouble in differentiating the species. Unfortunately the descriptions of Klug and Hartig are not very explicit, as these authors relied mainly on colour for their specific distinctions, and colour alone will not serve to properly elucidate such obscure forms. The excellent work of Thomson, depending as that author does upon structural as well as colour distinctions, is a great step in advance upon that of the German authorities, and I have derived much assistance from the "Hymenoptera Scandinaviae." I have to acknowledge my indebtedness to Mr C. Healy for types of the species described by him in "Newman's Entomologist," or otherwise I would not have been able to satisfactorily determine them—or at any rate some of them—from the descriptions alone. Prof. Zaddach of Königsberg has given me types of *P. pumila* and *pygmaea*.

A. Frontal sutures distinct; head pilose; marginal nervure received a good piece beyond the second sub-marginal. Antennae short, pilose. Feet more or less black.

Antennae not thickened towards the apex, 3d joint more than double the length of the 4th—*melanopoda*.

Antennae perceptibly thickened towards the apex, 3d joint not more than double the length of the 4th—*pumila*.

#### 1. PHAENUSA MELANOPODA, Cameron.

*Fenusa*\* *nigricans*, Thoms., Hymen. Scand., i., 184, 1.

Glossy-black; antennae shortly pilose, a little curved, as long, if not longer than the thorax; the 1st joint large, globose, with a pedicle at the base; the 2d nearly as long as the 1st, not so globose; 3d more than double the length of the 4th; the rest to the 8th getting a little shorter; 9th conical, thinner and longer than the 8th. Head scarcely narrower than the thorax, smooth, covered with a fuscous black pubescence; sutures distinct, moderately deep; labrum and mandibles piceous; palpi fuscous. Thorax shining, smooth, scarcely pubescent; sutures very distinct; cenchri obscure. Breast smooth, shining. Feet: all the knees, and four anterior tibiae and tarsi obscure yellowish-white, verging to testaceous; tarsi slightly darker; spurs short. Abdomen short; apex truncated obliquely; sheaths of saw glabrous, a little

\* Correctly, *Phaenusa*.

projecting; blotch broad. Wings blackish, with deep black costa, stigma, and nervures; costa dilated towards the stigma; 1st marginal cellule much broader and longer than the 2nd; 1st sub-marginal longer than the second, which is twice wider at the apex than at the base, and angled where it receives the 2nd recurrent nervure. Marginal nervure curved, received a good piece past the 2d sub-marginal; 1st recurrent received in the middle of the 1st sub-marginal cellule; the 2d about a fourth of the length of the cellule from the 1st sub-marginal nervure. Length  $1\frac{3}{4}$  lines.

The male I have not been able to distinguish.

The distinct frontal sutures, deep smoky black wings, pilose antennae with the 3d joint more than double the length of the 4th, will serve to distinguish this species.

Apparently not common. Taken near Glasgow, and in the London district (J. G. Marsh). June.

The larva is not known with certainty. Zaddach (Besch. neuer oder wenig bekant. Blattw., f. 12, p. 29) states that the larva of *P. pumila* mines the leaves of the alder; but as *pumila* in this country is a birch miner, it seems probable that Zaddach's observations refer to *melanopoda* rather than to *pumila*. The alder miner, as figured by Zaddach, does not differ apparently from that of the true *pumila*.

The *P. nigricans* of Klug and Hartig seems to be a different species from the above, as will be seen from Klug's description (Blattw., No. 188), which is as follows:—"Brownish-black; antennae as long as the abdomen; labrum and tips of the mandibles testaceous; legs pale testaceous, with dusky trochanters; wing scales yellowish; wings hyaline, with the nervures and stigma brownish." Length 2 lines (Hab., Sweden).

No one has yet re-discovered it, and Thomson thinks that the original type may have been a *Blennocampa*, with 3 sub-marginal cellules, and he adopts Klug's name for *melanopoda*; but we have no evidence that the original *nigricans* was not a true *Phaenusa*, and in default of this information, it seems to me better to regard it as belonging to that genus, and to rename the species first described by Thomson, which I have accordingly done.

## 2. PHAENUSA PUMILA.

*Tenthredo pumila*, Klug, Blattw., 120, 190. *Tenthredo pygmaea*, Zetterstedt, Ins. Lapp., 340, 11. *Fenusa pumila*, Stephens, Ill.,

vii., 41, 1; Hartig, Blattw. u., Holzw. 259, 3; (?) Zaddach, Beschr. neuer oder wenig, &c., Blattw., 29, f. 12; Thomson, Opus. Ent., 272, 2; Hymen. Scand., 186, 2. *Fenusa fuliginosa*, Healy, Ent., iii., 225.

Black, shining; knees, tibiae, and tarsi pale testaceous. Antennae short, slightly thickened towards the apex.

Male similar, but with thicker antennae, sometimes a little paler underneath, with the posterior tibiae suffused with black.

Length  $1\frac{1}{4}$  lines.

Smaller than the preceding; the head scarcely so pilose; the wings of a lighter tint; posterior tibiae rarely black; tarsi paler; antennae shorter, thickened towards the apex; the 3d joint not more than double the length of the 4th; the joints rather more globose, not so sharply cut off from one another; and the frontal sutures scarcely so deep.

Common in birch woods in May and June, and again in the autumn.

The larva, when young, has the body white, with a greenish tinge on the back, caused by the contents of the food canal shining through; the head pale brown. On the ventral surface of the 2d segment is a black dumb-bell shaped mark, and in the centre of the 3d and 4th is a round black dot. The feet are encircled with brown; the abdominal feet white. Before the third moult the head is darker coloured; on the dorsal surface of the 2d segment is an oblong black mark, usually divided in two by a pale band in the centre; on the ventral surface of the 2d segment is an irregular black plate, and on the 3d, 4th, 5th, and 6th there is in the centre a black dot, these dots being, however, frequently absent from the two last-mentioned segments. At the last moult the body loses the markings, and becomes of a yellowish-white colour, with a pale-brown head.

Length about 5 lines.

It mines the leaves of the birch, preferring, as Mr Healy has remarked, a variety with woolly leaves. There are usually from four to eight or ten in a single leaf, each mine being at first separate, but in course of time becoming united. There are two broods; the first in June and July, the second in August and the other autumn months. The pupa state is passed in the earth without the protection of a cocoon.

The pupa is white.

A A. Body form of A, but marginal nervure received immediately before the apex of 2d sub-marginal cellule, almost touching the 2d sub-marginal nervure.

### 3. PHAENUSA ULMI.

*Fenusa ulmi*, Sundivall, Forhandl. red de Skandin. Naturforsk. in Christiania (1847), 240, 241; Healy, Ent. v., 297; Kaltenschach, Pflanzenfeinde, 539. *F. intermedia*, Thoms. (*l.c.*), 186, 3.

Black, shining. Antennae short, stout, covered with a stiff pile; two first joints together equal in length to the third, which is twice longer than the fourth, the remaining joints to the eighth shorter, 9th joint conical, longer than the preceding. Head a little narrower than the thorax, scarcely pubescent, shining, smooth, sutures moderately distinct; labrum and mandibles piceous; palpi dark testaceous. Thorax shining, smooth, not pubescent; tegulae black. Abdomen short, thick, smooth, semi-truncate at apex; blotch large, sheaths of saw exerted. Feet: femora, with coxae and trochanters, black; apical half of the two anterior femora, knees, tibiae and tarsi, dark testaceous. Wings faintly smoky; first marginal cellule a little smaller than the second; second sub-marginal cellule more than double the width of the base at the apex, angled where it receives the recurrent nervure.

Male similar, but with thicker and longer antennae, the joints from the fourth being perceptibly thicker than the basal ones. Length  $1\frac{1}{4}$  lines.

*Var.* Four posterior tibiae and tarsi black.

*Ulm*i is not unlike the two preceding species, but has the frontal sutures less distinct, the wings a good deal clearer, and otherwise is easily separated by the alar cell-structure.

Common in England and Scotland.

The larva is white, with the head pale brown, darker at the sides; mouth reddish brown; feet encircled with brown. Beneath, on the second segment, is a black oblong plate, sometimes with a dot on each side; there is a small black central dot on each of the following segments, but the dots are often absent on the posterior segments. When full-fed it is yellowish-white. Length 5 lines.

It mines the leaves of *Ulmus campestris* and *U. montana*, and several larvae live in one leaf. According to Mr Healy there is but one brood in the year, viz., in May and June; but I have

captured the flies in August, so it is possible that there may be sometimes two broods.

Brischke (Sch. Phys. öko Ges. zu König, xi., p. 71), records having bred *Perilissus pictilis*, Holmgr., from larvae of *Phaenusa*, on elm leaves.

B. Frontal sutures invisible; marginal nervure received not far from the middle of the second sub-marginal cellule. Antennae longish.

Tegulae white; tibiae and tarsi white—*pygmaea*.

Tegulae black; feet entirely white—*albipes*.

Feet testaceous; wings hyaline at the apex—*pumilio*.

#### 4. PHAENUSA PYGMAEA.

*Tenthredo pygmaea*, Klug, *l.c.*, 121; Zetterstedt, *l.c.*, 340, 11 (male).  
*Fenusia pygmaea*, Stephens, *l.c.*, 41, 3; Hartig, *l.c.*, 259, 4; Thomson, *Opus. Ent.*, 272, 3; *Hymen. Scand.*, i., 186, 4.

Black. Antennae nearly as long as the abdomen; the two first joints large, the third scarcely double the length of the fourth, the remainder gradually, but slightly, decreasing in length; covered with a stiff microscopic down. Head very smooth, shining; face covered with a sparse scattered pubescence, frontal sutures invisible; eyes greenish. Thorax smooth, shining, with a faint scattered down; tegulae white. Abdomen a little longer than the head and thorax, apex rounded, saw considerably exerted. Feet: coxae, trochanters and the greater part of the femora black; knees, tibiae and tarsi, clear white. Wings half smoky, clearer at the apex; first marginal cellule a little shorter than second; first sub-marginal shorter than second; second double the width at the apex that it is at the base; angled where the recurrent nervure is received. Marginal nervure received about a fourth of the length of the second cellule in front of the second sub-marginal nervure. Length  $1\frac{1}{2}$  lines.

The male is unknown to me.

*Pygmaea* closely resembles *albipes*, but is distinguished from it by the black femora, white tegulae, shorter antennae, and longer 2d sub-marginal cellule.

Apparently not common. "Forest Hill" (Stephens); Darent (Rev. T. A. Marshall); London District (Healy); Dalry (Dr Sharp).

Larva white. Head light brown, darker at the sides, eyespots black, mouth reddish brown. On the ventral side there is on

the 2d segment a large black plate, occupying the whole segment, except a small portion at the edges and apex; on the 3d segment there is across the centre a large black band, and on the 4th there is a small band, somewhat spindle-shaped. On the back the 2d segment is black, with the exception of the edges; sometimes the black portion is divided down the centre by a faint white line. Length about 4 lines.

It blotches the leaves of the oak in the autumn. The larvae (for which I am indebted to their discoverer, Mr C. Healy), with me cast off their skins so compact, that they retained the shape and all the markings which were on them when enclosing the larvae.

*Grypocentrus incisulus*, Ruthe, is a parasite on an oak-leaf-mining *Phaenusa*, probably *pygmaea* (cf. Brischke, *l.c.*, 89).

#### 5. PHAENUSA ALBIPES.

*Phaenusa albipes*, Cameron, Ent. M. M., xii., 131 (1875).

Black, shining, covered sparsely with a very short pile, only visible in certain lights. Antennae a little shorter than the body, slightly pilose; the 3d joint longer than the 4th. Feet entirely white; posterior tarsi and tips of anterior faintly fuscous. Wings smoky; costa, nervures, and stigma black; marginal nervure received a little past the middle of the 2d sub-marginal cellule. Sheaths of saw and saw itself largely exerted. Length scarcely  $1\frac{1}{2}$  lines.

Easily known by the almost entirely white legs.

One specimen taken in Cadder Wilderness, near Glasgow, on 20th August, 1875. The larva is unknown.

#### 6. PHAENUSA PUMILIO.

*Fenusa pumilio*, Hartig, *l.c.*, 259, 5; Thomson, *l.c.*, 187, 5. *Fenusa pumila*, Wailes, Zoologist (1856), 5074; Westwood, Ent., Annual (1862), 129; Healy, Ent., v., 211-212. *F. rubi*, Boie, Ent. Zeit. Stett. (1848), 340.

Black, shining, scarcely pubescent. Antennae longer than the abdomen, moderately thick, and covered with a short pile; pale fuscous underneath. Head narrower than the thorax, very smooth, shining and glabrous; labrum piceous; palpi testaceous. Thorax smooth, shining, covered with a microscopic pile seen only sideways. Tegulae black. Abdomen about the length of head and

thorax, apex more or less truncate, slightly pointed; sheaths of saw hairy, exerted; blotch very large. Feet whitish testaceous; base of coxae black; apex of coxae, trochanters, and basal half of femora more or less obscured with black or fuscous; apex of tarsi fuscous. Wings smoky, apex hyaline; nervures deep black, stigma large; 1st marginal cellule triangular, smaller than the 2d; marginal nervure received a little past the middle of 2d sub-marginal cellule; 1st sub-marginal cellule nearly double the length of 2d, and near its apex there is a conspicuous round black horny point; 2d sub-marginal cellule not much longer than broad, angled where the recurrent nervure is received.

The male is similar as regards coloration; the antennae are a good deal thicker, slightly compressed; the 3d joint scarcely longer than the 4th (in the female it is perceptibly longer), and the femora have usually more black on them.

Length  $1\frac{3}{4}$  lines.

*Pumilio* can only be confounded with *betulae*, and from that species it can easily be known by its shorter antennae, perfectly smooth head, the position of the marginal nervure, and the smoky wings with hyaline apex. From the descriptions of Hartig and Thomson it seems to vary considerably in the coloration of the body. The former author describes it as having the mouth, antennae, abdomen, and feet dark brown, with the knees, tibiae, and tarsi pale brownish-yellow; while Thomson states that the antennae are fuscous beneath, and the palpi, knees, tibiae, and tarsi whitish-testaceous. A British specimen in my collection has a dark brown splash across the mesonotum.

Common, and generally distributed.

The larva is sordid white; the head pale brown, darker at the sides; mouth dark brown; eyespots black. The thoracic feet are banded with brown, the abdominal are marked posteriorly with a semi-circular black mark, and the anal pair are surrounded with black. On the back the 2d segment is black or brownish-black, and sometimes on the 3d and 4th there is a narrow band; beneath the 2d segment is dark brown; there is an irregular band on the 3d and 4th, and on the 5th and 6th a round dot, but these are frequently absent. When full-fed the markings are cast off. Length from 9 to 10 lines.

They mine the leaves of *Rubus fruticosus* and *R. idaeus*, and to the raspberry they often do so much damage that, according

to Prof. Westwood, the bushes, after having been devastated by these larvae, do not produce a proper supply of fruit for two or three years. There is a brood in July and August, and a second is met with from September to the end of October. Zaddach mentions that they mine the leaves of *Geum urbanum*, and Kaltenschach (Pflanzenfeinde, p. 582) that "the larva lives in the green, hard, projecting leaf-galls on *Salix caprea*," where it passes the winter, emerging as a fly in July. There is surely some mistake about this last observation.

C. Frontal sutures deep. Antennae long; marginal nervure almost joined to 2d sub-marginal. Terebra exerted. Feet yellowish-testaceous.

#### 7. PHAENUSA BETULAE.

*Fenusia betulae*, Zaddach, Beschr. neuer oder wenig bekannter Blattwespen, 29 (1859). *Phyllotoma mellita*, Newman, Healy, Ent., v., 1-7.

Black, shining, covered with a fuscous pile, especially on the head and thorax. Antennae longer than the head and thorax, covered with a microscopic down; the joints thicker at the apex than at the base; distinctly separated from one another; the 1st with a conspicuous petiole at the base, globular, considerably larger than the 2d, which is thin at the base, truncated at the apex; 3d longer than the 4th; the rest shorter; the 9th conical, thinner and longer than 8th. Head scarcely narrower than the thorax; face densely covered with fuscous pubescence; sutures on the vertex distinct; frontal foveae large, and moderately deep; the central round, the lateral longer and thinner; labrum testaceous; palpi pale testaceous. Thorax black, shining; tegulae testaceous. Abdomen shining, as long as the head and thorax, covered with a fuscous pile, shorter than that on the head and thorax; apex truncate; the blotch invisible; saw projecting, sheath very hairy. Wings faintly fulvous-coloured, if anything clearer at the apex; 1st marginal cellule longer than 2d; marginal nervure nearly, if not quite, interstitial, *i.e.*, joined to 2d sub-marginal; 2d sub-marginal cellule not much shorter than the 1st, the sides above straight, not curved, in length much longer than broad; at the lower end of the 1st sub-marginal cellule is a small black dot. Legs yellowish-testaceous; coxae, trochanters, and base of femora black; posterior tarsi fuscous.

Length 2 lines.

The male has the antennae longer, otherwise it does not differ from the female.

This is the largest of the European species. It is easily recognised by the colour of the feet and wings, alar cell-structure, and deep frontal sutures.

A common species, occurring from the London district to Strath Glass in Inverness-shire.

Larva white; the head pale-brown, darker at the sides; mouth reddish-brown; eyespots black. The 2d segment above bears a shield-like black plate; beneath there is a large black plate on the same segment, and on each of the 3d, 4th, 5th, and 6th, a smaller dot; along the sides are arranged a number of black dots, a large one on the 2d, three on the 3d, and four on the others, the latter being smaller than those in front. The thoracic feet are banded with black; the abdominal ones have, above, a small black band; and the anal pair are broadly marked with the same colour. The penultimate segment sometimes bears in the centre two small black dots. The number of dots varies a good deal; they are often absent from the 5th, 6th, and penultimate, and along the sides some individuals have more and others less than usual. When full fed the markings are cast off. Length 9 to 11 lines.

The pupa is yellowish-white.

The larvae live gregariously—often to the number of seven or eight in a single leaf—in the leaves of the birch, appearing in May and June, and again in the autumn. Brischke (*l.c.*, 71) mentions as parasites of this species, *Perilissus macropygus*, Holmgr., *P. soleatus*, Holmgr., and *P. verticalis*, Brischke.

These are all the species that I can record with certainty as British. Leach formed his genus *Messa* on an insect which he referred to *hortulana*, Klug. He, however, stated that it had one marginal and four sub-marginal cellules, while Hartig says that the true *hortulana* is a true *Phaenusa*. I suspect, then, that *Messa* was formed on some small species of *Nematus*. Stephens also describes (*Ill. Brit. Ent.*, vii., 40) *Messa hortulana*, but Mr F. Smith has examined for me his types; and, from the account which Mr Smith sends, it is clear that Stephens' *hortulana* is neither a *Messa* nor a *Phaenusa*, it having two marginal and four sub-marginal cellules: it is probably a *Blennocampa*. In the meantime, therefore, *hortulana* must be deleted from our lists;

but to render this paper more complete, I subjoin Hartig's diagnosis :—

Black ; mouth, sides of the breast and feet, reddish-yellow. Length  $1\frac{1}{2}$  lines ; alar exp., 4 lines (German). In gardens—rare.

The very dubious *P. nigricans* is described by Stephens as an *Emphytus* (Ill. vii., 93), but no such species exists in his collection, as Mr Smith informs me. It had better be relegated to the list of uncertain synonymy.

With regard to *Fenella*, it seems to me that two different species are confounded under the name of *F. nigrita* ; at any rate, it is difficult to see how the two following descriptions can refer to the same species :—

<p><i>F. nigrita</i>. West. (Int. ii., App., p. 54). Nigra, femorum apice, tibiis tarsisque obscure luteis ; alis nigricantibus. (Antennis 11-articulatis).</p>	<p><i>F. nigrita</i>. Thoms., Hymen. Scand., i. Nigra, nitida, glabricula ; antennis moniliformibus, 12-articulatis ; subtus fuscis pilosulis ; genubus, tibiis tarsisque albidis ; alis subhyalinis.</p>
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If my views are correct, the synonymy will then stand thus :—  
*Fenella nigrita*, Westwood, *l.c.*, *supra* (non Thomson).

*Fenella tormentillae*, Healy, Ent. iv., 140, 141. *Fenusa pygmaea*, Healy (non Klug), Ent. v., 300 ; Kaltenbach, Pflanzenfeinde, 225 and 227. *Fenella nigrita*, Thomson (non West.), Opus. Ent., 270, 2 ; Hymen. Scand., i., 180, 1.

*P. tormentillae* mines the leaves of *Tormentilla reptans* and *Agrimonia eupatoria*. I know nothing about *Fenella nigrita*. I have a species that I got among birch at Bishopton, which agrees in colour with *Phaenusa melanopoda*, but it is larger, and has the antennae 10-jointed. It may be truly *melanopoda*, or it may be a new species of *Fenella*. If I had males I should probably be able to decide this.

## II.—*A Monograph of the British species of Cladius, Illiger.*

By Mr PETER CAMERON.

The genera belonging to the sub-family *Nematides* may be separated as follows :—

Section i. Lanceolate cellule contracted.

A. Anterior wing with one marginal cellule.

a. 2d sub-marginal cellule receiving one recurrent nervure—*Cladius*.

b. 2d sub-marginal cellule receiving two recurrent nervures—*Camponiscus*.\*

B. Anterior wings with two marginal cellules—*Hemichroa*.

Section ii. Lanceolate cellule petiolate.

a. Anterior wings with two marginal cellules—*Dineura* (partim.)

b. Anterior wings with 1 marginal, and three or four sub-marginal cellules; if three, the first receiving two recurrent nervures—*Nematus*.

c. As in b, but with three sub-marginal cellules, the second receiving two recurrent nervures.—*Cryptocampus*.

### GENUS CLADIUS, ILLIGER.

Wings with one marginal and four sub-marginal cellules; the first sub-marginal is very small, and its dividing nervure is, in all the species, often absent, and when present is usually very faint; the second rather broad and long, forming a large angle at the bottom, and receiving one recurrent nervure near the centre, at the apex of the angle; the third a little longer than the half of the second, longer than broad, angled beneath, and receiving one recurrent nervure in the middle; the fourth is the largest, very broad at the apex, and bounded by the margin of the wing. The lanceolate cellule is contracted; the costal is divided by a nervure near its apex. In some species the nervures run parallel or nearly so. In the second sub-marginal cellule, in most of the species, there is a well-marked horny point. Antennae nine-jointed: in the female filiform, attenuate at the apex, nearly bare or with only a short pile; the first joint small, the second of the same size as the first; the third and fourth are the longest and equal, the third being often curved underneath; the remaining joints become gradually shorter and thinner. The apices of the joints are well developed. In the male, with one section, there are longish projections from the base of the third, fourth, and fifth joints; in another there is a small projection from the base of the third; and with the third section the joints are plain. With all they are more or less pilose.

\* In the recently issued fourth part of Brischke and Zaddach's "Beobachtungen ueber die Arten der Blatt-u. Holzwespen," the authors have adopted Hartig's sections *Leptocercus* and *Leptopus* as distinct genera. I have already pointed out (Ent. M. Mag. x., 84), that *Leptocercus* (1837) = *Hemichroa* (1835), and the latter name having the priority, must, of course, be used; while, as regards *Leptopus*, that name cannot be used either, as it is long pre-occupied in Hemiptera, if not in other orders. There being no other name available, that of *Camponiscus*, given to it by Mr Newman (Ent. 1869, p. 215), must, I suppose, be adopted.

The head is broader than long by about a half; the ocelli are moderately large and usually dull brown coloured; the front projecting; a little below the antennae there are two small depressions. The clypeus is small, emarginated in front, and in one species (*C. viminalis*) minutely toothed; the labrum is small, usually semi-circular, and hairy at the apex. In the male the clypeus is considerably more of an angustate form; and the labrum is smaller. The mandibles are armed with a projecting, somewhat bluntly pointed, apical tooth, and on the lateral surface of the anterior part there are a number of minute teeth. In *C. viminalis*, instead of these minute teeth there are two slightly larger, at the base of the large terminal one. The labial palpi are 4-jointed; the first is about  $\frac{1}{4}$  shorter than the 2d, which is the longest; the 3d is about the size of the 1st; the 4th is a little shorter than the 2d, and bluntly pointed. The ligula has its middle division short, a very little longer than broad; the lateral portions are small and similarly shaped. In the maxillary palpus the 1st joint is stumpy and minute, almost as broad as long; the second is a little longer and considerably thinner; the third about three and a half times longer than the 2d, it being especially thick in the centre, tapering towards the base and apex; the 4th thin at the base, thicker at the apex, and a very little shorter than the 2d; the 5th, somewhat longer than the 3d, increasing in thickness towards the top; the terminal joint is not so thick at the apex as the 5th, and is about the same length. The inner lobe of the maxilla ends in a blunt, slightly-curved point, the outer in a roundish, flat, disc-like projection.

In the body form *Cladius* does not differ essentially from *Hylotoma* and *Lophyrus*; the abdomen is more cylindrical, more elongated, with the apex more sharply pointed. The scutellum is flat; the cerci are longish. In the male the abdomen is longer, thinner, and more acute; the blotch is usually conspicuous. The saw is well developed, nearly a line long, and of considerable breadth and elevation, with the sides beset with seven or more rows of jagged, irregular teeth.

The feet are slim, with the calcaria moderately long, the inner one being one fourth longer than the outer. The middle tooth of the claw is bifid; the tarsal laminae large.

The egg is oval, white, and as a rule is deposited in the leaf-stalk.

Larva twenty-footed, the 5th and 12th segments footless, cylindrical, with roundish head; the skin beset all over with tubercles, which are usually arranged in a definite order, each ending in a long sharp-pointed hair. The head is distinctly separated from the body, roundish, always covered with short stiff hairs. The clypeus large and, usually, irregularly heart-shaped. The mandibles are strongly developed, of a horny consistence, and double-toothed at the point. The maxillae have 5-jointed conical palpi. The inner lobe of the maxilla has on its side seven to twelve bristle-like teeth, the whole having the appearance of a brush, the two at the apex being separated by a space from the others; the outer lobe is stumpy and crooked. The spinning vessels are situated close to the labium, which is provided with 3-jointed palpi. The feet are slightly haired; the claws are sharp, horny, and crooked; the second last joint, at its apex, projects outwards and forwards over the preceding joint into an oval ball-like mass. The claspers do not differ from those of the other genera.

The usual colour of the larvae is green, or some modification of it, and without markings, except in the case of one species which has the body orange, with black dots. They always frequent the under surface of the leaves of the food-plants (usually species of *Rosaceae*: with one species, poplar, and with another, *Salix pentandra*). They eat out the parenchyma at first, and then proceed to make holes in the leaves.

The larvae are attacked parasitically by various species of *Ichneumonidae*, and I have also found *Gordiidae* in them.

The pupa offers no striking peculiarity. The cocoon is thin, double, irregular, and almost transparent, and is spun in the earth.

So far as is known, the species of this genus are confined to temperate climates.

A. In the male the two basal joints are short and thick, the 2d being a little smaller than the first; on the underside of the 3d, at the base, there is a small knob-like projection; at the apex, on the upper side of the same joint, there is a branch-like prolongation, nearly as long as the segment itself; on the 4th, 5th, and 6th joints there are similar processes, each gradually decreasing in length; the 7th is a little pointed upwards at the apex; the terminal joint is almost awl-shaped. In the female the basal joint is nearly globose, and about double the size of the 2d, which is very small; the following joints become gradually shorter and thinner; the 3d is arched beneath; it and the 4th, 5th, and 6th have their apices obliquely

truncated, and the superior edges produced into sharp spine-like projections. In the male the joints and processes are densely covered with hairs; in the female the antennae are only slightly hairy. Cerci long; posterior calcaria a little shorter. Head densely covered with a fuscous pile—*Cladius*

### 1. CLADIUS DIFFORMIS.

*Tenthredo difformis*, Panz. F. G. 62, 10. *Lophyrus difformis*, Spinola, Ins. Lig. fasc. iii., T. 2. 153; Fallén Acta Holm. 1808, 41, 5-6; Mon. Tenth. 18, 9. *Cladius difformis*, Leach, Zool. Mis. iii., 130; Lepelletier, Mon. Tenth. 58, 165; Fauna Fr., pl. 12, f. 4; Brullé An. Soc. Ent. Fr. i., 308, pl. xi. f. 10-12 (lar.); Dahlbom, Consp., Tenth., 34; Prod. Hymen., 100, 35, pl. 2. f. 81-85; Hart., Blatt. u. Holzw. 175, 1, Taf. ii. f. 20; Stephens, Ill. Brit. Ent., vii., 23, 1. Thomson, Hymen. Scand., i., 71, 1; v. Vollenhoven, Tidjr. Ent., iii., 202-205, pl. 9; Ent. No. 139, 26-29; Kaltenbach, Pflanzenfeinde, 222; Brischke, Besch. 10, Taf. ii. f. 3. *Cladius Geoffroyi*, Lep. Mon. Tenth. 58, 166.

Black, shining, covered with scattered grey pubescence; knees, tibiae and tarsi yellowish white; last two or three joints of tarsi (especially the posterior) pale brown; cerci long; epistoma slightly convex. Wings faintly smoky, apex clearer, nervures at base and costa brownish white, or pale reddish; nervures at apex blackish, stigma obscure black. Tegulae grey or white. Length 4 to 5 lines.

The male is easily known by the form of the antennae; smaller and thinner than the female.

Beyond slight colour aberrations, I have not noted any varieties of this species in Britain. Hartig mentions a very small form with the sheaths of the saw and the last abdominal segment milk-white = *C. lacteus*, sibi. *C. Geoffroyi* differs merely in having the prolongation of the 3d antennal joint white, a peculiarity probably owing—as van Vollenhoven has suggested—to want of development.

The larva lives on the underside of the leaves of various roses, both cultivated and wild, in which it devours irregular holes; at first these are small, but by degrees they become larger, and occasionally the edge of the leaf is eaten. The mid-rib is never touched and the other nerves rarely, if ever. Two generations occur in a year, the first in May and the early part of June, the second in August and September. From the summer brood the

imago appears two or three weeks after pupation; from the autumnal one the larvae remain unchanged during the winter till the following spring. The cocoon in confinement is spun between the leaves; in a state of nature, in the earth. It is double; the outer covering, which is transparent and thin, is separated by a small space from the inner one, which is much finer and of a more compact texture. Both coverings are of a dull grey colour. According to Brischke (*loc. cit. supra*) the cocoon is simple, but certainly as a rule it is double.

The larva is flat, moderately narrow at the 2d segment, and from that increasing in breadth until past the middle, from which it again slightly decreases towards the anus. The head is small, shining, covered sparingly with longish hairs; the ground colour is green, but obscured with numerous small brown dots, closely packed together; across the face there is a semi-circular brown mark of a deeper colour than the other dots on the vertex; the eyes deep black, the mouth brown. The body is entirely deep green, sometimes having a yellowish tinge. On each segment there are three rows of tubercles, from each of which projects a long black hair; the feet are glassy green with brown claws. The colour of the head varies; when the creature is young, it is browner than when full fed, at which time the whole body assumes a much brighter green colour. Length 7-8 lines.

The pupa I have not noticed when very young; when I did see one, it was of a grey colour. The egg-laying I have not observed, nor have I bred any parasites from the larvae.

This species is tolerably common in Britain, appearing often in gardens. It has occurred from the south of England to Strathglass, in Inverness-shire. Its distribution extends all over the continent.

B Male with the antennae as long as the body, covered with a longish pile; the 3d joint at the base produced into a knob; the 4th, 5th, and 6th joints not produced into a spine above. Cerci short—(*Trichiocampus*).

a. Labrum, apice emarginated. Epistoma keeled. 3d antennal joint in the female scarcely curved. Patellae of tarsi large. Abdomen ochreous.

## 2. C. VIMINALIS.

*Tenthredo viminalis*, Fallén, Acta Holm., 1808, 117, 59. *Nematus grandis*, Lep. Mon., 61, 179; F. Fr., pl. 10, f. 1. *Cladius luteiventris*, Dahlb. Consp., 69; Prod., 103, 3. *C. luteicornis*, Ste., Ill., vii.,

24, 7, pl. 38, f. 1. *C. eucera*, Hart., Blattw., 177, 4. *C. viminalis*, v. Voll., Tidjr., i., p. 176, pl. 10; Zool., 7721; Bouché, Natur. Ins., 100; Ratz., Forst., iii., p. 129, Taf., 9; Brischke, Besch., 9, pl. ii., f. 1; Thoms., Hym. Scand., i., 74, 5.

Luteous; head, middle of the breast, pronotum in front above, meso- and meta-notum for the greater part shining black. Antennae longish, black above, beneath deep ochreous. Apice of tarsi fuscous-black. Palpi and tegulae pale luteous. Wings yellowish-hyaline, slightly clearer at the apex; nervures and costa dark reddish-brown; stigma at base dark fuscous. The 1st sub-marginal nervure is sometimes present, as often absent. Length 3 to 3½ lines.

The male has longer antennae, of a dark luteous colour, except the two basal joints, which are black.

The luteous colour of this insect serves at once to distinguish it from the other species.

The larva has the head compressed in front, shining black; mouth pale yellow; mandibles black. Feet white; claws brown, with a black line over them; claspers white. The 2d, 3d, and the two last body segments, orange, the rest of the body green, sometimes with a faint orange tinge. On each side, close to the top, are twelve large oval or roundish black marks; directly over each clasper is a small black mark; over these, and close to the large dots, are two small ones, also black; over the anal segment is a large oval black mark. When full-fed, the body is entirely orange, with the exception of the legs and the above-mentioned black marks. The body is cylindrical, rather flat, broader anteriorly than posteriorly; the skin beset with tubercles, from each of which proceeds a longish hair; the segments are well marked. Length nearly 12 lines.

The eggs, according to van Vollenhoven, are deposited in the leaf-stalk of the poplar, the petiole thereby being swollen on both sides, bending over, and to a certain extent, covering the eggs. In one case ten eggs were laid on one, and eight on the other side of the stalk. When young the larvae are green, with black heads, and it is not till the second moult that the orange colour begins to show itself.

They feed in company, on the underside of the leaves of the poplar, in a row of three to five on a leaf, each larva touching its neighbour. They eat only the epidermis, according to my

experience, never eating holes in the leaf like the other species. Apparently there is only one brood in a year, and it is met with during August and September. The cocoon is double, thin, and yellow, and in confinement is spun between the leaves, or outside in the earth, or between loose scales of bark.

I am not sure but that the larvae go down to the earth during the heat of the day; at any rate, I have only found them during the evening, never during the day, and once or twice at dusk I have seen them marching up the trunks.

The pupa is orange.

*C. viminalis* is distributed all over Britain, the imago appearing in June. I have met with it as far north as Kingussie. Its distribution extends over all Europe.

As parasites, Brischke (Ges. König., xi.) records *Mesolius rufus*, Gr., *Polyblastus sanguinatorius*, Ratz., and *Acrotomus lucidulus*, Gr.

*b.* Apice of labrum rounded. 3d antennal joint in female curved; beneath slightly produced. Epistoma not keeled. Colour of abdomen black.

Feet yellowish-red—*rufipes*.

Femora totally black—*eradiatus*.

Femora nearly all white; wings not clearer at the apex than at the base—*Dreuseni*.

### 3. CLADIUS RUFIPES.

*Cladius rufipes*, Lep., Mon., 58, 167; F. Fr., pl. 12, f. 5; Dahlb., Consp., 35; Prod., 102, 36, pl. 2, f. 86-87; Ste. Ill., vii., 23, 2; Thoms., Hym. Scand., i., 72, 2. *Cladius uncinatus*, Hart., Blattw., 176; Voll. Tidjr., 4, 84-87, pl. 4; Zool., 9833-35; Kalt., Pfl., 539.

Antennae about the length of the body, pilose, deep black, the joints distinctly separated; the two basal joints large, the 3d and 4th equal; the 3d curved underneath; the remaining joints decreasing gradually in length, and very noticeably in thickness towards the apex. Head very broad, projecting in front between the antennae, shining, seen in certain lights to be covered with a fuscous down; labrum and mandibles pale; palpi pale-fuscous. Thorax black; sutures distinct, shining, smooth, covered with a fuscous pubescence; cenchri large, pale-white. Abdomen short, thick, black; anus piceous; cerci short. Feet reddish-yellow; coxae, trochanters, and anterior femora at base black; apex of tarsi fuscous. Wings smoky, the apical third almost hyaline;

tegulae testaceous ; costa and stigma dark-fuscous. Near the base of the second sub-marginal cellule is a small dark spot.

Length  $2\frac{1}{2}$  to 3 lines.

The male is similarly coloured, but with the antennae deeply pilose, and with the usual process on the 3d joint.

Larva green, thinly haired, with the sides raggedly indented. Head yellow, with the eyes and a spot on the vertex black. Young individuals bear a brown cross-band on the front. Length 8 to 9 lines (Kaltenbäch).

It lives on high elms, eating smaller and larger holes in the leaves, and resting usually on their under surface. It spins a clear, transparent cocoon, which is either fastened to a leaf or a branch. There are two generations in a year. Brischke records *Mesolius impressus*, Brischke, as its parasite.

*C. rufipes* is common in the midland and southern counties of England, but I have not yet found it in Scotland. It is met with all over Europe.

#### 4. CLADIUS ERADIATUS.

*Cladius eradiatus*, Hart., Blattw., 176, 2; Thoms., Hym. Scand., i., 72, 3; Kalt., Pfl., 288.

Antennae moderately long, densely pilose, black, the third joint curved. Head black, covered with a fuscous pile; clypeus somewhat emarginated, labrum and palpi piceous. Thorax black, shining, covered with a fuscous pile; tegulae black; abdomen black, also covered with a fuscous pile; membrane at the base large; cenchri white; cerci short. Wings almost hyaline, stigma fuscous. Feet: femora, coxae, and trochanters black; knees, tibiae, and tarsi fuscous-white, paler in front, and covered with a pale pile. Length  $2\frac{1}{2}$  lines.

The male does not differ in colour from the female, and is easily known by the form of the antennae.

Hartig describes the wings of *eradiatus* as “dunkel-rauch-grau;” and Thomson, as “hyalinis;” and hence there may be two species described under this name. British specimens have the wings almost hyaline, slightly suffused with grey.

From the female of *difformis*, *eradiatus* is known by its more attenuate antennae, uniformly coloured wings, and fuscous-white tibiae and tarsi; from *Brullaci*, the colour of the wings will serve to distinguish it.

This species is not very common. In Scotland I have taken it in Rannoch, and I have seen English specimens taken by Mr R. M'Lachlan and the Rev. T. A. Marshall. The larva has not been described. It is stated by Kaltenbach to have been reared from the stem of *Anthriscus sylvestris*, by Herr Boie of Kiel, and from it was bred an ichneumon, *Hemiteles trichocampi*, Boie.

#### 5. CLADIUS DREWSeni.

*Cladius Drewseni*, Thoms., Hym. Scand., i., 73-4.

Black; antennae a little longer than the body, very slightly pilose; the third joint a very little shorter than the fourth, and a little curved beneath, the other joints getting gradually shorter and thinner. Head covered with a grey pubescence, smooth, shining; epistoma somewhat convex; on the front, directly above the antennae, is a very distinct round depression, and below the antennae are two comparatively large pits; mandibles and apex of labrum reddish; palpi pale. Thorax shining, pronotum minutely punctured; tegulae black; cenchri oval, white. Abdomen broadest in the middle, greyish pilose, apex especially; cerci short. Wings sub-hyaline, costa pale, stigma fuscous; second sub-marginal cellule without a distinct horny point. Feet white, femora inclining to yellow, marked with black in the middle, anterior coxae almost wholly, posterior at base, and posterior tarsi at the apex, fuscous; claws and calcaria short. Length  $2\frac{1}{4}$  lines.

Male with long pilose antennae, the knob at the base of the third joint small. Femora with more black than in the female; anus testaceous.

The colour of the feet separates this species from the rest of the section. It is very like the white-footed variety of *padi*, but may be known from that species by the epistoma being convex, instead of keeled, and by the shorter cerci and calcaria. In *padi*, also, there is a distinct black dot in the second sub-marginal cellule, which is absent in *Drewseni*.

The larva is unknown. In Britain it has been found in England and Scotland, but not very abundantly. On the Continent it is only known as a native of Sweden.

C. Antennae in the male simple, compressed, without any process on the third joint. Cerci longish. Epistoma almost keeled. (*Priophorus*).

Apex of coxae and trochanters white—*padi*.

Coxae and trochanters black—*Brullaci*.

## 6. CLADIUS PADI.

*Tenthredo padi*, Linné, Fauna Sv., No. 1544; Fallén, Acta Holm, 1808, 110, 47. *Priophorus albipes*, Dahlb. Prod., 104, 38, pl. 2, f. 88, 89. *Cladius pallipes*, Lep. Mon., 59, 169; F. Fr., pl. 12, f. 6. Ste. Ill., vii., 23, 3. *C. immunis*, Ste., l.c., 24, 5. *C. pili-cornis*, Curtis, Brit. Ent., pl. 457; Ste., l.c., 24-6. *Cladius albipes*, Hart. Blattw., 175-8, pl. 2, f. 3, 10, 16, 17, 19, 25, 26, 29; Voll. Tidjr, 6, 72-75, pl. 5; Brischke, l.c., 10, pl. 2, f. 2; Kalt. Pfl., 174. *Cladius padi*, Thoms., Hym. Scand., i., 75, 5.

Black; antennae longish, pilose, setaceous, nearly as long as the body. Head covered with a fuscous down, frontal tubercle very distinct, epistoma keeled, mandibles reddish, palpi pale testaceous. Thorax shining, covered with a scattered greyish down; cenchri large, dull white; tegulae piceous, rarely pale. Abdomen covered with a scattered pubescence; cerci longish. Wings sub-hyaline, having a smoky tinge (varying in different individuals); costa pale, stigma fuscous. Feet white, the base of the coxae, femora in the middle, and often the posterior tarsi, with the apex of the tibiae, black. Calcaria long.

Length 2 to 2½ lines.

The male has the antennae strongly compressed and pilose, and a little shorter than the body.

*C. padi* is easily recognised, by having always the trochanters white, the keeled epistoma, and longish cerci and calcaria, and pilose antennae. In the coloration of the legs four aberrations occur:—

- a. femora quite white;
- b. femora with a fuscous splash in the middle;
- c. femora nearly all black;
- d. posterior tarsi, and apex of tibiae, black;

also, in many individuals the colour is testaceous, and even inclined to yellow. The wings vary in the amount of smoky colour with which they are suffused; and the tegulae and palpi vary from black through testaceous to white.

Larva: head covered with longish hairs, light orange-brown, spotted over with small orange dots; eyespots black, with a black, roundish mark on the vertex, extending to the extreme back of the head; mouth reddish-brown, with black mandibles. Feet white, claws brown. The ground-colour of the body is usually green, varying to grey; the sides are clearer, almost white, and

the last two segments are also white. The skin is beset all over with tubercles, each ending in a long hair.

When young the larva has not the colour so deep, and the body often has a reddish tinge. With old larvae the colour of the head varies very much: sometimes it is quite orange, at other times almost black, and often the black mark on the vertex is absent.

The eggs are laid about the beginning of May, on the under surface of the leaves of the wild rose, bramble, mountain ash, pear, plum, and birch. When very young the larvae merely devour the epidermis; but, as they get older, eat large holes all over the leaves, and frequently do very considerable damage to pear and plum trees. From the spring brood the imagos come forth in about five weeks after the laying of the eggs, the pupal state lasting nine to ten days; the second brood occurs in the autumn, often as late as October.\* Its manner of pupation does not differ from the other species. When not feeding the larvae remain rolled up into a ball on the under side of the leaf, and if touched they drop at once to the ground.

The pupa is greyish-white.

*Tryphon lucidulus* and *Ichneutes reunitor*, Nees, are parasites on the larvae. I have also found them infested with a *Gordius*.

This is the most common of the British species of *Cladius*. It occurs from the south of England to Sutherland. Northern specimens are darker coloured than those from the south. I have very rarely captured the aberration with white legs in Scotland. In mountainous districts I have taken the species at an elevation of about 2300 feet. Its distribution extends all over the European Continent.

#### 7. CLADIUS BRULLAEI.

*Cladius Brullei*, Dahlb. Consp., 39; Thomson, Hym. Scand., i., 75-7; Cameron, Ent. M. M., xii., 42. *Priorphorus geniculatus*, Dahlb. Consp., 38. *Cladius tristis*, Zadd., Besch., 11.

Black; antennae a little longer than the abdomen, slightly compressed, diminishing very noticeably in thickness towards the apex, scarcely pilose, the third joint a little longer than the fourth. Head shining, clothed with a fuscous pile; epistoma

\* According to van Vollenhoven there are four generations in a year in Holland.

compressed, pits below the antennæ shallow, apex of labrum hairy, mandibles black. Thorax black, shining, with a fuscous pile; sutures of mesonotum deep; breast smooth and shining, with the pubescence less dense, more scattered; cenchri pale, conspicuous; tegulae piceous. Abdomen a little shorter than the head and thorax, apex angustate, densely pilose; saw projecting, sheaths hairy; cerci short. Wings with the basal half smoky; apex hyaline; costa and stigma dark fuscous. Feet: coxae, trochanters, and femora, black; knees, tibiae, and tarsi, white; posterior tarsi a little darker; apex of tibiae brownish; posterior tarsi shorter than the tibiae; calcaria short. Length 2 lines.

The male has the antennae short, slightly pilose.

The black coxae, trochanters, and femora, less pilose antennae, shorter cerci and calcaria, will readily separate *Brullaci* from the preceding species. From *eradiatus*, it is distinguished by having the basal half of the wings smoky, and the antennae separate it from *difformis*.

Larva: head deep shining black; feet and claspers white. Upper half of the body deep-brownish, rather glistening black; the lower half glistening white. The base of the second and the anal segment white; head and body covered with tubercles, from which proceed long hairs. Length 9 to 10 lines.

It feeds on *Rubius idaeus* and *fruticosus*; and in its habits and mode of pupation does not differ from its congeners.

This seems to be the rarest of the British species. I have only found it in Cadder Wilderness, near Glasgow. On the Continent it has been recorded from Sweden and Prussia.

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NOVEMBER 30TH, 1875.

Mr Thomas Chapman, Vice-President, in the chair.

Mr Robert Wylie Hill, Berbice, British Guiana, was elected a corresponding member, and Messrs Henry Grieve and Sigismund Schuman ordinary members of the Society.

SPECIMENS EXHIBITED.

Mr Francis G. Binnie exhibited the species of *Phryganea* found in this district, viz.:—*P. striata*, Lin., from Possil Marsh, and the Lily Loch in the Kilpatrick Hills; *P. varia* (Fab.), from Possil

Marsh; and *P. obsoleta*, M'L., from the Lily Loch. *P. striata* is a large insect, its nearest ally being the equally common *P. grandis*, Lin., a species which has not yet been found in the district. *P. striata* is a smaller and darker insect; and an examination of the abdominal appendices will at once distinguish it. The two species are generally mixed in collections. *P. varia* and *P. obsoleta* are exceedingly alike. A good distinction is the darker piceous abdomen of the latter, that portion being more ochreous in *varia*. *P. obsoleta* is found in the north of Scotland and England, and is also of northern distribution on the Continent. *P. minor*, the remaining British species, is found in England, where it is local, but seemingly abundant.

Mr Binnie also exhibited *Stenophylax coenosus*, Curtis, from Bishopton, found very rarely in the north of England, and recorded by Curtis for Scotland. It is a very aberrant species, the distinctly truncate wings being suggestive of affinity with the genus *Limnophilus*, from which the equality of the second and fourth apical cells of the posterior wings separates it. Occasionally, however, according to M'Lachlan, the fourth is narrower than the second. The British exponents of the species are remarkable for their small size as compared with Swiss examples. *Stenophylax stellatus*, Curtis, from Cambuslang, and *S. latipennis*, from Milngavie, are two species usually mixed in collections; the former is generally distributed through Britain, the latter is chiefly found in the south-west of England, and has not been previously recorded for Scotland. *Plectrocnemia conspersa*, Curtis, from Spout of Ballagan, and *P. geniculata*, M'Lachlan, from Braemar. When the "Trichoptera Britannica" was published in 1865, only one species was known in Europe. In 1871 M'Lachlan published a paper in the Entomologists' Monthly Magazine, in which he characterised two new species, one of which was British. *P. conspersa* is probably generally distributed. M'Lachlan mentions only four examples of *P. geniculata*, three of which are British (localities not known), and one from Switzerland. It may at once be distinguished from its common ally, *conspersa*, by the geniculate process of the inferior appendices of the male; the female is unknown.

The Chairman exhibited specimens of *Morpho gordartie* (Guerin), and *M. aurora* (Westwood), two fine butterflies from Bolivia, which he believed were the first which had been brought to this country; also *Morpho cypris* (Westwood), and *M. sulkowskyi* (Kolf),

from New Granada, and *Thaumantis camadeva*, from the Himalayan district in India.

## PAPERS READ.

I.—*Note on the recent occurrence in various parts of Scotland of the Rough-legged Buzzard (Archibuteo lagopus).*\*

By JAMES LUMSDEN, F.Z.S.

The recent N.E. gales, although destructive to life and property, have given all interested in the migration of birds something to speculate on, in the almost unprecedented number of Rough-legged Buzzards which have been driven to this country.

About the 22d of October, Mr M'Culloch, bird-stuffer, showed me a specimen of the Rough-legged Buzzard (*Archibuteo lagopus*), which had been sent him from the neighbourhood of Castlecary, Stirlingshire. The bird, when first observed, was in the act of eating a grouse, but flew away on the approach of the gamekeeper who saw it. In about ten minutes, however, it returned to its feast, and was shot by the man, who was waiting for it near the place.

A few days afterwards I received a letter from Mr Robert Gray, stating that four Rough-legged Buzzards had been sent that week to the bird-stuffers in Edinburgh. Those proved to be but the first of a long list of specimens which have come in from almost every part of Scotland. Even now, it is impossible to say how many have been procured, or how many may have visited this country during the past few months; but I fear that few of the birds which landed in Scotland will ever return to their native haunts. Large hawks are now, unfortunately, so uncommon in the lowland counties, that when one does appear, it is almost sure to fall to the gun or trap of some watchful gamekeeper. The present flight has extended from the north-east to the south-west; and the following is a list of some of the captures of which we have authentic information:—

1	Specimen from Castlecary, Stirlingshire.
8	„ Duntreath, do.
1	„ Aucheneden, do.
1	„ Dumbartonshire.
5	„ near Dundee: other 7 observed.

\* This Paper was read in Nov. 1875, but has since been rewritten, and brought up to the present date, May, 1876.—J. L.

1	Specimen from near Largo, Fifeshire.
3	„ south of the Pentlands: other 2 observed.
1	„ near Haddington, Haddingtonshire.
1	„ Coldingham, Berwickshire.
1	„ Stow, Mid-Lothian.
2	„ near Stow, do.
1	„ Balmaghi, Kirkcudbrightshire.
2	„ near Newton-Stewart, Wigtonshire.
1	„ Langholm, Dumfriesshire.
1	„ Balthayock, Perthshire.
1	„ Newtyle, Forfarshire.
2	„ Strathmore, do.
1	„ near Aberdeen, Aberdeenshire.
1	„ near Kelso, Roxburghshire.
2	„ Selkirkshire.

Many more are reported ; but we give only those which, without doubt, are specimens of the *Rough-legged* species, as some mistakes have occurred by persons confusing this bird with the Common Buzzard (*Buteo vulgaris*), of which specimens have also been more numerous than usual this season. The bird-stuffers in Glasgow have received several during the last few weeks. No fewer than six were sent in from one gamekeeper in Mull, in the beginning of February. Those birds were all fine dark specimens, with the darker feathers under the wings of a bright chestnut. On the Dumbartonshire hills, too, there were an unusual number of Buzzards seen, although, fortunately, there are not many captures recorded from this district.

The Rough-legged Buzzard may, when on the wing, be distinguished from the common species, by the dark band below the wings, which is more marked in immature than in adult birds. But the latter are very rare in this country. All the specimens which have come under my notice during the present flight have been immature birds, some of them having the dark band very distinctly marked.

The food of the Rough-legged Buzzards in this country seems to have been almost entirely rabbits. The stomachs of nearly all the specimens preserved in Glasgow contained rabbit fur and small bones, sometimes mixed with bits of grass, picked up most likely when tearing their prey on the ground.

The Rough-legged Buzzard is a native of the northern parts of

the European and Asiatic continents. "In Norway and Sweden," says Professor Newton,\* "it breeds in the higher sub-alpine districts, and in Lapland, even to the North Cape, is the most common bird of prey." Mr Wheelwright† says, that in one district of Lapland more than fifty nests were destroyed during the spring of 1862. It was obtained this year by Messrs Seeböhm and Harvie-Brown‡ on the banks of the Petchora. It is known in Turkey and Greece, and has been observed in Italy and Sardinia. Its nest has been taken in England, and rarely in Scotland, where it is an autumn migrant. Specimens have been obtained nearly every year, but seldom if ever in the same numbers as during the past winter.

*Obs.* When on the subject of Buzzards, I may read the following notice which has been kindly sent me by Mr Gray: "A very fine Honey Buzzard (*Pernis apivorus*) was shot at Kilberry, Argyllshire, in the end of September, by Mr Campbell of Kilberry. The specimen is a young male, and the first bird in this plumage I have ever seen." This species is uncommon on the west coast of Scotland, although it has several times been obtained, and has even bred, on the east coast.

In illustration of his paper, Mr Lumsden exhibited a series of specimens of the Rough-legged Buzzard, both mounted and in the flesh, and expressed his indebtedness to Mr Alexander Martin, Exchange Square, and to Messrs M'Culloch & Sons, Sauchiehall Street, who had lent some of them for exhibition.

## II.—Notes on a few of the Tube-building Annelids.

By Mr DAVID ROBERTSON, F.L.S., F.G.S.

The few annelid tubes that I now bring under your notice may be considered fair specimens of "Homes without Hands." It is not, however, to the suitability of these "homes," or to the various wants of their occupants, that I wish to draw your attention, but to the style of architecture maintained by each species. Omitting those that secrete calcareous, chitonous, and leathery tubes, I will confine the remarks that I have to make to those which build with

\* Yarrell's History of Brit. Birds, 4th ed., vol. i., p. 117.

† Spring and Summer in Lapland.

‡ "Ibis," Third Series, vol. vi., p. 110.

grains of sand, pieces of shells, and masses of clay, held together by means of a secreted mucus.

The specimen which I now hand round, marked No. 1, probably belonging to *Maldane*, is chiefly or wholly composed of clay. This example is very poor, but it is the only one at present at my command. They are frequently met with, about an inch in diameter, and twice that length, on mud bottoms in the Firth of Clyde; and, although plastic, they are sufficiently firm and tough to bear considerable strain without injury. The walls of this tube are hardest next the annelid, and they increase in thickness by the action of the exudation of the animal on the clay, becoming softer and softer as they extend outwardly, until the line between the tube and the soft mud in which it lies becomes imperceptible. In the construction of this tube there is no display of ingenuity on the part of the animal: a mass of stiffened clay, with an oblong cell for the occupant, closed at one end, open at the other, and destitute of all architectural design or beauty.

No. 2, *Terebella*, is also a clay tube—a compact, long, smooth cylinder, well defined, alike hard within and without, and which we may therefore suppose was built from bottom to top, according to the demands of the animal. This view is strengthened by observing a ring or joint near the top; as this is not seen on other parts of the tube, we may take for granted that this addition had been in progress of completion at the time the animal was captured, differing in this respect from No. 1, where the addition appears to go on laterally. As extraneous matter enters into the composition of the tubes, these animals may be fairly looked upon as *builders*; and not without interest, when we consider the nature of the thin, soft material out of which the fabric has been consolidated.

In Professor Thomson's report on the work of the "Challenger," which appears in "Nature" of 23d Nov., 1875, he says: "We sounded in 1,875 fathoms, with a bottom of bluish-grey clay, and a bottom temperature of 1° 7c., forty miles to the south-east of No Sima lighthouse. The trawl was put over, and it brought up a large quantity of the bottom, which showed the clay was in a peculiar concretionary state, run together in coherent lumps, which were bored in all directions by an annelid of the Aphroditacean group. In many cases the annelids were still in the burrows." May it not be possible that the cohesion of those

lumps of which Professor Thomson speaks, was caused by the annelid, as in the previous instance.

The examples No. 3, also *Terebella*, have added to their clay tubes a few chips of shells and other hard materials, as if to give support to the structure, but they do not belong to the same species.

The specimen No. 4 is too fragmentary to be determined. It is less remarkable for the order in which the materials are built, than for the selection it makes of the particular materials used. The sand, amongst which the tubes are found at a depth of 60 fathoms, is of a yellowish-green tint, and is intermixed with a few grains of garnets and black sand. The specimens of the tubes shown are placed on the sand in their natural condition; and a decided contrast between the native sand and that of the tubes is seen. This difference of shade will be found on close examination to arise from the animal having selected from the general material chiefly those grains most brilliant and conspicuous in colour, to adorn its subaqueous habitation.

No. 5, *Petta pusilla*, is made up of grains of sand of various sizes, which are fitted one into another with extreme neatness, and are securely held together by clean lines of white cement, anticipating our finest specimens of rubble work.

No. 6, *Pectinaria belgica* (Pallas). In this the building materials are much finer, and of a more uniform size, than in the previous cases. Nothing can exceed the manner in which these grains are put together, far surpassing the finest mosaic work. In this case the interbinding cement adds greatly to the beauty and delicacy of the structure. The cement has also the priority over all art compositions, inasmuch as it sets or hardens and remains insoluble under water.

No. 7, *Owenia filiformis* (D'Chiagii). The tube of this animal in its entirety tapers towards both ends. The taper is longest posteriorly, and is beautifully imbricated along its whole length, each piece being selected and arranged to suit the swell and decline of the taper. There are other species that follow the same style, but differ considerably in the execution of the work; as in No. 8, a doubtful species, which is much more coarse and rugged, and has a more abrupt taper.

No. 9, probably *Terebella*. The style and purpose of the workmanship of the tube in this case are not easily understood,

all the pieces of shells with which it is overlaid being placed along the inner frame of the tube in pentangular rows.

No 10, *Nothria conchylega* (Sars), is less symmetrical, the tube being greatly depressed and rugged at the edges, with a coarse and irregular aspect; but when we examine it with care we see a strict application of means towards an end. It will be observed that all the building materials (fragments of shells) have been laid down in the under row with the concave side up, and in the upper row with the concave side down, thereby forming a flat tube for the lodgement of the animal. It will be noticed that the pieces with which it is built are mostly of a considerable size, and so laid as to secure the greatest possible strength, which is accomplished by laying one piece over the other in such a way that an upper piece will cover the joining of two under pieces, a process familiarly known to builders by the name of "breaking band." This again anticipates one of the universal principles both of ancient and modern architecture.

There are many tube builders whose materials are laid less orderly, and where the cement is more gelatinous and yielding in character than in the cases we have noted, as in Nos. 11, *Lanice conchilega* (Pallas), and 12, *Thelepus circinnatus* (Fabricius). There are others, as No. 13, also *Lanice*, where the fine sand forming the tube is held together by a very thin mucous secretion of the animal. These tubes are often very long; some that have come under my own observation being formed in the following way:—The animal gathered a ring of sand round its neck, where it was supplied with the requisite amount of mucus to secure cohesion; from thence the ring was carried down to the posterior end of the body. Other rings were formed, and followed each other in the same way till the tube was completed.

Some species of these annelids are solitary, while others are gregarious. On the south-east side of Luce Bay the interstices of the shingle between tide-marks are closely filled up with the arenaceous cases of a colony of *Subellaria alveolata*, in some places fringing the sides of pools, and at other points covering the flat rocks with a solid crust. It may be remarked that this annelid is not always gregarious, nor in all cases confined to the tidal belt, as I have often brought it up in the dredge at Cumbræ in twos and threes adhering to the valves of *Pecten opercularis*, from a depth of twenty-five fathoms.

It is found that each species selects that kind of material which accords with its own particular habits; but the departure from the common rule is often considerable, where the supply of proper materials are not within reach. In such cases they avail themselves of the next best, and failing such, some of the species fall back on the resource of constructing a tube solely from their own secretion. These shifts often give the structure a very different aspect from its common appearance, and one that is ready to mislead as to the true character of the occupant.

But whatever straits or shifts they may be driven to, or whatever kind of materials they may use, whether the consolidation of soft mud into tubes, the picking out of fancy stones to cover the walls of their habitation, the laying of each piece so as to "break band," the overlapping the materials of the walls like the slates on a house, the construction of the edifice with fine mosaic work or with plain rubble, the same line of structure of each species is rigidly adhered to.

Mr John Young, F.G.S., stated that probably never had such an interesting series of tube-building annelids been exhibited before any Society in this country as those laid before the meeting on this occasion, and they were the more interesting from the fact that they had all been obtained by Mr Robertson's own dredging, chiefly from the Frith of Clyde. The group had hitherto been little studied, and probably many other species await further exploration in the seas around the Scottish coasts. Mr Young hoped that Mr Robertson would still continue his researches among the less known marine fauna, as only from the investigations of able naturalists important information like that embodied in Mr Robertson's paper is to be obtained.

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DECEMBER 28TH, 1875.

Mr James Ramsay, Vice-President, in the chair.

Mr Arthur Pratt was elected an ordinary member of the Society.

Mr J. B. Murdoch called the attention of the meeting to the death, after a long illness, of Mr James H. Pearson, who had for many years been a member of the Society. He had for a

lengthened period been in delicate health, and consequently unable to take such a prominent part in the proceedings as his interest in Natural History subjects prompted him to do. He was an industrious and zealous worker in entomology, and gave promise, had his life been prolonged and health granted him, of becoming distinguished in that branch of science.

Reference was also made to the death of Mr James Thomson, Curator of the City Industrial Museum, Kelvingrove Park, who had been an active and valuable member of the Society since his first appointment to the office which he held. He was ever ready to promote the interest of the meetings, by the exhibition of specimens, or by taking part in any discussion that might arise, and his opinion was often of value, especially on any point connected with ornithology, which was his favourite study, although he took a lively interest in all branches of Natural History. By his urbanity and obliging disposition, he gained the esteem of all with whom he came in contact, and in the occasional meetings of the Society held in the rooms of the Kelvingrove Museum, he always endeavoured, even at much trouble to himself, to promote the comfort and convenience of the members.

The Secretary was instructed to record in the minutes the feeling of regret with which the meeting had heard of the death of these two esteemed members, and to furnish an extract of the minute to the nearest surviving relatives of the deceased, with an expression of sincere sympathy in their bereavement.

#### SPECIMENS EXHIBITED.

Mr John Kirsop exhibited a collection of ferns from the province of Auckland, New Zealand. The specimens, which were mounted with great taste and care, numbered over seventy, and embraced examples of nearly all the genera of Filices.

The Chairman, in a few remarks, pointed out the peculiar character of the New Zealand flora, which comprised a larger variety of ferns than was known in any other country, many of the species being confined to those islands. Mr George J. Combe also made some general observations on the collection.

Mr Peter Cameron exhibited a large collection of insects, embracing—of Ichneumonidae—specimens of the female of *Eumesius crassicornis*, Grav., from Kingussie, and from the same locality, an undescribed species, proposed to be named *Limneria*

*croceipes*, and distinguished by having a black body, with bright yellow coxae, tibiae, and tarsi, and black femora; also *Bassus flavo-lineatus*, Gr., found in Cadder Wilderness. Of Tenthredinidae Mr Cameron showed *Nematus hortensis*, Hartig, from the London district, the larva feeding on the acacia; also *Cladius Drewseni*, Thoms., from England and Scotland, the latter species being an addition to our list.

Mr George Donaldson exhibited the nest of the Trap-door Spider from California, which country he considered to be the head-quarters of the species, as it is there met with in large numbers. He described the mode in which these nests are constructed. A well of five or more inches in depth is sunk in the ground, and inside of this the nest is formed of red clay, and lined with a fine silk-like material obtained from the secretions of the spider. The door or trap is a marvel of ingenuity; it cannot be opened from the outside, and serves not only for catching the prey of the animal, but affords a secure refuge from the attacks of more powerful enemies.

Mr Donaldson also exhibited a piece of a clay-like substance which is largely eaten by the Indians, and of which they are so fond that a supply is invariably carried with them when journeying. It appears to be a fresh-water deposit, and to be largely composed of diatoms. He also showed a number of objects of interest from Figi, among which was a necklace worn by the natives, and made up of the teeth of the sperm whale, which they obtain from the whaling vessels in exchange for palm oil and other native produce.

#### PAPERS READ.

I.—*Notes on the occurrence and distribution of Spirifera trigonalis, and its varieties in the Limestone Strata of the Coal-fields of the West of Scotland.* By Mr JOHN YOUNG, F.G.S.

During the very long period represented by the Old Red Sandstone series of Scotland, no evidence of purely marine conditions has yet been discovered over the area of country now covered by rocks of that formation. Throughout a thickness of several thousand feet of strata, the characteristic organisms met with are fishes, of which the greater number belong to the ganoid order, a group finding its nearest living representatives in the rivers and fresh-water lakes of the globe. Besides fishes, the

only other organisms met with in the Scottish Old Red are crustacean and plant remains. Of the crustacea, the genus *Estheria* affords evidence of fresh-water conditions. We find no remains of corals, crinoids, or molluscs, such as characterize the marine strata of the Devonian formations of other countries, and which are believed to be the marine equivalents in time of the Old Red of Scotland. The evidence afforded by the organisms, and by the prevailing red colour of the formation, favours the assumption that the whole series of beds were accumulated in a great fresh-water lake or lakes, but in which the waters may have been at times slightly brackish.

In the east of Scotland, in the calciferous sandstone series that overlies the Old Red Sandstone, we meet with, at intervals in the strata, evidence of the return of the sea, as indicated by the occurrence of certain characteristic marine fossils of the Carboniferous limestone period, which there make their appearance for the first time, so far as known to us.

In the west of Scotland, the calciferous sandstone series forming the lowest division of our Carboniferous system, is represented by a series of fresh-water strata, known as the Ballagan group, in which no characteristic marine fossils have yet been found. Overlying this group, we have a great thickness of trappean or volcanic rocks, which build up the Campsie, Kilpatrick, Renfrew, and Ayrshire hills; these in their turn are succeeded by strata belonging to the lower Carboniferous limestone period, in which we have abundant evidence of those alternate changes of conditions—from lakes, with fresh-water strata, to land surfaces, with forests of vegetation, as represented by our coal-seams; and from these to deep sea bottoms, with their growths of corals, crinoids, shells, shark-like fishes, and other characteristic marine forms.

Having stated this much regarding the palaeontological character of the Old Red Sandstone and Carboniferous strata, as indicated by their fossils, I come now to call your attention shortly to a group of the *Spirifera*, found in the marine limestone strata, belonging to the well-known and common species, *Spirifera trigonalis*, Martin, and the variety, *S. bisulcata*, Phil. These two forms present us with several variations in shape, which in some cases seem to be peculiar to certain localities, and to the strata of different geological horizons; and as the species ranges from the lower beds of the limestone series, in the west of Scotland, up to

the millstone grit, the whole representing a group of strata some 3000 feet in vertical thickness, it is possible that some of the varieties may have been evolved from earlier types, during the very long period of the accumulation of these strata. Although *Spirifera trigonalis*, with its var., *S. bisulcata*, are not known from any strata earlier than the Carboniferous period, yet it probably existed over some tract of the sea-bottom during pre-Carboniferous times.

I have already stated that in the Old Red Sandstone period, and in that of the calciferous sandstone series of the west of Scotland, we have no evidence from the contained fossils that the sea occupied the tracts where these strata were being deposited; but after the outpouring of the volcanic rocks forming our trappean hills, there appears to have been some change in the physical features of the country, the sea having apparently had ready access over the area as often as the land was depressed under its level. Mr Robert Craig of Beith, in his interesting paper "On the first appearance of certain fossils in the Carboniferous strata around Beith and Dalry,"\* points out that, in the strata overlying the lowest of the volcanic series of that district, and which belong to the calciferous sandstone period, there is a bed of coal representing an old land surface, and that over it, in a bed of argillaceous shale, the first of the group of marine organisms make their appearance. These appear in such force, and are represented by so many genera and species, as to lead me to believe that they must have migrated from some other tract of the sea bottom outside the area of the west of Scotland, where they had been flourishing, either in pre-Carboniferous times, or in the period represented by the fresh-water strata of the calciferous sandstone group. In this bed, Mr Craig has noted sixty species of molluscs, besides corals and crinoids; while amongst the Brachiopoda *Spirifera trigonalis*, and some of its varieties, make their first appearance. I have found the shell, on nearly equally low horizons of strata, in other portions of the coal-field around Glasgow, and it has also been obtained from strata of the same age in other districts of Scotland, as well as in England, Ireland, and other European countries where marine Carboniferous strata prevail.

What was the ancestor, in pre-Carboniferous periods, of *Spirifera trigonalis* and its varieties we do not know. Mr Davidson, the

\* Trans. Geol. Soc., Glas., Vol. v., p. 36.

eminent palaeontologist, states that the variety, *S. bisulcata*, has been by some assimilated with the Devonian *S. aperturata*, to which it approaches somewhat closely in form. I think that not only this species, but many others, may have been derived from Devonian forms by descent. Thus, amongst others, our abundant *Spirifera Urvii* is believed to be identical with the Devonian *S. unguiculus*, and it has also been shown that it survived along with some other Carboniferous species until Permian times, in which formation it is known as *Spirifera Clannyanus*. In the lower limestone shales of the Beith district, *Spirifera trigonalis* on its first appearance presents us, as will be seen by the specimens exhibited, with at least three or four well-marked varieties, one of which has the mesial fold more produced than any yet described. This variety I have found in the upper cement limestone at Arden, near Thornliebank. One of the other varieties approaches closely to *Spirifera acuta*, which has not yet been identified from Scotland; the others agree with the typical varieties, *S. trigonalis* and *S. bisulcata*, although some of the latter are more transverse than are usually found. In the shales at Newfield, High Blantyre, a variety of *S. trigonalis* is found, which, in the extension of its hinge-area and elongated mesial fold, almost rivals that of *S. triangularis*, from which species it is known by its more numerous ribs. This wide variety is there the only form of the species that has yet been found. I also exhibit specimens of the ordinary varieties of *S. trigonalis* and *S. bisulcata*, from both the lower and upper limestone series of the west of Scotland; the species, as I formerly stated, ranging upwards into the millstone grit, being found in the sandstone and shales of that group to the north-east of Glasgow.

One of the largest and finest varieties of *Spirifera bisulcata* obtained in the west of Scotland, is that found in the shales overlying the cement limestone at Orchard, near Giffnock, on the Busby railway. The strata belong to the upper limestone series, and this form, so far as yet known, seems to be peculiar to that horizon. It is very deep between the valves, and comes very near to *Spirifera mosquensis*, a species not hitherto recognised from Scotland, being only distinguished from it by its fewer ribs. It is very probable that all these varieties of *Spirifera trigonalis* are only varieties produced by descent from one original type, which seems to have been very variable, the variations probably being

caused by the conditions of the sea bottom on which it lived. Mr Davidson states, that at the time when he commenced his investigations amongst the British Carboniferous *Spirifera*, there were about one hundred and seventeen described species. After a long and searching investigation, he came to the conclusion that eighty-six of these so-called species were mere synonyms and varieties, and out of the thirty-one species admitted to his lists, only some twenty-three have been satisfactorily determined. All this variation, therefore, favours the view that many of the closely-allied forms once ranked as species, are only varieties of one original type.

One point in connection with the distribution of *Spirifera trigonalis* and its varieties in our strata I wish to refer to before I have done, and that is its disappearance throughout a considerable thickness of strata, represented by the fresh-water beds of our middle coals and ironstones of the Possil and Govan group. The absence of decidedly marine remains from this group of strata, points to physical conditions that once more shut out the sea from the space occupied by their area, and during which the strata accumulated were such as had either grown upon land, or had been deposited in lake bottoms of fresh water origin. With the return of the sea, during the upper limestone period, returned also *Spirifera trigonalis*, and some of its varieties, as well as many other of the older forms of Carboniferous marine life. These maintained for a period a sort of shifting existence, until they finally disappeared, by the shutting out of the sea during nearly the whole time of the deposition of the upper Carboniferous coal measures. Evidences of these physical changes are derived from the study of the groups of fossils found in the various strata, these affording the only true key to the history and conditions of the fossiliferous sedimentary deposits of every geological period.

II.—*On some Plants rare in the West of Scotland, observed during last Summer.* By Mr JAMES RAMSAY, Vice-President.

Mr Ramsay stated that on 3d July, 1875, along with Prof. A. Dickson, he had visited the island of Cumbrae, and while passing along the margin of a field of oats, just coming into ear, they discovered among the corn a great many plants of the Night-flowering Catch-fly (*Silene noctiflora*), an annual species, confined in Scotland entirely to the eastern counties. This was the only

time he had ever seen the plant growing, and he had no doubt it had been introduced with seed corn, and would likely establish itself in Cumbrae, for in a neighbouring field they found the Penny cress (*Thlaspi arvensis*), also a denizen of the east, but which is seldom seen in the west, excepting occasionally on ballast or rubbish heaps.

On the 10th of the month they visited Benlomond, but neither in ascending nor descending the mountain was anything met with that they had not seen there before. One of the party, however, who in coming down had taken a different route from the others, succeeded in picking up specimens of three plants worthy of notice. The Holly fern (*Polystichum lonchitis*), is chiefly found on the highest mountains of Scotland and Wales. It was last summer reported as having been got on Benvoirlich, but it has not hitherto been recorded as found on Benlomond. The next to be noticed, *Potentilla alpestris*, is a very attractive species, with deep rich, golden yellow flowers, and the only stations given for it in the "British Flora" are the Clova and Breadalbane mountains. The third noticeable species was *Arenaria verna*, which is quite common in the east, growing plentifully on Arthur's Seat and the Corstorphine hills, but not recorded hitherto as found in the west. It is noticeable that neither of these plants, nor *Sibbaldia procumbens*, which grows abundantly on the mountain, are mentioned in Henney's "Clydesdale Flora," although Benlomond comes within the range of its stations.

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#### JANUARY 25TH, 1876.

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

Messrs Alexander Hill, Daniel Wilson, George Rennie, and William Baxter, were elected ordinary members of the Society.

#### SPECIMENS EXHIBITED.

Mr Francis G. Binnie exhibited two specimens of Trichoptera, united by authors under the *Halesus digitatus* of Schrank, and remarked that three species are confused under this name, two of which—viz., those exhibited—seem to be British. The first, *H. radiatus*, Curt., is not uncommon by the Clyde at Carmyle, and by the Allander, also in the vicinity of the Cloch. The second,

*H. digitatus*, Schr., is a larger insect, more yellow in colour, and has the longitudinal grey streaks in the apical cells of anterior wings more or less broken up, giving a freckled appearance to that portion of the wings. The inferior abdominal appendices of the male are widely furcate; these parts in *H. radiatus* being simple, with the apex excised. It occurs along with the last, by the Clyde and the Allander. Both species are mixed under *digitatus* in Stephen's collection. For the nomenclature I am indebted to Mr R. McLachlan, the first living authority on the group, who is at present engaged upon a monographic revision of the European Trichoptera.

Mr John A. Harvie-Brown, M.B.O.U., corresponding member, exhibited a fine specimen of the Great Grey Shrike, *Lanius excubitor*, which had been killed at Tongue, Sutherlandshire, on 7th Dec., 1875, and was sent to him in the flesh by Mr John Crawford.

Mr Peter Cameron exhibited specimens of *Macrophya albipunctata*, Fallén, from Perthshire and Aberdeenshire. It is a species new to the British fauna, and has been recorded hitherto only from Scandinavia, but he had also specimens of it from eastern Germany, where it is in all probability confounded with *M. albicincta*.

Dr Dewar exhibited a pair of live Wild Cats, *Felis catus*, Linn., which had been obligingly lent by Mr Henry Martin, Buchanan Street, and remarked that this species was frequently met with in Inverness-shire. He said he knew of one gamekeeper who had obtained a dozen specimens in a short time. He had no doubt that the pair exhibited were the real Wild Cat, and not merely specimens of the Domestic Cat run wild.

Mr Harvie-Brown corroborated Dr Dewar's remarks. He had seen Wild Cats among the birch woods of Sutherlandshire, where they are not uncommon, and considered that the markings of the fur and the conformation of the head and tail were sufficient to distinguish them from the domestic animal.

#### PAPERS READ.

I.—*Note regarding the occurrence of the American Bittern, Botaurus lentiginosus, in Islay.* By Mr JAMES LUMSDEN, F.Z.S.

At the November meeting of the Society Mr Lumsden placed upon the table a Bittern, which had been killed in Islay in the previous month. At that time he could not confidently state to which species the bird belonged, not having had an opportunity

before the meeting of comparing it with other specimens, or of consulting any work on the subject. Since then, however, he had carefully examined the bird, and he could now state that it is a specimen of the American Bittern. Mr Harvie-Brown and Dr Dewar also identified the specimen. It was killed about the last week of October on the shore at Islay, and is the fifth or sixth specimen recorded from Scotland.

II.—*Sketch of the Ornithology of the Lower Petchora, with some account of a Journey to the Delta of that river, and to the Tundras of N. E. Russia; with remarks on the migratory movements of the species observed.* By Mr JOHN A. HARVIE-BROWN, M.B.O.U., corresponding member.

This journey was undertaken by Mr Henry Seebohm, F.Z.S., and Mr Harvie-Brown, during the spring and summer of 1875. After describing shortly their route from London to Archangel,—2d to 19th March,—and sojourn at the latter place, the writer entered into details regarding the incidents of travel and scenery along their way through the less known country between Archangel and Ust Zylma on the great river Petchora,—6th to 15th April,—specially noting the scenery of the Kuloi River, a tributary of the Mezèn, and referring his hearers to a fuller description in Rae's "Land of the North Wind." He also casually made mention of the migrating bands of Samoyedes who inhabit in summer the dreary tundras northward and eastward of the town of Mezèn, and with whom the travellers, later on their journey, had abundant opportunity of becoming acquainted. They passed to the eastward of Mezèn through almost uninterrupted forests for 600 miles, travelling day and night, and only stopping at the stations, which are from 14 to 33 versts apart (3 versts are equal to 2 English miles), for the purposes of changing horses or taking a hurried meal. A great stretch of this forest country, containing about 14,000,000 acres, and about 460 miles in length, is held by Mr Rusánoff, of Mezèn, in grant from the Crown, for the purpose of felling and exporting the timber. The vastness of this great country more and more impressed the travellers as they passed onwards on their journey through the deep pine woods, the wild cries of the yemstschik or driver, and the constant crunching and thumping of the hard frozen snow against the sides of the sledge, being the only sounds to disturb the otherwise silent forests. The

curiosity of the inhabitants at the villages or stations was also more noticeable from day to day; and, as they reached farther to the eastward, the native love of rude ornamentation and carving on the road-side crosses was also observed. After six days and nights of sledge-travel, they arrived at Ust Zylma on the 15th April. Here they remained until the 10th June, waiting for the summer, and for the breaking up and clearing away of the ice on the great river, which took place on the 22d May and ten succeeding days. During this time much interesting information regarding the Samoyedes was gathered, and a collection of implements, dresses, and harness for deer formed, which is destined for the Christy Ethnological Museum in London.

After describing Ust Zylma, a long straggling town of about 2000 inhabitants, on the east bank of the great river Petchora, which rises far to the southward, in the government of Perm, and after a course of over 1000 miles, flows into the Arctic Ocean, in about  $68\frac{1}{2}^{\circ}$  north latitude; and having described in general terms the willow-covered banks and islands between Ust Zylma and a place called Alexievka, the port of the timber-trading company, situated near the river, Mr Harvie-Brown enumerated the species of birds which they met with, a hundred in number, between the two places named. At Alexievka the travellers remained from the 19th June, the day of their arrival, till the 2d August, during which time they added about another dozen of birds to their list. They then embarked on their voyage home, round the North Cape, in a small schooner, 149 tons register, the "Triad" of Campbeltown, Captain Charles Taylor; and, after a five weeks' voyage, landed at Elsinore, reaching England on the 10th September, having been absent six months.

They met with and identified in all 113 species of birds, and brought home over 1000 skins and 1000 eggs. An examination of these specimens, and of the travellers' journals, resulted in the following papers, which it is recommended should be read in connection with the present:—

"Notes on the Birds of the Lower Petchora" ("The Ibis" for January, April, July, and October, 1876), by Henry Seebohm, F.Z.S., and John A. Harvie-Brown.

"Notes of a Journey to, and Ornithological Observations on, the Lower Petchora in 1875," by J. A. Harvie-Brown; part of which is printed in Proc. Roy. Phys. Soc., Edin., 1876, p. 81.

Various articles on the rarer and more interesting species, in Mr Dresser's "Birds of Europe," Parts xlii., *et seqq.*

"On the migration of Birds in N. E. Russia," by H. Seebohm, in Rowley's "Ornithological Miscellany," Part iv., May, 1876, p. 239.

*Remarks on Migration.*

In the introductory portion of the first of the papers above noted, Mr Seebohm and I have indicated, in a general way, the duration of the migratory season of 1875 for birds in the district in which our observations were made, and have taken notice of the numbers of species added to our list from day to day. Further, under each species we have recorded our first recognition of it, along with other particulars, including distribution, habits, and nidification, which matters will also be found treated of at greater length in Seebohm's articles in the "Birds of Europe." In the second of the papers above noted, I have given a list of fifteen of the rarer and more interesting species met with, along with references; and in the last, Seebohm has already treated of the subject of migration.

In preparing the following list of species and table of migratory movements, I have desired to confine myself to remarks upon the latter subject. I am aware of the difficulties of the subject and of the imperfection of this table, an imperfection which can only be partially rectified by further and repeated observations in different localities, in different years, and by a large staff of observant naturalists, who will tabulate their records so that they can be used for comparison. My desire now is to supply a link, necessarily incomplete though it be, in this long chain of facts and comparisons; and I hope that some interest may be found to attach to it, and some results, however small, be gleaned from it.

Our head-quarters for observations during the time of migration in 1875, were at Ust Zylma, 300 miles from the mouth of the Petchora (65° 26' N. lat.), and at Habariki, a few versts further north, or lower down the river, and the time was between the 15th April and the 11th June.

We believe that we were stationed rather too far to the westward to meet the main body or direct tide of migrants, and that a large proportion of the species which we afterwards met with, at their more northerly breeding stations, in summer, must have reached these breeding stations by some more direct route, and

without passing our points of observation. There can be little doubt, we think, that the valley of the great Petchora river, in conjunction with that of the Volga, forms one of the great channels along which the vernal migrants pour in a great wave from south-west to north-east,\* but that many species, when they reach Ust Ussa,—at the junction of the rivers Ussa and Petchora, 600 miles from the junction of the latter with the sea,—do not go out of their course by following down the river past Ust Zylma, but continue their journey to the northward, spreading, like the rays of a fan, over the northern tundras and forests, or flying direct to their breeding haunts on the shores of the Arctic sea.

In some seasons, no doubt, this movement may be ruled by prevailing winds on their arrival at Ust Ussa, in conjunction with cold or heat or want of food, lateness or earliness of the Arctic summer; and therefore, while in some seasons they thus pursue their northerly course, as in 1875, in others they may be compelled to pass Ust Zylma. In illustration of a parallel case, I may instance what the authors of a Russian work, treating of the birds of the Volga, say. They tell us that the Grey Plover is seen both in May and in September, *i.e.*, on their vernal and autumnal migrations, in small flocks, at Kasan, *but not every year.* (*Vide* "Ibis," April, 1876).

It is also possible that we missed some of the other migrants by leaving as early as the 11th of June. Thus, at Ust Zylma, before that date, we only saw two Wigeons, which we afterwards found to be the most abundant species of duck down the river and on the delta; and we were told by the sportsmen at Ust Zylma, that they generally arrive *en masse*, some time after the Pintail ducks put in an appearance. On the other hand, however, we found these two species breeding at Habariki at the same date,—the beginning of June,—and only a few days after the arrival of the latter, which was first noticed by us on the 18th May. I do not think, however, that we can have missed many species in this way.

I now proceed to tabulate the species met with. Under the heading "Remarks" in the following columns, C. stands for common; R., rare; A., abundant.

\* *Vide* "Encyclopedia Britannica," Ninth Edition, Vol. ii., 1876, p. 758, where Professor Newton, in his article "Birds," quotes Von Middendorff's "Die isepiptesen Russlands, Grundlagen zur Erforschung der Zugzeiten und Zugrichtungen der Vögel Russlands. St. Petersburg, 1855."

## LIST OF SPECIES, WITH MIGRATORY MOVEMENTS.

NAME OF SPECIES.	Residents.	Migrants.	Date of first Record.	Not seen at U. Zylina.	But seen at Habariki.	Not seen on migration at all.	REMARKS.
1. <i>Aquila chrysaëtus</i> .....	*	..	.....	..	..	..	Only once identified.
2. <i>Haliaëtus albicilla</i> .....	..	*	.....	..	..	..	Not R.
3. <i>Pandion haliaëtus</i> .....	..	*	3. vi. 75.	*	*	*	Only 1 seen.
4. <i>Buteo lagopus</i> .....	..	*	11. vi.	*	..	..	Only 1 seen.
5. <i>Falco peregrinus</i> .....	..	*	13. v.	..	*	..	Not R.
6. <i>Falco subbuteo</i> .....	..	*	5. vi.	*	..	..	Only 1 seen.
7. <i>Falco aesalon</i> .....	..	*	5. v.	..	..	..	C.
8. <i>Astur palumbarius</i> .....	..	*	13. vi.	..	..	..	Only 1 seen.
9. <i>Accipiter nisus</i> .....	..	*	29. v.	..	..	..	Only 1 seen.
10. <i>Circus cyaneus</i> .....	..	*	24. v.	..	..	..	C.
11. <i>Surnia nyctea</i> .....	..	*	10. v.	..	..	..	Not A.
12. <i>Asio accipitrinus</i> .....	..	*	23. v.	..	..	..	Not C.
13. <i>Bubo ignavus</i> .....	*	..	.....	..	..	..	Parts of two birds seen.
14. <i>Dryocopus martius</i> .....	*	..	.....	..	..	..	R. ?
15. <i>Picus minor</i> .....	*	..	.....	..	..	..	C.
16. <i>Picus tridactylus</i> .....	*	..	.....	..	..	..	C.
17. <i>Cuculus canorus</i> .....	..	*	3. vi.	..	..	..	C.
18. <i>Corvus corax</i> .....	*	..	.....	..	..	..	C.
19. <i>Corvus cornix</i> .....	*	..	.....	..	..	..	A.
20. <i>Corvus frugilegus</i> ..	..	*	17. v.	..	..	..	Only 1 seen.
21. <i>Corvus monedula</i> .....	..	*	3. v.	..	..	..	Only 2 seen.
22. <i>Pica rustica</i> .....	*	..	.....	..	..	..	C.
23. <i>Perisoreus infaustus</i> .....	*	..	.....	..	..	..	C.

LIST OF SPECIES, WITH MIGRATORY MOVEMENTS—Continued.

NAME OF SPECIES.	Residents.	Migrants.	Date of first Record.	Not seen at U. Zylma.	But seen at Habariki.	Not seen on migration at all.	REMARKS.
24. Passer domesticus.....	..	*	15. v. ?; 18. vi.	...	...	...	Not rare.
25. Passer montanus.....	*	...	.....	...	...	...	C.
26. Pyrrhula vulgaris.....	..	?	.....	...	...	...	Not C.
27. Carpodacus erythrinus.....	..	*	7. vi.	...	...	...	2 only seen.
28. Corythus enucleator.....	..	*	24. v.	...	...	...	C.
29. Fringilla montifringilla.....	..	*	24. v.	...	...	...	C.
30. Linota linaria.....	..	*	early in April.	...	...	...	C.
31. Linota canescens.....	..	*	early in April.	...	...	...	C.
32. Emberiza citrinella.....	..	?	.....	...	...	...	R.
33. " pusilla.....	..	*	31. v.	...	*	...	C.
34. " schoeniclus.....	..	*	15. v.	...	...	...	C.
35. Plectrophanes nivalis.....	..	*	early in April.	...	...	...	A.
36. " lapponica.....	..	*	18. v.	...	...	...	A.
37. Alauda arvensis.....	..	*	22. v.	...	...	...	Only 2 seen.
38. Otocoris alpestris.....	..	*	10. v.	...	...	...	A.
39. Anthus seebohmi (Dresser)....	..	*	16. vi.	...	...	*	Not rare. ( <i>sp. nov.</i> )
40. " trivialis.....	..	*	22. v.	...	...	...	Only 1 seen.
41. " pratensis.....	..	*	12. v.	...	...	...	Not C.
42. " cervinus.....	..	*	17. v.	...	...	...	A.
43. Budytes viridis.....	..	*	23. v.	...	...	...	C.
44. " ctreolus †.....	..	*	3. vi.	...	*	...	C.
45. Motacilla alba.....	..	*	12. v.	...	...	...	C.
46. Turdus pilaris.....	..	*	17. v.	...	...	...	C.

† None were seen at Ust Zylma; 5 seen at Habariki; very abundant north of Arctic circle.

## LIST OF SPECIES, WITH MIGRATORY MOVEMENTS—Continued.

NAME OF SPECIES.	Residents.	Migrants.	Date of first Record.	Not seen at U. Zylma.	But seen at Habaraki.	Not seen on migration at all.	REMARKS.
47. <i>T. iliacus</i> .....	..	*	17. v.	..	..	..	C.
48. <i>Cyanecula suecica</i> .....	..	*	23. v.	..	..	..	A.
49. <i>Ruticilla phoenicea</i> ..	..	*	12. v.	..	..	..	Not C.
50. <i>Saxicola oenanthe</i> .....	..	*	21. v.	..	..	..	C.
51. <i>Pratincola rubicola</i> †.....	..	*	.....	..	..	..	Not R.
52. <i>Phylloscopus trochilus</i> .....	..	*	20. v.	..	..	..	C.
53. " <i>borealis</i> .....	..	*	12. vi.	*	..	*	One only.
54. " <i>tristis</i> .....	..	*	22. v.	*	..	*	C.
54B. " <i>neglectus</i> .....	..	*	3. vi.	..	..	..	Only one.
55. <i>Parus kamschatkensis</i> .....	*	..	.....	..	..	..	Not C.
56. " <i>cinctus</i> .....	*	..	.....	..	..	..	Not C.
57. <i>Colamodyte phragmitis</i> .....	..	*	.....	..	..	*	Not C.
58. <i>Ampelis garrula</i> .....	..	*	4. vi.	*	..	*	C.
59. <i>Hirundo rustica</i> .....	..	*	26. v.	..	*	..	R.
60. <i>Cotyle riparia</i> .....	..	*	10. vi.	*	*	..	R. Local.
61. <i>Lagopus albus</i> .....	*	..	.....	..	..	..	C.
62. <i>Tetrao urugallus</i> .....	*	..	.....	..	..	..	C.
63. <i>Tetrao tetrax</i> .....	*	..	.....	..	..	..	Not C.
64. <i>Tetrastes bonasia</i> .....	*	..	.....	..	..	..	Not R.
65. <i>Charadrius pluvialis</i> .....	..	*	17. v.	..	..	..	C.
66. <i>Squatarola helvetica</i> .....	..	*	.....	..	..	*	C.
67. <i>Eudromas morinellus</i> .....	..	*	.....	..	..	*	R.
68. <i>Aegialites hiaticula</i> .....	..	*	26. v.	..	..	..	C.

† Eastern variety.

LIST OF SPECIES, WITH MIGRATORY MOVEMENTS—Continued.

NAME OF SPECIES.	Residents.	Migrants.	Date of first Record.	Not seen at U. Zylma.	But seen at Habariki.	Not seen on migration at all.	REMARKS.
69. <i>Aegialites fluviatilis</i> .....	...	*	8. vi.	...	...	...	R.
70. <i>Haematopus ostralegus</i> .....	...	*	26. v.	...	...	...	Not plentiful.
71. <i>Phalaropus hyperboreus</i> .....	...	*	.....	...	...	*	C.
72. <i>Totanus glottis</i> .....	...	*	19. v.	...	...	...	C.
73. " <i>fuscus</i> .....	...	*	2. vi.	*	*	...	Not R. at Habariki.
74. " <i>glareola</i> .....	...	*	26. v.	*	*	...	C.
75. <i>Actitis hypoleuca</i> .....	...	*	.....	...	...	*	R. or local.
76. <i>Terekia cinerea</i> .....	...	*	3. vi.	...	...	...	C.
77. <i>Limosa aegocephala</i> .....	...	*	.....	...	...	*	I only seen on Tundra.
78. <i>Machetes pugnax</i> .....	...	*	3). v.	...	...	...	C.
79. <i>Tringa subarcuata</i> .....	...	*	.....	...	...	*	I seen on N. Tundra coast.
80. " <i>cinclus</i> .....	...	*	.....	...	...	*	A.
81. " <i>minuta</i> .....	...	*	.....	...	...	*	C.
82. " <i>temminckii</i> .....	...	*	26. v.	...	...	...	A.
83. <i>Calidris arenaria</i> .....	...	*	.....	...	...	*	Not R.
84. <i>Scolopax gallinago</i> .....	...	*	2. vi.	*	*	...	C.
85. <i>Scolopax major</i> .....	...	*	3. vi.	*	*	...	C.
86. <i>Numenius phaeopus</i> .....	...	*	18. v.	...	...	...	3 seen.
87. <i>Grus cinerea</i> .....	...	*	21. v.	...	...	...	R.
88. <i>Cygnus musicus</i> .....	...	*	11. v.	...	...	...	C.
89. <i>Cygnus bewickii</i> †.....	...	*	.....	?	...	?	Not R.
90. <i>Anser segetum</i> .....	...	*	15. v.	...	...	...	C.
91. <i>Anas clypeata</i> .....	...	*	21. v.	...	...	...	Not C.

† Probably passed Ust Zylma along with the last species, though not identified by us on migration.

## LIST OF SPECIES, WITH MIGRATORY MOVEMENTS—Continued.

NAME OF SPECIES.	Residents.	Migrants.	Date of first Record.	Not seen at U. Zychma.	But seen at Habariki.	Not seen on migration at all.	REMARKS.
92. <i>Anas crecca</i> .....	...	*	18. v.	...	...	...	C.
93. " <i>acuta</i> .....	...	*	18. v.	...	...	...	Very C.
94. " <i>penelope</i> .....	...	*	20. v.	...	...	...	R. Afterwards very A.
95. " <i>marila</i> .....	...	*	.....	...	...	*	Not C.
96. " <i>cristata</i> .....	...	*	.....	...	...	*	R.
97. " <i>clangula</i> .....	...	*	.....	*	*	...	Not R.
98. " <i>glacialis</i> .....	...	*	.....	...	...	*	A. on Tundra.
99. " <i>fusca</i> .....	...	*	.....	...	...	*	R. 1 pair seen on Tundra.
100. " <i>nigra</i> .....	...	*	31. v.	...	...	...	R. Afterwards C.
101. <i>Mergus albellus</i> .....	...	*	.....	*	*	...	Not R. at Habariki.
102. " <i>mergamser</i> .....	...	*	.....	*	*	...	1 seen.
103. " <i>serrator</i> .....	...	*	.....	*	*	...	Not R. on Tundra streams.
104. <i>Sterna hirundo</i> .....	...	*	.....	*	*	...	C.
105. <i>Larus canus</i> .....	...	*	15. v.	...	...	...	C.
106. " <i>affinis</i> ?.....	...	*	15. v.	...	...	...	C.
107. " <i>marinus</i> .....	...	*	.....	...	...	...	R.
108. " <i>glaucus</i> .....	...	*	.....	...	...	...	C.
109. <i>Stercorarius parasiticus</i> .....	...	*	.....	...	...	...	Not R.
110. <i>Stercorarius buffoni</i> .....	...	*	.....	...	...	...	A.
111. <i>Eudytes septentrionalis</i> .....	...	*	.....	*	*	...	Not C.
112. " <i>arcticus</i> .....	...	*	3. vi.	...	...	...	C.
113. Vide 54p.	...	*	.....	...	...	...	

An examination of the above table gives the following results, so far as we are able to judge from the data at command.

Of the 113 species mentioned (*Phylloscopus neglectus* (Hume), true to its name, having been inadvertently left out in the numbering), we find only 16 species which are undoubtedly resident, and two others—the Bullfinch and Yellow-hammer, to which I have attached queries (?)—though I believe they may be considered as very early migrants, along with the Snow Bunting, Lesser and Mealy Redpoles.

Of these 16 Residents, however, the Hooded Crow, though resident at Ust Zylma, is said by the natives to be migratory between that and Gorodok (or Pustozersk), arriving at Gorodok about the 10th May and quitting it in the dead of winter. On the other hand, the Magpie is said to remain there all winter, appearing, therefore, to be more hardy than its congener.

Of the remainder, which, for convenience, we may class under Migrants—95 in number—the Snow Bunting, Lesser and Mealy Redpoles, would appear to be the earliest to arrive, if we put aside the two species I have marked as doubtful, viz., the Bullfinch and the Yellow-hammer. The House-sparrow appeared to gain additions to its numbers in May; but I feel also somewhat doubtful about its being really a migrant, as suspicions of its presence as early as the 15th April—the day after our arrival at Ust Zylma—were so strong as almost to amount to a certainty, although we did not succeed in procuring specimens until the 18th May, after which time they rapidly became more plentiful.

Of the other undoubted Migrants, 25 species were not observed to pass or visit Ust Zylma or Habariki up to the time we left, viz., the 11th June. These were Nos. 4, 39, 53, 54<sup>B</sup>, 57, 66, 67, 71, 75, 77, 79, 80, 81, 83, 95, 96, 98, 99, 103, 104, 107, 108, 109, 110, and 111 of the above list. Of these 25 species we may, I think, reasonably suppose that the following really did not pass Ust Zylma or Habariki, but reached their breeding grounds by a more direct route or routes: some probably striking north from Ust Ussa, as before suggested; others reaching their breeding stations by following the coast line—as, for instance, *Larus*

*glaucus*\* and *L. marinus*. I say *reasonably suppose*, because it was not until very long afterwards that we met with these species. They are Nos. 66, 67, 77, 79, 80, 81, 83, 99, 107, 108, 109, 110, 111, and also 39, 71, 75, 95, 96, 98, 103, 104. The first 13 of these we afterwards met with only on the tundra and the far-out islands of the Petchora Gulf; and the other 8 were found on the river and its islands, but considerably to the north. Of each of Nos. 4, 53, 54<sup>B</sup>, we got only one specimen; and they may or may not have passed Ust Zylma.

If we consider, however, that *Phylloscopus tristis*, an eastern species and of the same group as 53 and 54<sup>B</sup>, was not uncommon at Ust Zylma, then there is a probability that these latter also would find their way north by a not very different route. No. 57 we did not see on migration, because we had no opportunity of visiting suitable ground at the right time; but very soon after leaving Habariki, we found it in full song amongst the willow thickets. No doubt, could we have reached the west shore of the Petchora, opposite Ust Zylma, between the 22d May and the 10th June, we would also have been able to add it sooner to our list. We were prevented from doing this by the flooding of the river and the stream of ice.

For convenience of comparison of the dates of arrival of migratory species at Ust Zylma and in Egypt, I append the following table:—

*A comparative Table of the arrivals of Birds in Egypt, and in the district around Ust Zylma and Habariki, in N.E. Russia.*

NAME OF SPECIES.	EGYPT. Say 30° N. Lat.	U. ZYLMA. 65° 30' N. Lat.	TIME.
Sand Martin.....	Feb. 21st	June 10th	112 days.
Wheatear.....	March 8th	May 21st	84 "
Swallow.....	" 14th	" 26th	53 "
Redstart.....	" 31st	" 12th	42 "
Sedge Warbler.....	April 5th	June 12th	68 "
Cuckoo .....	" 7th	" 3d	58 "
Tree Pipit.....	" 23d	May 22d	30 "

\* Upon an examination of such papers as I have access to upon the Birds of the countries bordering the coasts of the east of the Mediterranean, I can find no record of the occurrence of *Larus glaucus*, and very few records of its occurrence in the Mediterranean at all. Salvadori says that *L. glaucus*

The dates of arrival in Egypt are copied from my friend Mr J. H. Gurney's "Rambles of a Naturalist in Egypt," 1876, p. 112. The comparison, I believe, will be found in some degree useful, as there is an extreme probability that many even of the individual birds, not to mention species, which pass down the Nile, continue their flight northward through the plains and valleys of Southern Russia and descend the valley of the Petchora. Corresponding with me on the subject of migration, Mr J. H. Gurney writes as follows: "The comparison of your dates and my Egyptian ones on the one hand, and of my Algerian ones with English ones on the other, must in a measure show the rates at which they travel; and, if they take longer in travelling in the East than in the West, the greater number of observers in England must be taken into consideration." An additional cause for greater time spent in migration in the East, appears to me to be found in the longer continuance of winter, and consequent scarcity of food, deterring the birds from reaching their far northern breeding limits. I might here quote at greater length from Mr Gurney's interesting correspondence, but I refrain for two reasons—first, because by doing so, I would get beyond the bounds of this connection; and, secondly, because I understand that Mr Gurney intends treating of the subject in a future paper.

Of course the foregoing table must be offered for the present in its incompleteness, as there is a great want of tabulated records between Egypt and Ust Zylma, and the time cannot be considered to have arrived in which to generalize more fully, until these records are supplied, or at least until the chain more nearly approaches completion. Those who desire to pursue the subject further—and a very interesting, if intricate one, it is—would do well to consult the following papers:—

"Die isepiptesen Russlands. Grundlagen zur Erforschung der Zugzeiten und Zugrichtungen der Vögel Russlands," by Dr von Middendorff, St Petersburg, 1855; and Professor Newton's

is an occasional visitant in Liguria and Venice; and two specimens are in the Genoa Museum, said to have been killed in Liguria. Lieut.-Col. Irby notices it as having occurred once on the coast of Tangiers ("Ornithology of the Straits of Gibraltar," p. 215). Its absence there would seem a good reason for excluding it from the list of such as would migrate down the Petchora; and I believe that the large gulls seen passing over Ust Zylma ('Ibis,' Jan., 1876), must have belonged to some other species.

remarks on the same, in the ninth edition of The Encyclopedia Britannica, under the article 'Birds,' p. 768.

For a complete list also of the principal works treating of migration of Birds, see the Foot Note No. 3, on the same page.

The Chairman proposed a vote of thanks to Mr Harvie-Brown for his interesting paper, which he was sure the meeting had highly appreciated, and made a few remarks on the large and fine collection of specimens with which it had been illustrated, many of the species being very rare and little known.

The motion was cordially responded to ; and several donations to the library having been announced, the Society adjourned till the last Tuesday of February.

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FEBRUARY 29TH, 1876.

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

SPECIMENS EXHIBITED.

Mr D. C. Glen, F.G.S., exhibited a specimen of *Lepidodendron obovatum* in clay-band ironstone, from the Possil ironstone series near Robroyston, which was remarkable for the large size and bold sculpturing of the leaf scars. Mr John Young made some remarks on the specimen, and stated that few would believe that *Lepidodendron* was ornamented in the bold manner indicated in this specimen, except those who were acquainted with the plants in their uncrushed condition, the great majority of the specimens found in our coal-fields having their leaf scars much flattened by pressure. Mr Glen presented the specimen to the Hunterian Museum plant collection.

Mr Thomas Chapman exhibited a living specimen of the Praying Mantis, *Mantis religiosa*, in the pupa state, the wings being undeveloped, and stated it had been brought from the banks of the Nile in January of this year. The insect excited considerable interest amongst the members, from its singular attitude. The long body is rested on the four hinder legs, with the head and neck thrown back, and the two fore legs raised upwards and crossed over each other. To this strange posture,

which it assumes when watching for the insects which are its prey, it is indebted for its name ; and during the Middle Ages it was regarded with very superstitious feelings. It is very ferocious ; and if a number are placed together in a box a free fight immediately commences ; in a short time the weakest have to succumb, and are frequently devoured by the survivors.

## PAPERS READ.

I.—*On the Leptoceridae of the Glasgow District.*

By Mr FRANCIS G. BINNIE.

The writer stated that he had been engaged for the last two years in collecting and studying the Trichoptera or Caddis flies of Scotland, his attention being chiefly directed to those occurring in this district. Having no observations of former workers to form a basis, he had to a large extent to work single-handed ; but he begged to acknowledge his obligations to students of other branches of entomology, and more especially to Messrs Cameron and King, who had kindly secured for him any specimens that came in their way. There was yet much to be done before anything like a complete list for this district could be given ; but what had been obtained probably fairly represented the species likely to occur in this vicinity. The Leptoceridae is the third largest in the group, which is divided into seven families. M'Lachlan, in his monograph of the British Caddis flies, published in 1868, describes twenty-four species distributed among six genera, and to this nothing has been added in the more recent catalogue published by the Entomological Society of London in 1870. Mr Binnie then enumerated the British species *seriatim*, described the local species as they occurred, with brief notices of the absent ones, and pointed out such as are yet likely to be found. Excluding *Setodes*, of which genus he had not seen any representatives in this district,\* there remained seventeen species, of which eleven had been identified as occurring in this quarter, and of the remaining six, four seemed scarce and local, but he hoped that the other two would yet be found in the Hogganfield and Frankfield districts, which had not been thoroughly explored.

\* Since the date of the paper, *Setodes testacea* (Curtis) has been captured near Milngavie.—F. G. B.

II.—*Sketch Paper on the Birds of Loch Lomond and Neighbourhood.*

BY Mr JAMES LUMSDEN, F.Z.S.

Those parts of the counties of Dumbarton and Stirling which are drained by the streams flowing into Loch Lomond, are rivalled by few places in Scotland as a varied ornithological field. There are not many districts of the same extent which can boast of such a long list of species, some of which have been met with in no other part of Scotland. Yet, with the exception of a list of the birds of the parish of Luss in the "Statistical Account of Scotland," 1790, and Mr Robert Gray's excellent list of the more interesting birds of Loch Lomond,\* little or nothing has been written on the bird life of the district.

The Golden Eagle may still, although rarely, be seen in the district, and in 1872 it nested within ten miles of the loch. Not very many years since the Osprey used to nest in the old castle of Inch Galbraith, and the Kite in Kenmore Wood. The high rocks of Inch Tavannach are now the nesting place of Kestrels and Jackdaws, and often a pair of Barn Owls; while in the woods on the border of the loch and neighbouring hills, the Sparrow-hawk builds in considerable numbers, their old nests being often occupied the second year by the Long-eared Owl.

All the streams and mountain burns are enlivened by the Dipper—or "Water Craw," as it is called in the district—that bird of perpetual motion.

The wooding round the loch is a favourite resort of many of the warblers. The Grasshopper Warbler has been taken in Kenmore Wood; and the Sedge Warbler, White-throat, Wood Warbler, and Willow Warbler, are not uncommon. The common Jay is met with here also; the banks of Loch Lomond being one of the few places where the species can still be called plentiful in Scotland.†

Among the heather and ferns on some of the hills, the Night-jar, Goat-sucker, or Fern Owl—by any of which names it is known—is sometimes observed; but its nest is not easily found, the eggs being laid on the ground without any proper nest.

\* Zoology of the Banks of Loch Lomond and its vicinity, by Robert Gray, contained in Maclure and Macdonald's "Guide to the Trossachs and Loch Lomond." Glasgow, 1864.

† "Scottish Naturalist." Vol. iii., p. 236.

On the higher hills Snow Buntings are got in severe weather during winter ; and Ptarmigan breed on Ben Lomond every year in limited numbers.

The flat shore at the mouth of the Endrick has proved a rich field for all kinds of waders. Here have been killed the Green-shank, Wood Sandpiper, Little Stint, and the Black-tailed Godwit in breeding plumage. In this district the Common and Jack Snipe are abundant, and the Freshwater Sandpiper and Dunlin are far from rare.

In winter the loch is a harbour for many kinds of ducks, and occasionally geese and wild swans. The Shoveller has been obtained, and also the Pin-tail and Long-tailed Duck. The Smew has once or twice been shot, and the Goosander is included in Mr Gray's list of Loch Lomond birds. Bernicle, Brent, Canada, and Egyptian Geese have all been shot on the loch ; and both Bewick's Swan and the Whooper have been obtained in severe winters.

But there is perhaps no spot in the district so full of interest to the naturalist as Inch Moan, or the Peat Island, which is the breeding place of many gulls, terns, and ducks. The island is a long flat piece of ground, covered in some places with bog myrtle and rank grass mixed with heather. At the west end of the island is a clump of small Scotch fir trees, in the middle of which stands an old cottage, in the ruined chimneys of which Jackdaws breed every year. The nests of the Wild Duck, Teal, and Red-breasted Merganser, are got amongst the undergrowth and below furze bushes, on the drier parts of the ground.

Of the Gulls, the Black-headed is the first to arrive and take up its abode in the most marshy places ; some of the nests being built on tussocks of grass or rushes, in the midst of pools and bogs. The Lesser Black-backed Gull is the next to come, and along with it a few pairs of the Great Black-backed. The Black-backs choose drier grass than the former species, and place their nests among the heather or other cover, and sometimes among the stones on the shore ; the larger species especially choosing this position, and often building their clumsy nests close to the water's edge. After the gulls are all settled, the terns arrive, and usually breed on a part of the island where the ground is harder and the undergrowth not so rank.

I do not know a finer sight than the low island on a summer day. The Great Black-backed Gulls, with their hoarse, loud croak,

flying overhead; while the terns, with their sharper cry, dash backwards and forwards in their swallow-like flight; and from the beach is heard the trilling whistle of the Freshwater Sandpiper, or the single note of the Dunlin; the whole forming a scene which gladdens the heart of the lover of bird life. And the pleasure is increased from the knowledge that on Inch Moan the birds can rear their young in safety, as the owner preserves it strictly during the breeding season.

The following is a list of the species which have occurred in the Loch Lomond district.\*

Order *i.*, *RAPTORES.*

Fam. *FALCONIDAE.*

GOLDEN EAGLE, *Aquila chrysaetus* (Linnaeus).

Rare; but sometimes seen in the vicinity.

WHITE-TAILED EAGLE, *Haliaëtus albicilla* (Linnaeus).

Has been observed.

OSPREY, *Pandion haliaëtus* (Linnaeus).

Used to breed on Inch Galbraith,† but none have been seen for some years.

PEREGRINE FALCON, *Falco peregrinus*. Gmelin.

Not very common, but breeds in the neighbourhood.

HOBBY, *Falco subbuteo*, Linnaeus.

Once an inhabitant of the district, but never met with now. It is included in the Rev. John Stewart's list of the birds of the parish of Luss.‡

MERLIN, *Falco aesalon*. Gmelin.

Not uncommon, but more rare than the Sparrow-hawk or Kestrel.

\* The nomenclature and arrangement followed is that of Harting's "Hand-book of British Birds," London, 1872.

† "Sporting Days," by John Colquhoun, p. 105.

‡ "Statistical Account of Scotland," vol. xvii., p. 247.

KESTREL, *Falco tinnunculus*. Linnaeus.

Common; breeds on some of the islands.

SPARROW-HAWK, *Accipiter nisus* (Linnaeus).

Very common, and breeds in all the woods.

KITE, *Milvus iclinus*. Savigny.

Used to breed in Kenmore Wood, near Tarbert.\*

COMMON BUZZARD, *Buteo vulgaris*. Leach.

Not uncommon; breeds in the neighbourhood.

ROUGH-LEGGED BUZZARD, *Buteo lagopus* (Gmelin.).

Has occurred in the district.

MARSH HARRIER, *Circus aeruginosus* (Linnaeus.)

Included in Mr Stewart's list of the birds of Luss.

HEN HARRIER, *Circus cyaneus* (Linnaeus).

Rare, but has bred in the neighbourhood.

Fam. STRIGIDAE.

WHITE OWL, *Strix flammea*. Linnaeus.

Not uncommon; breeds on some of the islands.

TAWNY OWL, *Syrnium aluco* (Linnaeus).

Common. Nests early in March.

LONG-EARED OWL, *Otus vulgaris*. Fleming.

Very common in many of the woods on the loch side.

SHORT-EARED OWL, *Otus brachyotus* (Forster).

Rare.

Order ii., INSESSORES.

Fam. LANIIDAE.

GREAT GREY SHRIKE, *Lanius excubitor*. Linnaeus.

Has been obtained once or twice on the borders of the lake.

\* "Birds of the West of Scotland," by Robert Gray, 1871, p. 42.

## Fam. MUSCICAPIDAE.

SPOTTED FLY-CATCHER, *Muscicapa grisola*. Linnaeus.

A very common summer migrant. A favourite place for the nest of this species is on fruit trees on garden walls.

## Fam. CINCLIDAE.

DIPPER, *Cinclus aquaticus*. Bechstein.

Common on all the streams, where it breeds early in spring.

## Fam. TURDIDAE.

MISSELTOE THRUSH, *Turdus viscivorus*. Linnaeus.

Very common.

SONG THRUSH, *Turdus musicus*. Linnaeus.

Exceedingly plentiful throughout the district.

FIELD-FARE, *Turdus pilaris*. Linnaeus.

Common in autumn and winter.

REDWING, *Turdus iliacus*. Linnaeus.

Like the last, a winter visitant.

BLACKBIRD, *Turdus merula*. Linnaeus.

Very common.

RING OUZEL, *Turdus torquatus*. Linnaeus.

Breeds on most of the hills in the neighbourhood.

## Fam. SYLVIIDAE.

HEDGE SPARROW, *Accentor modularis* (Linnaeus).

Very common.

REDBREAST, *Erythaca rubecula* (Linnaeus).

Very common.

REDSTART, *Ruticilla phoenicurus* (Linnaeus).

A few are met with every year.

STONECHAT, *Saxicola rubicola* (Linnaeus).

Rather an uncommon species.

WHINCHAT, *Saxicola rubetra* (Linnaeus).

Like the preceding, not very common.

WHEATEAR, *Saxicola oenanthe* (Linnaeus).

Not nearly so common as in many other parts of Scotland.

GRASSHOPPER WARBLER, *Salicaria locustella* (Latham).

Has been obtained.

SEDGE WARBLER, *Salicaria phragmitis* (Bechstein).

Not uncommon.

BLACK-CAP, *Sylvia atricapilla* (Linnaeus).

Very rare.

WHITE-THROAT, *Sylvia cinerea*. Latham.

Common.

LESSER WHITE-THROAT, *Sylvia sylvicola*. Latham.

Very rare.

WOOD WREN, *Phyllopneuste sibilatrix* (Bechstein).

Common.\*

WILLOW WREN, *Phyllopneuste trochilus*.

Common.

CHIFF CHAFF, *Phyllopneuste rufa* (Latham).

Rare.

GOLDEN-CRESTED WREN, *Regulus cristatus*. Koel.

Very common.

RUBY-CROWNED WREN, *Regulus calendula* (Linnaeus):

One shot in the summer of 1852.†

\* "Scottish Naturalist," Vol. i., p. 269.

† "Birds of West of Scotland," p. 100.



## Fam. TROGLODYTIDAE.

COMMON WREN, *Troglodytes parvulus*. Koch.

Very common.

## Fam. CERTHIDAE.

TREE CREEPER, *Certhia familiaris*. Linnaeus.

Very common.

## Fam. PARIDAE.

GREAT TITMOUSE, *Parus major*. Linnaeus.

Common.

BLUE TITMOUSE, *Parus caeruleus*. Linnaeus.

Very common.

CRESTED TITMOUSE, *Parus cristatus*. Linnaeus.

Has been obtained near Dumbarton.\*

COAL TITMOUSE, *Parus ater*. Linnaeus.

Very abundant.

MARSH TITMOUSE, *Parus palustris*. Linnaeus.

Rare, but occasionally met with.

LONG-TAILED TITMOUSE, *Acredula rosca* (Blyth).

Not uncommon.

## Fam. AMPELIDAE.

WAXWING, *Ampelis garrulus*. Linnaeus.

Has been obtained.

## Fam. MOTACILLIDAE.

PIED-WAGTAIL, *Motacilla yarrelli*. Gould.

Common.

GREY WAGTAIL, *Motacilla boarula*. Latham.

Common.

\* "Birds of West of Scotland," p. 104.

RAY'S WAGTAIL, *Motacilla rayi*. Bonaparte.

Rare.

Fam. ANTHIDAE.

TREE PIPIT, *Anthus arboreus*. Bechstein.

Not common.

MEADOW PIPIT, *Anthus pratensis* (Linnaeus).

Exceedingly numerous.

ROCK PIPIT, *Anthus obscurus* (Latham).

Not often met with near the Loch.

Fam. ALAUDIDAE.

SKY LARK, *Alauda arvensis*. Linnaeus.

Common.

Fam. EMBERIZIDAE.

SNOW BUNTING, *Emberiza nivalis*. Linnaeus.

A winter visitant. Some years more common than in others.

COMMON BUNTING, *Emberiza miliaria*. Linnaeus.

Not common.

REED BUNTING, *Emberiza schoeniclus*. Linnaeus.

Not uncommon.

YELLOW BUNTING, *Emberiza citrinella*. Linnaeus.

Very common.

Fam. FRINGILLIDAE.

CHAFFINCH, *Fringilla coelebs*. Linnaeus.

Very common. Gathering in large flocks in winter.

BRAMBLING, *Fringilla montifringilla*. Linnaeus.

Sometimes met with in winter.

GOLDFINCH, *Fringilla carduelis*. Linnaeus.

A winter visitant. Not common.

SISKIN, *Fringilla spinus*. Linnaeus.

Rare.

LINNET, *Linota cannabina* (Linnaeus).

Less common than in many parts of Scotland.

TWITE, *Linota flavirostris* (Linnaeus).

Not common.

LESSER RED POLE, *Linota rufescens* (Vieillot).

Uncommon.

HOUSE SPARROW, *Passer domesticus*. Linnaeus.

Common.

GREENFINCH, *Coccothraustes chloris*. (Linnaeus).

Common.

BULLFINCH, *Pyrrhula vulgaris*. Temminck.

Not uncommon.

Fam. LOXIIDAE.

CROSSBILL, *Loxia curvirostra*. Linnaeus.

Very rare.

Fam. STURNIDAE.

STARLING, *Sturnus vulgaris*. Linnaeus.

Very common, and increasing every year.

Fam. CORVIDAE.

Obs. CHOUGH, *Pyrrhocorax graculus* (Linnaeus).

Has been obtained near Bowling.

RAVEN, *Corvus corax*. Linnaeus.

Always a few pairs going about the hills.

CARRION CROW, *Corvus corone*. Linnaeus.

Common.

HOODED CROW, *Corvus cornix*. Linnaeus.

Common. This species is often found breeding with the preceding. Sometimes the male is a Hooded Crow and the female a Carrion Crow, and as often the reverse is the case.

ROOK, *Corvus frugilegus*. Linnaeus.

Very common. There are several Rookeries in the district.

JACKDAW, *Corvus monedula*. Linnaeus.

Common.

MAGPIE, *Pica caudata*. Fleming.

Not nearly so common as it used to be.

JAY, *Garrulus glandarius* (Linnaeus).

More common than the Magpie, but like it being much reduced in numbers every year.

## Fam. PICIDAE.

GREATER SPOTTED WOODPECKER, *Picus major*. Linnaeus.

One shot at Arden, November, 1871.\*

## Fam. CUCULIDAE.

CUCKOO, *Cuculus canorus*. Linnaeus.

A well known bird in the district.

## Fam. ALCEDINIDAE.

KING-FISHER, *Alcedo ispida*. Linnaeus.

Not very common.

## Fam. HIRUNDINIDAE.

SWALLOW, *Hirundo rustica*. Linnaeus.

Common; arriving about the 15th of April.

MARTIN, *Hirundo urbica*. Linnaeus.

Common; comes about the same time as the swallow.

\* Proc. Nat. Hist. Soc. Glasgow, vol. ii., p. 176.

SAND MARTIN, *Hirundo riparia*. Linnaeus.

Less common than the last.

Fam. CYPSELIDAE.

SWIFT, *Cypselus apus* (Linnaeus).

Some years much more common than in others.

Fam. CAPRIMULGIDAE.

NIGHT-JAR, *Caprimulgus europaeus*. Linnaeus.

Not very common, but breeds on the hills. I have seen a nest with the bird sitting as late as 14th August.

Order iii., RASORES.

Fam. COLUMBIDAE.

RING-DOVE, *Columba palumbus*. Linnaeus.

Very numerous.

TURTLE-DOVE, *Turtur auritus*. Gray.

Has been met with in the district.

Fam. PHASIANIDAE.

PHEASANT, *Phasianus colchicus*. Linnaeus.

Very common. Large numbers are reared and turned out every year.

Fam. TETRAONIDAE.

CAPERCAILLIE, *Tetrao urogallus*. (Linnaeus).

Has been once or twice shot in the district.

BLACK GROUSE, *Tetrao tetrix*. Linnaeus.

Common.

RED GROUSE, *Tetrao scoticus*. Latham.

Very common.

PTARMIGAN, *Tetrao lagopus*. Linnaeus.

A few breed on the higher hills.

PARTRIDGE, *Perdix cinerea*. Latham.

Common.

Order iv., GRALLATORES.

Fam. CHARADRIIDAE.

GOLDEN PLOVER, *Charadrius phivialis*. Linnaeus.

Not very common.

LAPWING, *Vanellus cristatus*. Meyer.

Very abundant.

DOTTEREL, *Eudromias morinellus*. (Linnaeus).

This species is included in Mr Stewart's list of the birds of the parish of Luss.

RINGED PLOVER, *Aegialitis hiaticula* (Linnaeus).

Common; breeds on the shores of the loch.

TURNSTONE, *Streptopus interpres*. Linnaeus.

Very rare.

OYSTER-CATCHER, *Haematopus ostralegus* (Linnaeus).

Not very common.

Fam. SCOLOPACIDAE.

GREENSHANK, *Totanus glottis* (Pallas).

Has been obtained, but very seldom.

COMMON REDSHANK, *Totanus calidris* (Linnaeus).

A well known species.

WOOD SANDPIPER, *Totanus glareola* (Linnaeus).

One shot at Ross, by Sir George H. Leith, on 8th August, 1872.\*

COMMON SANDPIPER, *Tringoides hypoleucus* (Linnaeus).

Common on the shores of the loch and on the rivers.

DUNLIN, *Tringa alpina*. Linnaeus.

Common; breeds on the shores and islands.

\* Proc. Nat. Hist. Soc. Glasgow, vol. ii., p. 193.

LITTLE STINT, *Tringa minuta*. Leisler.

One shot in September, 1873, by Sir George H. Leith.

SANDERLING, *Calidris arenaria* (Linnaeus).

Rare.

WOODCOCK, *Scolopax rusticola*. Linnaeus.

Common. A few pairs breed every year.

COMMON SNIPE, *Gallinago media*. Leach.

Common, and breeds in the neighbourhood.

JACK SNIPE, *Gallinago gallinula* (Linnaeus).

Not uncommon.

BLACK-TAILED GODWIT, *Limosa aegocephala* (Linnaeus).

Once obtained by Sir George H. Leith, May, 1851.

CURLEW, *Numenius arquatus*. (Linnaeus).

Very common.

Fam. ARDEIDAE.

COMMON HERON, *Ardea cinerea*. Linnaeus.

Common.

COMMON BITTERN, *Botaurus stellaris* (Linnaeus).

Has not been met with for many years.

Fam. RALLIDAE.

WATER RAIL, *Rallus aquaticus*. Linnaeus.

Rare.

LAND RAIL, *Crex pratensis*. Bechstein.

A well known species.

SPOTTED CRAKE, *Crex porzana* (Linnaeus).

Has been obtained once or twice by Sir George H. Leith.

MOOR HEN, *Gallinula chloropus* (Linnaeus).

Very common all round the loch.

COOT, *Fulica atra*. Linnaeus.

Not uncommon in winter.

Order v., NATATORES.

Fam. ANATIDAE.

WILD SWAN, *Cygnus musicus*. Bechstein.

Rare; but sometimes met with in winter.

BEWICK'S SWAN, *Cygnus minor*. Keys and Blasius.

Like the last, rare.

GREY LAG GOOSE, *Anser ferus* (Gmelin.).

Very rare.

BEAN GOOSE, *Anser segetum* (Gmelin.).

Not common.

PINK-FOOTED GOOSE, *Anser brachyrhynchus*. Baillon.

Has been shot on the Loch. (?)

BERNICLE GOOSE, *Anser leucopsis*. Bechstein.

Rare.

BRENT GOOSE, *Anser bernicla* (Linnaeus).

Has been obtained.

CANADA GOOSE, *Anser canadensis* (Linnaeus).

Mr R. Gray, in his list of Loch Lomond birds, states that "a single specimen was shot on Loch Lomond some years ago, and is now in the College Museum, Glasgow."

EGYPTIAN GOOSE, *Anser aegyptiacus* (Linnaeus).

A flock of five were observed on the Loch in 1861, three of which were shot.\*

\* "Birds of the West of Scotland," p. 353.

WILD DUCK, *Anas boschas*. Linnaeus.

Very common.

SHOVELLER, *Anas clypeata*. Linnaeus.

Has once or twice been shot on the Loch, and has bred.\*

PINTAIL, *Anas acuta*. Linnaeus.

Once obtained.

WIGEON, *Anas penelope*. Linnaeus.

A common winter visitant.

TEAL, *Querquedula crecca* (Linnaeus).

Common, and breeds on some of the islands.

POCHARD, *Fuligula ferina* (Linnaeus).

Not uncommon in winter.

SCAUP, *Fuligula marila* (Linnaeus).

Not common.

TUFTED DUCK, *Fuligula cristata* (Leach).

A few pairs on the Loch every winter.

GOLDEN EYE, *Clangula glaucion* (Linnaeus).

Very common in winter, but the proportion of old males observed is small.

LONG-TAILED DUCK, *Harelda glacialis* (Linnaeus).

A female was shot by Sir George H. Leith, some years ago.

SMEW, *Mergus albellus*. Linnaeus.

Has once or twice been shot on the loch.

RED-BREADED MERGANSER, *Mergus serrator*. Linnaeus.

Not uncommon; breeds in the district.

GOOSANDER, *Mergus merganser*. Linnaeus.

Included in Mr R. Gray's list of the birds of Loch Lomond.

\* "Zoologist," 1852. Vol. x., p. 3503.

## Fam. COLYMBIDAE.

GREAT NORTHERN DIVER, *Colymbus glacialis*. Linnaeus.

Included in Mr Stewart's list of the birds of the parish of Luss.

BLACK-THROATED DIVER, *Colymbus arcticus*. Linnaeus.

Has been obtained on the loch both in summer and winter plumage.

RED-THROATED DIVER, *Colymbus septentrionalis*. Linnaeus.

Very rare.

## Fam. PODICIPIDAE.

GREAT-CRESTED GREBE, *Podiceps cristatus* (Linnaeus).

Included in Mr Stewart's list of the birds of the parish of Luss.

SCLAVONIAN GREBE, *Podiceps cornutus* (Gmelin.).

Has been shot on the loch.

LITTLE GREBE, *Podiceps minor* (Gmelin.).

Not uncommon.

## Fam. ALCIDAE.

PUFFIN, *Fratercula artica* (Linnaeus).

In Mr Stewart's list.

RAZOR-BILL, *Alca torda*. Linnaeus.

Has been obtained.

## Fam. PELECANIDAE.

CORMORANT, *Graculus carbo* (Linnaeus).

Not uncommon; sometimes breeds in the district.

## Fam. LARIDAE.

COMMON TERN, *Sterna fluviatilis*. Naumann.

Very common.

ARTIC TERN, *Sterna hirundo*. Linnaeus.

Common.



ROSEATE TERN, *Sterna dougallii*. Montague.

Once bred on Inch Moan, but has not been identified there for several years.

SANDWICH TERN, *Sterna cantiaca*. Gmelin.

Has been shot on the loch.

LESSER TERN, *Sterna minuta*. Linnaeus.

Rare.

BLACK TERN, *Sterna fessipes*. Linnaeus.

Observed on Loch Lomond by Mr R. Gray.\*

LITTLE GULL, *Larus minutus*. Pallas.

This bird has also been observed by Mr R. Gray on Loch Lomond. †

BLACK HEADED GULL, *Larus ridibundus*. Linnaeus.

Very common.

KITTIWAKE, *Larus tridactylus*. Linnaeus.

Very rare.

BONAPARTE'S GULL, *Larus philadelphia*. Ord.

One shot on Loch Lomond by Sir Geo. H. Leith. April, 1850. ‡

COMMON GULL, *Larus canus*. Linnaeus.

Rare.

HERRING GULL, *Larus argentatus*. Gmelin.

Not very common.

GLAUCOUS GULL, *Larus glaucus*. Gmelin.

Has once been obtained. ||

\* "Birds of the West of Scotland," p. 472. † *Ibid.*, p. 474.

‡ "Zoologist," 1851, p. 3117, and 1867, p. 966.

|| "History of British Birds," by F. O. Morris, 2d ed., vol. vi., p. 164.

GREATER BLACK-BACKED GULL, *Larus marinus*. Linnaeus.  
Not uncommon.

LESSER BLACK-BACKED GULL, *Larus fuscus*. Linnaeus.  
An abundant species.

In the foregoing list are included 168 species; but of those several must be struck off if we confine ourselves to a list of the birds which may *now* be met with. Many species which were at one time common are now never seen, and are quite unknown in the district.

Hawks of nearly all kinds are on the decrease. The Osprey, Hobby, and Kite we can scarcely again expect to see on the banks of Loch Lomond. On the other hand, some of the smaller birds are increasing in numbers as plantations get up. Blackbirds and Thrushes are decidedly more common than they were at one time, and all the species of warblers are gaining ground.

The above notes have been put together only as an outline of what I hope may some day be made a more complete paper. Local lists are always of interest; especially from such places as the present, which, from its position, includes both highland and lowland species, and although an inland district, has its full complement of sea birds and wild fowl.

### III.—*On the Honey Bee.* By Mr R. J. BENNETT.

It is well known that throughout Britain thousands of stocks of Honey Bees perish every winter from starvation, or if they survive the early months, it is only to succumb during March or April. To the natural question as to the reason of this, the answer is simply that our bee-keepers lack knowledge, and there can be no success where there is not a proper understanding of the natural history and habits of the Bees, and a knowledge of the unmistakable laws by which they are governed.

I propose, then, to ask your attention, while, with the specimens before you, I try to explain the best method of cultivating and protecting this useful and industrious insect.

It is a singular fact that the best forms of government exist among the lower orders of the animal creation. Amongst the

latter, Ants and Bees have been long notable; Solomon points the sluggard to the Ant, while John the Baptist fed upon the excellent produce of the Bee. The many lessons Bees teach us in their mode of attack and defence, in their government, order, sanitary arrangements and economy, are in themselves a perfect school of instruction. I need not take up your time in describing the different modes of cultivation now in use, because there is but one opinion amongst advanced bee-keepers as to the proper way, which is by means of the bar-frame hive. The Lanarkshire one now before you may be compared to a large city and its workings, where every thing is carried on separately, yet combined; where one part may be withdrawn and yet not affect its neighbour; where each member works for his own good and for that of the community; and where the treasures are stored within the walls. With the aid of the "dividing board," this hive may be enlarged or decreased to suit the change of seasons. There can be no doubt the bee-hive was first invented by "Blind Huber," who was the first inventor of moveable combs; but to Dr Dzierzon of Germany, and the Rev. H. Langstroth of America, the present generation of bee-keepers should be, and I trust are, truly thankful, as through their invention we now have complete command over the Bees and comb in every part of the hive. Thus bee-keeping has been reduced to a sure, pleasant, and profitable business, and with the aid of a hive such as the one now before us, Bees, comb, and honey may be transferred from one hive to another in a few minutes. Worms may be readily destroyed before they make havoc of a weak stock, and weak stocks may at once be strengthened by giving them a bar of brood from a strong hive. Useless drone comb may be cut out, and the bee-master may satisfy himself that there is enough of worker comb at all times in the hive, as it sometimes happens that there is too much honey in the brood nest, and that the queen has no place to deposit her eggs, to the great injury of the hive. Bees in a state of nature usually build in a serpentine form, using small pillar-like attachments to connect the sides of the combs, and which serve the double purpose of steadying them and acting as suspension bridges by which the Bees may easily travel from one comb to another. But the bee-keeper who uses straw hives has none of these advantages, and has no means of easily

rectifying an evil, even if he discovers it. "Guide combs," as artificially prepared plates of wax are called, infallibly ensure straight comb. They may be fastened to the bars with sprigs, or by waxing the under side of the bar while hot, and pressing them together until united.

When we consider the enormous amount of honey required to produce one pound of wax, say fifteen to twenty pounds, one ounce of comb holding over one pound of honey, it shows the necessity of the bee-master saving such a valuable commodity. Wax is secreted on the underside of the Bee, and oozes out in scales, but both the weather and the warmth of the hive have a great influence in the building of combs.

The queen, or mother Bee, is the only perfect female, and her sole business or occupation seems to be to lay eggs, and this in the height of summer is often carried on to such an extent, that she produces from 2500 to 3000 eggs per day. During all this time her faithful attendants follow and feed her. She can also, when laying, deposit an egg alternately in a worker cell, or in a drone cell, and this probably has given rise to the theory which some apiarians have advanced, that the queen's body in passing into the worker's cell is slightly compressed, and causes the egg of a worker in passing from the ovary to touch the spermatheca sac, and thus become a worker or undeveloped female. A queen, when hatched, is generally of a whitish colour, and somewhat weakly looking. Her first action is to stretch herself, and get rid of any encumbrance about her wings or body. This done, she immediately begins to eat honey, which she devours greedily. In a hive that is preparing to swarm, the queens are not allowed to leave their cells for perhaps twenty-four hours, and they have been known to be detained as long as eight days; the Bees all this time feeding them through an opening under the seal of the cell, so that although kept prisoners they are treated as royal blood. Huber discovered the bitter animosity of the queens towards each other. He observed the first hatched queen emerge from her cell, traverse the comb until she found a royal cell, then tear it open in apparent fury, and sting the helpless pupa to death. This she repeats until she has destroyed every possible rival. If, however, two queens emerge simultaneously, the worker Bees clear a space and stand back to watch the inevitable conflict which must end fatally to one or

other. Should they during the fight happen to find themselves in such a position that by closing each would kill the other, they withdraw and begin the combat afresh. Should either secure such an advantage of position that she can sting without being stung, the fatal thrust is immediately given.

The queen is easily recognised among the other Bees by her shape and movements. Her body is more wasp-like than that of the common Bee, and her back of a much brighter colour. Her legs are longer, and she seldom uses her sting except when fighting with a rival.

Impregnation takes place on the wing, and as in the case of many other insects, one occasion lasts for life. Queens may live three to four years.

The drone is the male Bee, whose sole end seems to be to fertilize the virgin queens, and keep up the temperature of the hive. They are larger and more bulky than either queen or worker Bees, but having no sting to defend themselves, they fall an easy prey to the workers when the swarming season is over.

The worker, or undeveloped female, is the smallest Bee, and is by far the most industrious member of the hive, as its name implies. Nothing in the entire range of the history of Bees excites so much astonishment as the power which they possess of replacing the loss of their queen, in other words, of being able to develop a worker egg into a queen, by placing it in a suitable cell, and feeding it with royal jelly. How this comes about has puzzled the apiarian in all times, but the bee-keeper can easily verify the fact by removing the queen in midsummer. So soon as the Bees discover their loss they are in a state of great excitement for twenty-four hours, after which they select one of the worker eggs, make a queen cell, feed it with royal jelly, and raise a fully developed female in sixteen days. The workers may be divided into nurses, builders, wax secretors, honey gatherers, scavengers, sentinels, but it would fill a volume were I to enter into their various duties. The tear and wear of body to which they are exposed accounts for the very short life the worker Bees enjoy—from three to, at most, about nine months.

A Honey Bee filled with honey will not sting of its own accord, and herein lies the art of taming. When frightened, Bees generally eat honey, so that the operator by blowing a little

smoke into the hive, and waiting a minute or so till the Bees are filled, may do almost anything he pleases with them.

Honey is not really made by Bees, but simply gathered from flowers; thus almost any one can tell by its taste and appearance from what class of plants the honey has come. Bees also obtain large quantities of honey from what is known as "honey dew," which is often found in abundance on the leaves of the lime, the oak, the plane, the hazel, and the bramble.

Of course the test of a successful bee-keeper is his honey harvest, and truly in Ayrshire we have the men who can induce Bees to build their combs so beautifully straight, so symmetrical, so even on both sides, and so perfectly finished, that one could believe they were cast in a mould to pattern. These bee-keepers took their immense harvest over 400 miles of railway, without breaking a single comb, to the Crystal Palace Show in September, 1874, which was the finest display ever exhibited in Britain; and again to the City Hall, Glasgow, in September, 1875, under the auspices of the Caledonian Apiarian Society. This Society is making strenuous endeavours to waken up the people to the vast stores of honey that are every year wasted on our heather hills and in our clover fields.

[During the meeting of the British Association, it placed in the Kibble Crystal Palace an "Observatory Hive," where every visitor had an opportunity of seeing the interior economy of a hive and its inhabitants. Sept., 1876.]

Mr Bennett placed on the table, in illustration of his remarks, a series of specimens of honey, combs, wax, etc., with an example of the Lanarkshire bar-frame hive and its various appliances.

IV.—*Notes on the state of Vegetation in the Public Parks in January, 1876, as compared with the corresponding month in previous years.*  
By Mr DUNCAN M'LELLAN, Superintendent of Parks.

In the course of his remarks, Mr M'Lellan enumerated seventeen species and nine varieties of plants, which were seen in flower during the month in the Queen's Park, while in Kelvingrove, where the situation is damper and the park much shaded by large trees, only a few of those named were in flower, and that towards the middle and end of the month, and at the beginning of the year not a blossom could be seen. In the Alexandra Park, which

is in a more open situation, a larger proportion was observed than was noticed at Kelvingrove, but in the Green the daisy was the only plant in flower, and the specimens were very few in number. The spring of 1874 was a very early one, and the number of plants in flower in January of that year was 42 species, while in the same month of 1875 the number observed was only 5. The mean temperature of January, 1875, was—maximum, 44; minimum, 35; while this year the thermometer showed a lower range—the maximum, 42, and the minimum, 30. This statement may seem to be at variance with the reported progress of vegetation; but the December of 1874 was rigorous, with cold, dry, east winds, and although last December there were several days of severe frost, yet the covering of snow prevented plants from suffering to any extent. Vegetation is therefore much in advance of what it was last year, and should there be no return of frost, a moderately early spring may be expected. The subjoined table shows the rainfall and mean temperature of each month of 1875:—

1875.	Rainfall.	Max.	Temperature.		Dry.
			Min.	Wet.	
January, - - - -	5·60	44	35	45	47
February, - - - -	1·42	41	32	43	45
March, - - - -	1·75	46	35	40	45
April, - - - -	1·28	55	36	47	49
May, - - - -	1·57	61	44	53	56
June, - - - -	2·54	62	45	54	57
July, - - - -	1·40	70	48	59	61
August, - - - -	2·62	67	51	59	61
September, - - - -	4·08	62	47	57	59
October, - - - -	6·19	51	41	50	52
November, - - - -	3·83	44	33	45	47
December, - - - -	3·37	42	29	44	45

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MARCH 28TH, 1876.

Mr Thomas Chapman, Vice-President, in the chair.

Messrs James Bruce, Thomas Barclay, and Daniel M. Nelson, were elected ordinary members.

Before the ordinary business of the evening was entered on, Mr J. B. Murdoch said that the death had occurred, since last meeting, of Dr Donald Dewar, one of the earliest members of the Society.

He had arranged to be present this evening to exhibit a number of specimens which he had lately acquired, but died suddenly on Saturday, 18th inst. Dr Dewar was enrolled as a member in 1853, and shortly afterwards proceeded with the British army to the Crimea; while passing through Turkey he transmitted to the Society his observations on the birds of that country, his attention being particularly directed to the eagles, a family in which he took a special interest. He was always ready to aid in promoting the interest of the meetings by the exhibition of specimens from his own collection, or by observations on those brought forward by others, and from his extensive knowledge of natural history, especially of ornithology, his remarks were always greatly appreciated. He had been so long identified with the Society, and had become so much esteemed by the members for his genial and cheerful bearing, and the willingness he always showed to be of service to others engaged in similar pursuits, that the blank occasioned by his death will not be readily filled up. The meeting cordially sympathised with the sentiments expressed by Mr Murdoch, and resolved to record the deep regret of the Society for the loss of such an esteemed member, and of sincere sympathy with the bereaved relatives. The Secretary was instructed to furnish an extract from the minutes to Mrs Dewar.

#### SPECIMENS EXHIBITED.

Mr James Coutts exhibited a collection of ferns, and several large pods from a plant belonging to the natural order Leguminosae, which had been brought from Western Africa by Mr George Thomson, a corresponding member of the Society. One of the pods had a singular and curiously twisted appearance, seeming to belong to the genus *Pithecolobium*, the species uncertain, but probably *lobatum*; it is not known to be put to any use. Another specimen, about three feet long, appeared to belong to *Entada*, a genus which is remarkable for the great length of its pods, one species, *E. scandens*, having them of the length of six to eight feet. Its large seeds are sometimes carried by the winds and waves from the West Indies to the shores of the Outer Hebrides, and the natives of the countries where they grow convert them into snuff-boxes, scent bottles, and spoons; in the Indian bazaars they are used for weights, and in London they are offered for sale in the streets as Indian filberts, though they are not eatable.

Mr Coutts also exhibited several objects of interest from Old Calabar, amongst which were a number of articles formed of the rinds of gourds, and used by the natives for various domestic purposes. They were of different sizes, some being two feet in diameter, and were beautifully ornamented on the outer surface with various devices, burnt into the woody fibre with heated tools.

There were also shown by Mr Coutts specimens of the nest of the weaver bird, the construction of which displays remarkable ingenuity. They are about a yard in length, and are composed of dried grass, very similar to Esparto. In appearance they resemble fine basket work, and in shape are not unlike a large glass retort. The bulbous, closed end is suspended to the under side of the leaf of the palm tree, while the narrow open end hangs downwards. The object of this contrivance is to guard against the depredations of serpents, which are great plunderers of nests for the sake of the eggs. The position of this nest removes it out of the probable reach of the reptiles, but even should they succeed in getting to it, they contract the opening so much by winding round the nest, that it is not possible for them to get into the interior.

Mr John Young, F.G.S., exhibited some Carboniferous fossils from the limestone shale at Gillfoot, Carlisle, Lanarkshire. He stated that the specimens had been sent to him by Dr Rankin, Carlisle, who had examined the bed of shale very carefully, and had obtained from it nearly 150 species of various marine organisms, several of which were new to science. Two of those which he exhibited belong to the genus *Fenestella*, being, apparently, undescribed species. One of them has the interstices strongly carinated, and tuberculated on both faces of the frond of the polyzoon. These tubercles are seen in the best preserved specimens, which show the poriferous face of the frond to be the bases of short spines that are often broken off in the matrix in which the organism lies. When found in this condition these spines present the deceptive appearance of perforated tubercles, which, however, is not their true character. The other species of *Fenestella* exhibited is found in fronds of about one inch in diameter. It is characterised by the numerous and strongly tuberculated nature of its non-poriferous face. The tubercles occur in an irregular, alternating double row, and, like those noticed in the former species, present, when broken or worn, the

deceptive appearance of being perforated. These two species of *Fenestella*, along with some others, Mr Young hoped would be figured and more fully described by Dr Young and himself in the next part of the Society's Proceedings.

Mr Young also stated that on the fronds of the various species of *Fenestella* from the Gillfoot shales numerous polyzoan processes—the so-called *Palaeocoryne* of Messrs Duncan & Jenkins—are to be found. These authors say that *Palaeocoryne* “sat upon, covered, and destroyed numerous cells of the polyzoan,” but after a careful examination of his specimens, he was prepared to show that this statement of Messrs Duncan & Jenkins is incorrect. These polyzoan processes are found to proceed as often from the non-poriferous as from the poriferous face of the *Fenestella*. This being the case, it must be self-evident that the processes which proceed from the non-poriferous face, could not sit upon or cover any of the cell openings, and he found, as a rule, that they in no way interfered with the regular arrangement of the pores on the other side of the frond. When the processes proceed from the poriferous face, well-preserved specimens in his collection also show that the cell openings are not closed up nor interfered with; the series of pores being continued as usual alongside of the processes. Such being the case, and the above remarks applying only to those processes that proceed at right angles from the faces of the fronds, and not to the marginal processes, there is no evidence, as seen in the best preserved specimens, for the assertion that the so-called *Palaeocoryne* was an organism independently attached to the fronds of *Fenestella*.

Mr D. C. Glen, F.G.S., exhibited a weathered specimen of a Silurian coral, from Lake Huron, Canada, belonging to the genus *Favosites*, showing in a very clear manner the tabulate structure of the coral. Mr Glen stated that most of the corals from the above region are filled to a certain extent with silica, which has penetrated the structure, thus enabling the coral, while weathering, to resist the action of the atmosphere more thoroughly than when it is composed of calcite.

Mr James Lumsden, F.Z.S., exhibited an example of malformation in the bill of the Rook, *Corvus frugilegus*, and remarked that in this specimen the lower mandible was imperfect at the point, and the upper one had grown down in such a way that it projected more than an inch beyond the other. It was also worthy of

notice that the feathers at the base of the upper mandible showed no marks of the abrasion usual in the Rook, while those at the base of the lower mandible were partly destroyed, although not to the same extent as is found in specimens where the bill is properly developed.

Mr Peter Cameron stated that he had found, in a gall of *Nematus viminialis*, a very young larva of *Pimpla graminellae*, without there being any trace of the saw-fly larva. The young *Pimpla* larva continued to grow, and arrived at maturity by feeding on the juices of the gall, this being a deviation from the usual habits of the Ichneumons, which are, as a rule, animal feeders. Mr Cameron's observations confirmed those of Dr Giraud, who discovered the larvae of *Pimpla graminellae* feeding in a gall on *Triticum repens*.

PAPER READ.

*On some points in the Natural History of the Cynipidae.*

By Mr PETER CAMERON.

The paper was illustrated by specimens of the insects, their galls, and parasites, and by a series of enlarged drawings, and will appear *in extenso* in a future part of the Proceedings.

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APRIL 25TH, 1876.

Mr Thomas Chapman, Vice-President, in the Chair.

Messrs Alexander Macdonald, and J. H. Gurney, jun., were elected ordinary members.

Mr David Robertson, F.L.S., F.G.S., exhibited specimens of entomostraca and foraminifera, taken from mud brought up on the fluke of an anchor, in the Bay of Yokohama, Japan, and which he had received from Mr John Kirsop. A number of the species of ostracoda are new to science, and are of importance as affording confirmation to other inquiries of the day. It is of considerable interest to find along with these specimens a valve of *Tellina calcaria* (Chemnitz), a highly northern species, and one of the test Arctic shells of our Scottish glacial clays, but which is not now living in our seas. According to Jeffreys it still survives on the Danish coast of the Baltic, northward of Spitzbergen, and in

America from Behring's Straits to Massachusetts, as well as on the shores of Asia.

The climate of Japan seems to be extremely various, being intensely cold in the north, and in the south as warm as the highest temperature of France, while it is milder than its latitude would indicate, owing chiefly to the influence of the surrounding ocean. In the south the thermometer ranges between 29 deg. and 104 deg. Fahrenheit, 80 deg. being the average in summer, and 35 deg. in the coldest months of winter. Yokohama is about latitude 35°, and at 36° the lakes are covered with ice, which at 38° to 40° becomes thick enough to allow of rivers being crossed upon it. It would appear, therefore, that at Yokohama the cold does not reach that of Scotland, or at least does not exceed it, and yet this mollusc lives and thrives, if we may judge by the portly dimensions of its shell, in a temperature higher than that which is supposed to have driven it away from the shores of the British isles.

Mr Robertson mentioned, for the benefit of any of the members who might be mounting marine algae for the microscope, that there appears to be less need for being troubled about the preparation of preservative fluids than has generally been thought necessary. He showed a slide which had been mounted for nineteen years and one month, in nothing more than sea water, and which was still in a fine state of preservation; the colour was in a great measure gone, but the structure was clear and distinct. Few of those mounted with glycerine and distilled water (a preparation highly recommended at the time they were prepared) are so well preserved, either in colour or structure. Another mounted in sea water, glycerine, and spirit, was also in good condition, but the latter interferes with the adhesion of the cement of the cover, unless used very sparingly. Another mounted in sea water and spirits had the colour perfectly preserved, but this might be accounted for in a great measure by the more robust character of the plant.

Dr Francis P. Flemyng, F.R.G.S., exhibited a specimen of a species of cuttle-fish, *Sepia octopodia*, which had been captured at Dunoon in November last. He had managed to get it confined in a pool from which it could not escape, and had an opportunity of observing its movements, and the manner in which it seizes hold of anything coming within reach of its arms, holding it firmly

by the cups or suckers with which they are furnished. He showed drawings of this species, and of the Calamary, *Soligo vulgaris*, and pointed out the differences that exist in their structure. He had kept the specimen alive for some hours, during which it showed no signs of alarm, but when he was about to transfer it to his tank, it emptied its ink bag, completely saturating with the black fluid the handkerchief in which he had placed it, and died shortly afterwards. Dr Flemyng presented the specimen to the Hunterian Museum.

PAPERS READ.

I.—*On the occurrence in Islay of the Iceland Falcon, Falco islandicus.*  
By Mr JAMES LUMSDEN, F.Z.S.

This species is rare in any part of this country, only three specimens being recorded by Mr Harting in his "Handbook of British Birds," as having been got in England, while not many more than that number have been found in Scotland. This is, however, the second specimen that has been taken in Islay. The older writers included both the Iceland and Greenland Falcon under the common name of Gyr Falcon, but of late years three distinct species have been recognised, and we have now the Greenland Falcon, *Falco candicans* (Gmelin.); the Iceland Falcon, *F. islandicus* (Gmelin.); and the Jer Falcon, *F. gyrfalco* (Linnaeus). The latter, however, is not known in this country, being a native of Northern Scandinavia and Russia, Northern Asia, and Arctic America. Further particulars regarding these interesting species will be found in the new edition of "Yarrell's History of British Birds," edited by Prof. A. Newton of Cambridge.

II.—*On the Hymenoptera of Kingussie.* By Mr PETER CAMERON.

During last June I spent ten days at the pleasant village of Kingussie, and I propose to give some account of the Hymenoptera obtained there, as a further contribution to the Hymenoptera of the North of Scotland (*cf.* Proc. Nat. Hist. Soc. Glas. ii. 290–294). The country around Kingussie is very beautiful; its physical features are very varied, and its vegetation is equally so. These two conditions being present, it need hardly be said that as a hunting ground for insects no better could be had. I collected principally in the vicinity of the village in the evenings, the day time having been devoted to

more distant excursions—to Glen Tromie, where the principal tree is alder, and which is being rapidly cut down to be converted into clog soles; to Glen Feshie, where the Scotch pine is in fine condition; to the Grampians; to Avie More, where there are interminable fir woods—but somehow or other these more distant excursions generally were failures, so far as captures of insects were concerned, for the weather was usually wet or otherwise unfavourable for insect capture, so that most of the species mentioned here were taken within a mile or two of the village. It is probably owing to the area being thus restricted that the list—at any rate of Tenthredinidae, is less than that given last year for Western Inverness-shire; but Kingussie, on the other hand, yielded more parasitic Hymenoptera, or possibly I paid more attention to these at Kingussie than in the other places.

On comparing the list given here with that of Western Inverness-shire, there will be noticed a considerable resemblance between the two, nor is there much difference between it and that of Rannoch, nor even from that of Clydesdale; indeed, the variations are so slight, as to suggest that the species of Tenthredinidae are very generally distributed, that the local species are very few, or that the local and rare species have yet to be discovered. The latter is a very likely supposition, considering how very ephemeral saw-flies are in their lives as imagines, for in the perfect state they live only a few days, and there being few double-brooded species in Scotland, the difficulty of thoroughly investigating a district is much increased.

In a future paper I intend to treat of the parasitic Hymenoptera of Kingussie and Western Inverness-shire, so I need not say anything regarding them here.

#### Tenthredinidae.

*Cimbex sylvarum* rare on birch; *Trichiosoma lucorum* very common on birch. It is remarked by Landois, in his very interesting work on “Die Ton- und Stimmapparate der Insecten,” that he has never heard saw-flies producing any sound. If he had ever watched the males of the species just mentioned, on a warm sunny day in June, he would have had ample evidence that some “Blattwespen” at least can produce a very decided humming noise. I have often watched them in the sunshine flying in short

circles around the tops of birches, making as they did so a loud buzzing noise somewhat like the humming of a humble bee. They do not fly far, but generally, as has just been remarked, in short circles, there being usually several individuals together, and after flying for a short time they return to the tree top from whence they started. The males are rather pugnacious with each other, (any one who has ever collected these insects need scarcely be told that they can use their powerful mandibles to some purpose should they be able to get hold of the hand of the collector). I was once a witness of a battle between two males which lasted for nearly ten minutes, or perhaps longer, for they flew away, and may have continued the fight after I lost sight of them. Their manner of fighting was simply to fly at each other in the air, a concussion of the two bodies being the result; and they must have come together with some force, for the sound made thereby could be distinctly heard. I could not observe whether they tried to use the mandibles or not, but Westwood mentions having caught two males with their mandibles interlocked. As a general rule, however, they are very sluggish insects. *T. vitellinae* rare on willows; *Abia nitens* common; *Hylotoma ustulata* abundant in birch woods; *Cladius viminalis* common on aspen; *C. padi* common; *Hemichroa rufa* probably common; this species feeds on alder as well as birch. *Camponiscus luridiventris* very common; *Dineura degeeri* very common; *D. testaceipes* not rare; *Croceus septentrionalis* and *C. varus* rare; *N. fulvipes*, Fall., rare; *N. rumicis*, Fall., in a mossy place near Loch Gynach; *N. appendiculatus* not uncommon; *N. quercus*, Htg., one specimen below Craig Dhu; the larva, which is red, with black dorsal marks, feeds on the blaeberry. *N. obductus*, H., and *N. conductus*, Ruthe, not rare; *N. capreae*, Pz. (*Kirbyi*, Thoms.), very common. Although I believe the regular food plant of the larva of this species is various Carices, yet it will also eat grasses; indeed, all the specimens that I have reared were fed on *Poa annua*, or any other grass that might be had conveniently, and the larvae fed on them readily enough. I captured what I consider to be *N. imperfectus*, Zaddach, below Craig Dhu; it has been described this year by Prof. Zaddach; and is very like *N. capreae*, from which it is perhaps not distinct. *N. punctulatus* rare; *N. crassus*, Fall., Thoms., one example on aspen; *N. luteus* abundant on alder; *N. bilineatus* not so common on the same plant; *N. dorsatus*, Cam., common on

birch, and very variable; *N. abdominalis*, Pz., (*N. ventralis*, Htg.—the *ventralis*, Pz., is a *Selandria*); *N. ribesii* (?), a couple of insects that appear to be this species, were taken in a birch wood not far from the top of Craig Dhu, there being no *Ribes* near at hand; they may, however, belong to another species. *N. myosotidis*, Fab., common; Thomson considers that this species is the same as *N. papillosus*, Retz., De Geer, a willow feeder, but this is certainly not the case, for the true *N. myosotidis* feeds on clover. *N. cadderensis*, Cam., not uncommon on birch; *N. miliaris* very frequent; *N. crassulus* not infrequent on willow; *N. cinereae* abundant; *N. viminalis*—perhaps only the same species—not so common; *N. gallicola* abundant; *Cryptocampus saliceti* very common; *Athalia rosae* abundant; *Phyllotoma nemorata* common; *Phaenusa pumila* and *P. betulae* both not rare on birch; of *Blennocampa* there occurred *bipunctata* one specimen; *nana* several on birch; *luteiventris* not rare in marshy places; and *pusilla* on rose. The larva of the last species may be found in July inside rose leaves, rolled together into a cylinder. *Eriocampa annulipes* common; *Pocilosoma pulveratum* common as larvae, and in the perfect state on the alder; *P. excisum*, Thoms., occasionally met with; *Selandria serva*, *stramineipes*, and *morio* all more or less common. The last mentioned *Selandria* is reported to feed during the larval state on *Ribes*, but certainly with me the imago has always occurred on birch, and that too in places where no gooseberry was near at hand. *Stronglogaster cingulatus* and *delicatulus* were both in plenty. The former feeds as a larva on the *Pteris aquilina*, and the latter on *Lastrea*. *Pachyprotasis rapae* abundant; *P. simulans* not so common; while about a dozen were taken of *veriegata*; *Allantus nothus* as usual very numerous; *Perineura instabilis* met with everywhere, especially the variety or (?) species *nassata*; *Tenthredo dispar*, Klug, common. I have hitherto considered *T. dispar* to be merely a variety of *T. atra*, L., but this I now find is not the case, for *dispar* and *atra* differ in their larval states. According to Rudow (Stett. Ent. Zeits. xxxiii. p. 386), *atra* is an alder feeder, while I find that the larva of *dispar* is attached to *Scabiosa succisa*. It has the head black, except the face in front and at the sides, where the colour is green, the eyes being situated in the black portion. The body is dark green; the folds of the skin are marked with black, and the back is marked with dark green stripes, each proceeding from the sides and drawing

near to each other at the centre, but still remaining apart. Across the body there are also—two rows to a segment—some whitish raised dots, while below the spiracles the sides are of a lighter green colour than the upper part. The head bears a few scattered hairs, and the feet are light green. When disturbed it ejects a brownish liquid from the mouth, and rolls itself up into a ball. I find the larva in July. When full fed it becomes of a uniform green colour, and proceeds to pupate in the earth. Its length is 13 lines. *T. mesomela*, L., (*viridis*, Kl.) not uncommon. As the larva of this common species has not been described, I give a diagnosis of it here. Head deep black, mouth pale, upper part of the body deep brownish black, marked on the back with paler markings and covered with tubercles. The head and body bear also short hairs. The lower half of the sides are pale white, spotted with brown; the feet white, with brown claws. At the third moult it becomes of a uniform shining olive green colour. It feeds on *Heracleum*, *Ranunculus*, etc., during the autumn. *T. scalaris*, *punctulata*, *olivacea*, *livida*, *velox*, *batteata*, and *rufiventris* all common. *Dolerus* represented by *pratensis*, *palustris*, *gonager*, *haematodis*, *niger*, *gibbosus*, and *aeneus*. A specimen of *Lyda pratensis*, captured in Glen Feshie, and *L. depressa* not rare among birch.

#### Cynipidae.

The only gallmakers noticed were *Dryoteras terminale*, *Spathogaster buccarum*, and *Rhodites eglanteriae*. Of parasitic species: *Allotria aperta*, *A. minuta*; *Sarothrus canaliculatus*; *Melanips opacus*, *Pentacrita geniculata*; *Trybliographa diaphana*, *T. scutellaris*; *Aegilips nitidulus*, *A. dalmanni*, *A. armatus*; *Megapelmus eucharoides*, and *M. ensifer*.

#### Aculeata.

The aculeate Hymenoptera met with were very few. They are *Bombus muscorum*, *fragans*, *lucorum*, *pratorum*, *scrimshiranus*, *hortorum*, *lapponicus*, and *lapidarius*; *Nomada flavoguttata*; *Andrena nana*; *Formica fusca*, *F. nigra*; *Myrmica ruginodis*; *Leptothorax acervorum*; *Pompilus affinis*, *P. niger*; *Crabro wesmaeli*; *Odynerus parietum*.\*

\* At p. 292, vol. ii., delete *Blennocampa betuleti* and add *Phaenusa betulac*.

III.—*Notes and Observations on injured or diseased Crinoids.\**

Any observer who has explored the limestones and accompanying shales of the Carboniferous period, could not have failed, amongst the myriads of fragments of Crinoids, to have been attracted by the occasional occurrence of tumid or partially enlarged columns.

Ure, in stating the characteristics of Crinoids obtained by him, remarks that "Some appear to have been wounded in a recent state; this is indicated by an unusual swelling, which in every case exhibits a large and deep puncture, probably the cause of the swelling." (History of Rutherglen and East Kilbride, 1793, page 324).

Miller, in his work on the Crinoidea, is more elaborate in his remarks on the tumid condition of these stems. Speaking of the *Poteriocrinus crassus*, he states: "Its column has sometimes numerous joints swelling gradually out, and thus giving it a barrel-shaped appearance, generally pressed in on one of its sides, and becoming there concave, with a central perforation evidently leading to the alimentary canal. This has all the appearance of a cicatrized wound; and as the alimentary canal is not increased in the column, the swelling can only arise from a more rapid secretion from these joints, probably to strengthen it, and to compensate thus for the injury probably sustained in one of its auxiliary side-arms. The cavity before mentioned was probably produced by the loss or separation of the stump or side-arm from the column, and the subsequent cicatrizing of the wound." (Natural History of the Crinoidea, 1821, page 69).

A paper "On the cause and nature of the enlargement on some crinoidal columns," by Mr Rofe, F.G.S., appeared in the *Geological Magazine* for August, 1869, accounting apparently for the cause of the appearances observed by Ure, Miller, and others; but it does not seem that the facts described by Mr Rofe have any such bearing. Encircling coralloids had no part in the one, and there is no depression or perforation on one side in the other.

In the remarks which follow, therefore, the encrinal columns

\* Read by Mr John Young, F.G.S. (communicated).

observed by Ure, Miller, etc., will alone be considered, while the facts and observations faithfully detailed by Mr Rofe cannot be dealt with as at all similar or analogous. Probably no observer of Scottish Carboniferous strata has ever seen specimens such as Mr Rofe describes.

It may seem uncalled for, at this time of day, to offer any detailed observations as to the general character and structure of the Crinoidea; but a few remarks may be sanctioned, in order to secure a basis for entering on the facts about to be offered.

Crinoids, as seen in the fossil state, consist of a calcareous foot or base, well fused to some fixed foreign body, having no positive defined form, and depending very much, in that respect, on the nature of the body to which it is fixed, and on the age of the animal; but in the majority of instances it is constructed on the principle of a sand hill or embankment; and where room is wanting further to extend the base when needed, it passes over the edge of the substance, or over to the other side, forming what may be called a brace. This mass of matter has a cavity in its thickest and commonly central part, of inverted conical form (V-like), half as deep as wide, which presents around its inner edge radiating striae, while the deeper sides of the cavity seem smooth, and towards the bottom it becomes expanded, giving space, it may be, for a ligament to fix the extreme end of the column. These calcareous cup-shaped structures are all formed on one principle, and often occur single; but in many instances several are clustered together, some of which are still occupied with the terminal joint of the column. In one instance, as many as eighteen of these cups had been formed on a strong piece of shell not exceeding an inch square, six of which are occupied with the terminal joint; and curiously, the piece of shell having evidently been fixed vertically, or on edge, both sides are clustered over with cups not placed at right angles to the surface in the usual manner, but at an angle so small as to admit of the column having free action in an upright position. This foot or basement is no doubt an integral part of the organism, nurtured, matured, and modified according to the requirements of the animal, in conformity with the laws of vital economy.

The joints of the columns and side-arms would, in a recent state, be very flexible through the intervention of elastic tissue,

and the column so connected and so placed would have ample play, without jar or arrest, and would apparently be the chief source of defence or protection from injury from without.

For the purpose in view no other part of the animal need be noticed.

Impressions are frequently stamped on the columns, made in all likelihood after deposition; and fragments depressed irregularly, without fracture, are often collected, showing that the parts of the column were, so far, soft and ductile. "Wounds" or "punctures" were consequently possible. But judging from analogy, the system would, in the event of a wound or puncture, direct the restorative matter to, or towards the injured part, not away from it, as observed in these tumid parts of columns. The same remark applies to a side-arm broken off. An arm has joints, and a central canal, as in the primary column; but junction of the column and side-arm is only by a peculiar articulation to the outside of a column without weakening it, the canal being carried on to the central one by a transverse passage through the body of the column till it joins the main central cavity. If, then, a side-arm were loped off at the articulation or elsewhere, the restorative process would be directed to the injured, and not to any uninjured part; in all instances, nevertheless, the protecting fortification is not direct.

Now, what little remains to be stated would perhaps be better done if strictly demonstrative.

Any description of these swelled columns of Crinoidea—not confined to *Poteriocrinus crassus* alone, by the way, but extending to several species, points only to one marked feature, a cylindrical tumidity or swelling, one side of which is depressed and perforated in a column which above and below the swelling is in a normal condition. But there are many varieties or stages of this morbid or diseased condition. Among 28 specimens specially examined, some have been selected as modifications of each other, from the stage of active diseased action to something like restoration of parts—all teaching one lesson.

Two specimens, something like what Miller describes, namely, several joints bulging out on three sides, the other depressed with an irregular circular hole with inverted edges in the centre of the depression, the column above and below being in a normal state. Bulging as long as wide.

Three specimens presenting evidence of serious injury, tending towards repair. Bulging longer than wide.

Two specimens more advanced in the restorative process. Bulging in a less degree—longer than wide.

Two specimens presenting evidence of greater progress in repair. Bulging longer than wide.

One specimen all but sound after supposed injury.

Two specimens without depression on any side, or any evidence of disease except the swelling of the column.

One specimen with two flattened sides, each perforated. Swelling of column consequently peculiar.

One specimen with little if any swelling, having a slightly depressed side, and deep, oblong, clean, straight-edged hole, with everted edges.

One specimen with little swelling or depression, bearing strong evidence of active local action towards healing.

This seems to be an example, and the only one, of separation of a side-arm.

Two specimens ground down, one on the depressed side, the other on the tumid side, to expose the central cavity, which, on examination, does not seem to be involved.

In these examples three additional features are presented worthy of attention :

1. The joints or ossicles of the column concerned in the enlarged or swelled portion, are almost always thickened, which necessarily produces elongation of the stem, and the surface ornamentation, in several instances, is in larger characters and more distinct than on the normal parts.

2. Around the perforation, and on the depressed side, some specimens seem stained, as if by colouring material (discharge?).

3. An irregular or contorted state of the restored ossicles of the column is observable where repair of injury is advanced, or, indeed, in some instances throughout the entire process.

These details may have been not a little tiresome; but the facts being fairly presented, the deduction need not be tedious.

Recalling to mind the phenomena attending necrosis, or caries, or even fracture when defensive action is active, as well as the more rare instances of adventitious structure, formed to defend or support certain organs of animals against threatened

destruction, and dismissing the idea of wound or puncture, how does the question rest?

Assuming that disease and destruction of parts had taken place, arising from an overstrain caused by forced flexion, or from idiopathic causes; nature would adopt the fittest and safest means to avoid, if possible, a fatal result; and that seems, by the study of these specimens, to have been gradual and partial enlargement or increased size of the walls of the column (a process of time), by local and special deposition of constructive materials—providing thus a safeguard to sustain the column while under active disease, till the morbid parts were eliminated and restoration effected. By direct and instantaneous injury of an organism so flexible, such as puncture or laceration, to the extent indicated, the column would have been hopelessly destroyed.

Something strictly analogous takes place in the vegetable world. A larch is observed to dwine, a dark spot appears, which seems as if caused by puncture, from which, in time, issues abundantly a resinous substance. The tree swells or increases in size for a space above and below the injured part, except on the side of the aperture, and after a struggle the tree dies, or may regain new powers, and grow vigorously. Trees are found with the remains of two or sometimes three such efforts at destruction by disease. In a plantation of any considerable extent where there are the usual proportion of larch trees, hundreds of examples of this morbid process may be seen. This disease is considered to be constitutional or hereditary.

The deduction adopted seems to be a fair and reasonable inference from the phenomena presented, in the examples given of partial or local enlargement, and relative conditions of the Crinoidea.

Addendum to Monograph on *Phaenusa*. By Mr Peter Cameron.

(See page 5 of present Volume).

Since my paper on *Phaenusa* was written, I have seen two British examples of *P. hortulana*—one in Stephens' collection in the British Museum, and another in the collection of the Rev. T. A. Marshall, F.L.S., this last specimen having probably been taken by that gentleman's father. I do not know the locality where either of them was taken.

The following description will then have to be interpolated between *P. ulmi* and *P. pygmaea*, at page 10.

### 3<sup>A</sup> PHAENUSA HORTULANA.

*Tenthredo hortulana*, Klug, *l.c.*, 187; *Fenusia hortulana*, Hartig, *l.c.*, 258, 1; (?) *Messa hortulana*, Stephens, *l.c.*, 40, 1.

Antennae a little longer than head and thorax, black above, pale testaceous beneath; the joints distinctly separated, slightly projecting at the apex underneath; pilose; the 3d joint more than double the length of 4th. Head smooth, shining, covered with a short pile; the sutures distinct, the antennal fovea large, but shallow, apex of clypeus semi-truncated; labrum large, rounded; clypeus and labrum white, mandibles brownish at the tips; eyes lead coloured. Thorax: tegulae, pronotum, and pleurae broadly whitish testaceous, the pronotum being whiter than the sides of the breast; sternum and the lower fourth of the sides black. Abdomen short and broad; the ventral segments a little whitish at their junction; sheath of saw projecting, hairy and curved. Legs whitish testaceous, the base of coxae black. Wings almost hyaline, costa and stigma pale testaceous; 2d sub-marginal cellule not much longer than 1st, and a very little longer than 3d, but much narrower at the apex than the last cellule; marginal nervure nearly interstitiate; 2d recurrent received a little in front of middle of 2d cellule. The cenchri are obscure, and the blotch very small. Length  $1\frac{3}{4}$  lines.

From *pygmaea* (which it resembles in size, and in having the tegulae white), *hortulana* is distinguished by having the pronotum and pleurae white, and the legs of one colour; with *albipes* it agrees closely in the coloration of the legs, but otherwise differs in the colour of antennae and thorax, and lastly, from *pumilio* it is to be known by the shorter and thicker antennae, the distinct frontal sutures, the coloration of the thorax, clearer wings, nearly interstitiate marginal nervure, and very much longer 2d sub-marginal cellule, this being longer than in any of the other species.

*Hortulana* does not appear to be a common species either here or on the Continent. There it has only been recorded from Germany and France, and nothing is known concerning its larval life.

With regard to the other species, I may add that I found the

larvae of *pygmaea* commonly at Tarbert, Loch Lomond, and more rarely on the banks of the Allander, above Milngavie; and another specimen has been taken of *albipes* in Cadder Wilderness, curiously enough on the same day of the year and on the same rose-bush on which the first was captured.

## SESSION 1876-77.

TWENTY-FIFTH ANNUAL GENERAL MEETING, ANDERSON'S  
UNIVERSITY BUILDINGS, SEPTEMBER 26TH, 1876.

Mr James Ramsay, Vice-President, in the chair.

The Treasurer submitted his annual Financial Statement for the past year, which showed a balance in favour of the Society of £39 1s. 4d. It was explained that the smallness of this balance as compared with that with which the session commenced, arose from the cost of printing, two parts of the Proceedings having been charged in the accounts of the year.

The Secretary read the Report of the Council on the business of last session. During its course sixteen members had been admitted. Five had died during the same period, several of whom had been active and useful associates. Notwithstanding the losses by death, removals, etc., some progress had been made during the year, the roll standing at present at 135 as against 131 reported last year. Eight meetings had been held during the session, and these had been generally well attended. The business was of the usual varied character. The exhibition of specimens embraced all departments of natural science; and the papers read were of an interesting character. These are in course of publication, and will shortly be in the hands of members. A number of excursions to places of interest in the neighbourhood had been arranged for the summer months, but from various causes, were not so largely taken advantage of as had been expected. The Council hopes that an effort will be made to carry out during the session now commencing, what is one of the primary objects of the Society, and one so well calculated to promote its interest and usefulness.

The Librarian reported that the books were all in excellent order, and the use of them largely taken advantage of by the members. The exchange of publications with kindred Societies

had been considerably increased, and was still capable of larger extension.

The following gentlemen were elected office-bearers for the session:—Professor John Young, M.D., F.G.S., F.R.S.E., President; James Ramsay, Thomas Chapman, and James Barclay Murdoch, Vice-Presidents; Robert Mason, Secretary; R. J. Bennett, Treasurer; Peter Cameron, Librarian; Hugh M'Bean, John Kirsop, James Coutts, James Lumsden, F.Z.S., Duncan M'Lellan, Henry C. Young, David Corse Glen, C.E., F.G.S., John Young, F.G.S., and Francis G. Binnie, Members of Council.

Messrs John Robertson, James Paton, Joseph Somerville, and James T. M'Callum, were elected ordinary members of the Society.

#### SPECIMENS EXHIBITED.

Mr Thomas Chapman exhibited specimens of *Papilio antimachus* from Western Africa, the largest butterfly, and one of the rarest species, known; also, from Cape Coast Castle, specimens of the large beetle *Goliathus drurii*, on which he made a few remarks.

#### PAPERS READ.

I.—*On a peculiarity in the habits of a species of Cirropsilus.*

By Mr PETER CAMERON.

Mr Cameron said—The Chalcididae exhibit in their manner of pupation two forms. In the one case the pupa has each limb enveloped in a separate thin, transparent white pellicle, which does not enfold the organ in a very compact fashion, and when these skins are cast off they do not retain the shape of the creature whose body they covered. In the other type the skin of the pupa is hard and thick, and remains of the same shape after the insect has left it, as it did before. It, moreover, closely envelopes the limbs of the pupa, so as to give it the appearance of the obtected pupa of the lepidoptera, and in no other hymenopterous family do we find pupae of this nature. It seems to be the case also that these two forms are correlated with differences in the habits of the insects, for those of the first class are parasites on gall flies, or on wood boring insects, and they pass the pupa state enclosed in the galls, etc., in which they lived; while the other tribe are attached to free feeding larvae, and they pass the period of quiescence in a position more or less exposed. The *Eulophides*

belong to this latter class, and many of them have been recorded as parasites of lepidopterous larvae, as also the fact that their pupae are attached by silk threads to the undersides of the leaves upon which their hosts had fed. I now wish to direct attention to the peculiar way in which the pupae of a species of *Cirrospilus* arrange themselves after leaving the body of the larvae which they had eaten. As a rule, ten to twelve of the chalcids are found in a larva, which they devour almost entirely, the head, forefeet, and a portion of the skin being all that is left, and around these the parasites arrange themselves in a definite circular order, lying on their backs, the head directed to the edges of the leaf, with the other end of the body pointing to the remains of the larva in the centre; in a word, they are arranged like the spokes of a carriage wheel, the axis being represented by the exuviae in the centre. When they emerge from the caterpillar they are quite soft and white, but in a day or two they become black and hard. As I have seen nine different batches of larvae arranged in this regular way, I think it may be concluded that this is their normal custom. On the other hand, the species of *Eulophus* pupate without distributing themselves in any definite manner. So far as I can make out, the species is *C. lamius*, Walk., Mon. Chalc. i., 327, 152; but I must confess my utter inability to make anything of Walker's descriptions.

II.—*Observations on the progress of Vegetation in the Public Parks, during the spring and summer months of 1876.* By Mr DUNCAN M'LELLAN, Superintendent of Parks.

Mr M'Lellan stated that during the month of January the weather was exceptionally mild, the mean temperature being  $36\frac{1}{2}^{\circ}$ . The following months of February, March, and April were unusually cold, wet, and changeable. The lowest point the thermometer reached was on 11th February, when it reached  $16^{\circ}$  of frost, and 6.77 inches of rain fell during these three months, the mean temperature being  $35^{\circ}$ . On the 1st of May vegetation was three weeks later than usual, and on the 2d the thermometer indicated  $2^{\circ}$  of frost, but owing to the extreme lateness of the season no material injury was done to the growth of trees or shrubs, and by the middle of the month they were all proceeding favourably. The oak was in full leaf about the 18th and the ash about the 30th. The ash is generally the earliest of these trees,

but this year the reverse was the case; and this is usually believed to be indicative of a fine summer, as really turned out to be the case. The early part of June was cold and dry, but towards the middle of the month summer fairly set in, and on the 20th the thermometer stood at  $84^{\circ}$  in the shade. The weather from this date up to the end of August was all that could be desired for growing and maturing the crops and fruit. The highest temperature reached during the season was on 16th July, when  $85^{\circ}$  was registered in the shade; and the lowest during the last three months was on 25th August, when the thermometer stood at  $34^{\circ}$ , being two degrees above the freezing point. The foliage of the trees and shrubs in all the parks was in great perfection this season; and the finer sorts of flowers, such as geraniums, calceolarias, etc., were in better bloom than usual. The following table shows the maximum and minimum temperature, and the rainfall during seven months of this and last year:—

	1875.			1876.		
	Max.	Min.	Rain	Max.	Min.	Rain.
February,	41	32	1.42 inches	32	29	3.11 inches
March,	46	35	1.75 „	35	29	5.00 „
April,	55	36	1.28 „	52	36	1.66 „
May,	61	44	1.57 „	61	38	.44 „
June,	62	45	2.54 „	66	45	2.35 „
July,	70	48	1.40 „	75	49	2.58 „
August,	67	57	2.62 „	69	49	2.68 „

The snow-fall was—February 15th, 2 inches; 24th and 25th, 9; March 9th and 11th,  $1\frac{1}{2}$ ; 12th and 13th, 2; 16th,  $3\frac{1}{2}$ ; 17th,  $1\frac{1}{4}$ ; 21st and 22d,  $\frac{1}{2}$ ; April 10th and 11th, 2. Total,  $22\frac{3}{4}$  inches.

Mr John Young, F.G.S., made some remarks upon the meeting of the British Association in Glasgow, and said that it must be gratifying to the members of the societies who had taken a part in contributing to the various exhibitions which were then opened, to learn that their efforts had been eminently successful, and had been much appreciated by the visitors. The illustrations of the fauna and flora of the West of Scotland in the Queen's Rooms and in the Kelvingrove Museum, the display of rock specimens, minerals, and of fossils in the Corporation Galleries, and the natural history collection and magnificent suite of minerals in the Hunterian Museum, which also contained several

cabinets of Silurian, Carboniferous, and Post-tertiary fossils, had been examined by a large number of visitors, who had expressed the great pleasure these exhibitions had afforded them. He had been assured by many of the distinguished foreigners who had been present that they had never seen collections in which the specimens were so perfect, and where the mountings, whether for the microscope or cabinet, were so well executed, and the arrangement so admirable. He trusted that the workers would not rest contented with what they had accomplished, but that, as every day was bringing to light some new discoveries, either in living or extinct forms, they would continue their investigations and collections, so that, when another opportunity offered, they might be found to surpass any former exhibition.

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31ST OCTOBER, 1876.

Mr Thomas Chapman, Vice-President, in the chair.

Mr James Grahame was elected an ordinary member of the Society.

#### SPECIMENS EXHIBITED.

Mr John Young, F.G.S., exhibited a series of slides of mounted specimens of Carboniferous silicious sponge spicules found in the fissures of the limestone strata at Cunningham Bedland, near Dalry, Ayrshire. The discovery of the sponge spicules in this deposit is due to the researches of Mr John Smith of Eglinton Iron Works, Kilwinning, he having submitted specimens of the organisms to Mr Young for determination during the course of last summer. Previous to this discovery by Mr Smith, no remains of silicious sponges had been noted from the Carboniferous strata of the British Isles, so that their abundant occurrence in the limestone of the above district is a point of great interest. The bed of limestone in which they are found lies in the lower division of the Carboniferous series of Western Scotland, and crops out on the west bank of the glen at Cunningham Bedland, where it has been worked in former years. The limestone is traversed at intervals by thin bands of silica, and many of the organisms it contains are found in a silicified condition. A narrow trap dyke

runs through the limestone strata at this place, the direction being from N.N.W. to S.S.E. This dyke has not caused much displacement of the strata; but the faces of the vertical joints of the limestone in the quarry are seen to be beautifully marked with slickensides, the striae of the polished surfaces running in horizontal directions. By the percolation of water impregnated with carbonic acid along the faces of these joints, the limestone has been curiously eroded into narrow gutters or fissures of a few inches in depth, and it is from the decomposed material filling these fissures that the sponge spicules are to be obtained in excellent preservation. Besides these, other organisms which the limestone contains are to be found in the deposit, many of the species of *Productus* having their spines still attached to the shell, and weathered quite free from the matrix. The sponge spicules, which are of various sizes, from one-twelfth to three-eighths of an inch, are of tri-radiate and quadri-radiate forms, a few being stellate, while more rarely others are fluke—or anchor-shaped. The rays of the various spicules generally terminate in points, but certain of them terminate in rounded knobs. They agree in general form with many of the silicious spicules found in sponges which still live in our present seas. Mr Young stated that the Carboniferous spicules from Dalry are being investigated by Professor Young and himself. They had provisionally placed them in the genus *Acanthospongia* of M'Coy, naming the species after the discoverer, Mr Smith. In the same deposit is found an abundance of another organism termed *Serpula parallela* of M'Coy. These consist of bundles of tubular silicious rods, varying in diameter from the size of fine hairs to one-sixteenth of an inch. This organism, which is not uncommon in other localities in the lower limestone strata of Scotland, is now believed not to be a species of *Serpula*, but to be somewhat closely, if not generically, related to the recent *Hyalonema*, one of the glass rod sponges. In strata, where all the other organisms exist in a calcareous condition, *Serpula parallela* is always made up of brush-like silicious bundles. This being the case, Dr Young and himself had provisionally placed it in the genus *Hyalonema*, naming it *H. parallelum*. It has been thought probable that this glass rod sponge and the spicules of the *Acanthospongia* may belong to the same organism, but they had failed as yet in finding any specimens that showed the organic connection of the two forms.

Mr James Lumsden, F.Z.S., exhibited a specimen of the Black Tern, *Sterna fessipes*, Linn., which had been obtained in Possil Marsh in the beginning of October, and remarked that it was an immature specimen, being evidently a bird of this year. The Black Tern is rare in the West of Scotland; and although more frequently observed in the east, it cannot be called common in any part of the country, while, so far as is known, no authentic instance of its breeding in Scotland is on record. In England it still breeds in some of the eastern counties, but not in such numbers as it did at one time. In Ireland it is now and then observed, but only as a straggler, and, as in other places where it occurs in the same way, most of the specimens obtained have been in immature plumage. Mr H. Saunders, in his recent paper read before the Zoological Society of London (P.Z.S., 1876, p. 643), gives the distribution of this species as "found throughout Europe, Palestine, and North Africa to the Nile; to South Africa it appears to go only as a winter and somewhat rare visitant."

Mr Peter Cameron exhibited a number of new or little known British Hymenoptera, these being—1. *Nematus westermanni*, Thoms., a species very like, and perhaps only a variety of, *N. vesicator*, found among osiers on the banks of the Severn, below Gloucester. It is stated to be a gall maker by Thomson, but no precise details of its habits have been published. 2. *Nematus vesicator*, Bremi., which had been bred from large bladder-shaped galls found in Rannoch last year. 3. *Nematus longiserra*, Thoms., a species very like *N. histrio*, St. Farg., but differing in having the last abdominal segment considerably produced. It was bred from larvae found in Inverness-shire, which had been collected in the belief that they were those of *N. histrio*, so that the larva of *longiserra* cannot differ much from that of the other. 4. *Blennocampa bipunctata*, Klug, from Kingussie. This species has been recorded by Stephens as British, but in error, so that the capture of the species in Scotland enables it to be re-introduced as a native of Britain. 5. *Blennocampa lineolata*, Klug; like the last, this species was erroneously introduced as British by Stephens. It has, however, been bred by Mr J. E. Fletcher of Worcester, so that it is truly British. 6. *Pentacrita nigra*, Thoms., found at Dalry during the excursion of the Society to that place in August last. 7. *Torymus hibernans*, Mayr, bred from the galls of *Neuroterus lenticularis*, from Cadder Wilderness. There were also shown the undescribed

male of *Nematus pallescens*, Hartig, and the chalcid, *Calypso compressus*, Foerster, from Milngavie.

Mr Cameron also exhibited some male individuals of an ant (*Leptothorax acervorum*), which he had found on the top of Ben Lawers during the Society's excursion to that place last July, this being a strange habitat for the species, which is generally found making its nest under the bark of pine stumps. No females or workers were found, nor any indication of a nest on the mountain, where there were certainly no tree stumps, and it was suggested that they had been blown up to the situation in which they were found by a gust of wind. He at the same time mentioned having caught a hive bee on the top of Ben Lawers, and on a neighbouring mountain in Rannoch under a stone in June, two specimens of *Zicrona coerulea*, at an elevation of 1500 feet—this being also an agrestal species. ("Taken flying in woods in the spring," "in moss in winter," "among heather in April, May, and October." Douglas and Scott, Brit. Hemip., I, p. 88).

Mr Robert Hill, corresponding member, exhibited a number of objects of interest from Berbice, British Guiana, including several species of fungi, specimens of a very large frog, and of the great beetle, *Scarabaeus hercules*, which has a proboscis of nearly three inches in length. Mr John Young made a few remarks on the specimens.

Mr Archibald Robertson showed a specimen of limestone from Odessa, containing a large number of small organisms, which Mr Young stated was of Eocene age, and corresponded with the nummulitic limestone so widely distributed over the East.

Mr T. S. Hutcheson brought forward the nest of a species of pipit from Calcutta, which was of a large size, being composed of dry grass, and substantially put together. They are found hanging from trees, with an opening in the bottom, through which the bird enters to reach the interior.

#### PAPERS READ.

I.—*On the results of some Experiments on the Leaves of various Trees and Shrubs.* By Mr JAMES NAPIER.

A few years ago, when examining some newly-developed leaves of trees, I was much impressed with the fine soft velvety feel they had compared with leaves in autumn. Thinking it probable the cause was in some difference in their composition at these two

periods of their growth, I gathered a number of leaves from different trees and shrubs upon the 1st of June, keeping them in a water bath at a heat of 212° Fah., until they ceased to lose weight, and I set down the loss by this means as moisture. I then burned off the dry solid organic matter, and obtained the ash. On the 1st of September I took leaves from the same trees, before the leaves had begun to change their colour, and submitted them to the same operation; the results are given in the following table, reduced to 100 parts for comparison. And although taken from a chemical standpoint, the results may not be without interest to the Natural History Society.

KIND OF TREE OR SHRUB.	1ST JUNE.			1ST SEPTEMBER.		
	Moist- ure.	Solid Carbon. matter.	Ash.	Moist- ure.	Solid Carbon. matter.	Ash.
Plane, . . . . .	73.54	24.40	2.06	66.50	29.68	3.83
Apple, . . . . .	61.33	37.31	1.36	54.80	41.20	3.00
Pear, . . . . .	61.30	36.70	2.00	32.50	64.78	3.72
Lilac, . . . . .	83.00	15.64	1.35	66.90	30.27	2.83
Laburnum, . . . . .	73.30	24.50	2.20	59.44	37.31	3.25
Rowan, . . . . .	61.15	36.14	2.71	51.65	44.20	4.15
Horse Chestnut, . . . . .	76.61	21.05	2.34	66.90	30.26	2.84
Willow, . . . . .	72.50	26.16	1.34	64.82	31.57	3.61
Hawthorn, . . . . .	62.85	35.15	2.00	51.63	43.39	5.00
Bay Laurel, . . . . .	74.00	25.29	0.71	56.80	41.51	1.69
Holly, . . . . .	73.84	25.21	0.95	58.93	38.18	2.89
Gooseberry, . . . . .	63.35	34.15	2.50	63.06	32.41	4.53
Currant, . . . . .	16.80	27.80	2.40	60.10	36.10	3.80

It would be unwise to draw conclusions from one course of experiments under the same circumstances, but they are suggestive. One thing is evident, that, independent of the important functions which leaves play in the life of the plant, they also accumulate and remove from it a large quantity of earthy matter, that might otherwise clog up its life system. And they show the necessity, when experiments are made for determining the quantity of ash which different plants absorb and fix in their system, of paying particular attention to the age of the plant, for if, like the leaves, a young plant contains much less earthy matter than an old plant, it may lead vegetable physiologists astray in making their deductions.

II.—On a new species of *Blennocampa* (*B. alchemillae*), with remarks on the species allied thereto. By Mr PETER CAMERON.

*Blennocampa alchemillae*, sp. n. Antennae filiform, longer than the abdomen, the first joint globular, much longer than the 2d, the 3d and 4th nearly equal, the remaining joints a little shorter. Head a little narrower than the thorax, smooth, shining, covered with a fine grey pile. Frontal sutures distinct. Tegulae and basal edge of pronotum white; scutellum flattish on the top, very smooth and shining; cenchri small, dull white. Abdomen a very little longer than the head and thorax, the apex projecting above, narrow, the sheath of the saws largely projecting and hairy at the apex; sides of abdomen covered sparsely with a white pile. Legs: base of coxae, femora for the greater part, and the extreme apex of posterior tibiae and apical joints of tarsi black; trochanters, apex of coxae and femora, knees, tibiae and base of tarsi testaceous white. Wings clear hyaline, costa at base and base of stigma whitish testaceous, rest of costa, stigma and nervures black. Marginal nervure joined to 3d submarginal or received in the 4th submarginal cellule; 2d recurrent nervure received a very little in front of submarginal cellule; 2d submarginal cellule longer and thinner than 3d, angled where it receives the re-current nervure; 3d submarginal cellule expanded at the apex; 2d submarginal nervure straight and bent slightly downwards in the direction of the base of the wing; 2d runs nearly parallel with the 1st; 3d curved in the middle and running in the direction of the apex of the wing, *i.e.*, in a contrary direction to the other two.

The male has the antennae a little longer than the body, covered with a short stiff pile, the joints thicker and more flattened than in the female, their general form being as in *Priophorus*; the anal lobes pale testaceous. Length  $2\frac{1}{2}$ – $2\frac{3}{4}$  lines.

The species of *Blennocampa* with the tegulae and pronotum white are divisible into three groups, arranged according to the neuration of the posterior wings; in one group there is a middle cellule in both sexes; it belongs, therefore, to the section *Monophadnus* of Hartig, *e.g.*, *B. bipunctata*; in the 2d, there is a middle cellule in the female, but none in the male (and this circumstance renders impossible the raising of *Monophadnus* to generic rank, as has been done by some authors, for if so, the sexes would be separated into different divisions), *e.g.*, *B. lineolata*,

*albipennis*, etc.; in the 3d case in both sexes there is no middle cellule, so that this division belongs to *Blennocampa* proper, and to it the species here described belongs.

It comes near to *B. uncta*, Klug, a species not known to me, but described by Thomson (Hymen. Scand., i. 219) as having the antennae "longis, abdomine fere longioribus" in both sexes, and by Hartig, (Blatt. u. Holzwespen, p. 269) as having the same organ in the male "etwas Kürzerals der Hinterleib") but differs in having the antennae much longer than the abdomen in both sexes (in the male they are nearly as long as the body); from *B. pubescens*, Zaddach, it is also distinguished by the length of the antennae (and it may be also mentioned that *pubescens* belongs to the 2d group described above) by the position of the marginal nervure, which in Zaddach's species is received near the middle of the 3d submarginal cellule; from *B. albipennis*, Zaddach, it is at once distinguished by that species having the 3d antennal joint double the length of the 4th (to say nothing of the length and the different neuration in posterior wing); *lineolata* is also easily separated by the same peculiarity.

*B. alchemillae* has been taken in the Glasgow districts and in Rannoch, and I found some specimens in Stephens' collection in the British Museum under the name of *B. uncta*. I have likewise bred it from a green spiny larva (which did not differ from that of *B. lineolata*) found on *Alchemilla vulgaris* in Cadder Wilderness. This larva was full fed when I got it; it cast off the skin, with the spines, and became of a pale green colour, without any spines or other projections, immediately after I brought it home, and before a detailed description of it could be taken. There can, however, be no reasonable doubt that it is the same larva as that described by Reaumur (Mem. Tom. v., pp. 94, 95, pl. 12, fig. 13, 14), and by De Geer (Mem., p. 969, No. 9, pl. 35, fig. 19-23); but these authors had not been able to rear the fly, nor am I aware of any one else having done so.

Mr J. E. Fletcher of Worcester has sent me a *Blennocampa*, which appears to be *B. subserrata*, Thomson, Opus. Ent., 285, 22; Hymen. Scand., i., 220, 25. It is very like the above species, but the legs are quite black at the base, the pronotum has scarcely any white, the antennae are not much longer than the abdomen, the 3rd joint being distinctly longer than 4th, and the submarginal cellules are much broader, but otherwise the

neuration agrees closely enough. Thomson quotes *lineolata* doubtfully as a synonym, but this is certainly not the case, for *subserrata* has no middle cellule in posterior wings, the marginal nervure is joined to the submarginal; the pronotum is differently coloured; the head is narrower and smaller; the antennae are, if anything, longer, and have a longer pubescence; the joints are more distinctly separated, and project at the apices underneath; the marginal nervure is joined to 3d submarginal; the 1st submarginal cellule is nearly square (in *lineolata* it is nearly a parallelogram); the 2d is broader and very little shorter, considerably angled where it receives the recurrent nervure (near the middle of the cellule), while in *lineolata* it is received near the base, and is scarcely angled; the apex of abdomen is more rounded; the sheath of saw is longer and more projecting, and the cerci are distinctly visible; the base of the tarsi are more broadly banded with white; finally, the wings are clearer, and altogether it is a more slender and longer insect.

In some observations on the spinose larvae of the oak-feeding *Blennocampae* (Ann. Soc. Ent. France (5), i., pp. 380-386), Giraud says that *B. lineolata* is in all probability only a synonym of *B. bipunctata*. Such, however, is not the fact; the latter species is larger; the antennae are shorter and thicker; the 3d joint is longer in proportion to the length of the 4th; the 3d submarginal cell is shorter, and the 3d submarginal nervure does not slope so much; while there are the punctures behind the eyes, and both sexes have a middle cellule in posterior wings. The male of *bipunctata* has the antennae shorter, thicker, and more compressed than in *lineolata*, and the femora are reddish, lined with black.

The British species of *Blennocampa* with the tegulae and pronotum more or less white may then be diagnosed as follows:—

A. Posterior wings with a middle cellule in both sexes, and a deep puncture behind the eye. *bipunctata*, Klug.

B. Posterior wings with a middle cellule in the female, none in male; no puncture behind the eye. *lineolata*, Klug.

C. Posterior wings without middle cellule in both sexes.

3d and 4th joints of antennae almost equal; edge of pronotum broadly white, base of legs white, abdomen as long as body in male; in female longer than abdomen. *alchemillae*, n. sp.

3d joint of antennae distinctly longer than 4th; edge of pronotum scarcely white, legs black at base, antennae shorter than abdomen. *subserrata*, Thoms.

I do not know anything definite about the early life history of *B. bipunctata*. It is clear that the larva described by Giraud (Ann. Soc. Ent. Fr. (4) viii., p. 55), refers to *B. lineolata*, while according to Dours (Cat. Syn. des Hymèn. de France, p. 18) "la larve vit sur les rosiers à basse tige," but this requires confirmation. I have taken it on the alder several times.

Mr D. C. Glen, F.G.S., in name of the Local Executive Committee of the British Association, presented to the Library copies of the several guide-books issued during the recent meeting in Glasgow. Mr Glen was requested to convey to the Committee the best thanks of the Society for this donation. It was also resolved to render the thanks of the Society to those of its members who had provided the collections of birds, insects, and sea-weeds, for the exhibition in the Queen's Rooms, which had been organised by the Zoological and Botanical sub-section of the Museum Committee of the British Association.

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28TH NOVEMBER, 1876.

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

Mr William Hamilton, Yokohama, Japan, was elected a corresponding member, and Messrs Rowley Jex Long, John F. Millar, and David Robertson, jun., ordinary members of the Society.

#### SPECIMENS EXHIBITED.

Mr Peter Cameron exhibited specimens (1) of *Ceroptres cerri*, Mayr, an inquiline gall insect, new to the British fauna, from the banks of the Clyde, near Newton. The occurrence of this species in this country is of interest, as on the Continent it frequents galls which have not been found here, these galls being attached to *Quercus cerrus*, which is not a British plant. (2) *Mesoleius marginatus*, Brischke, an ichneumon hitherto unrecorded as British. It was bred from larvae of *Lophyrus pini*, got in a wood at Lambhill. The ichneumon was first described from the neighbourhood of Königsberg. (3) There was also shown a specimen of the American gall-fly, *Cynips spongifica*, a species remarkable (as has been stated by Walsh), from its possessing

two very distinct forms, differing very considerably from each other; one form being met with in the spring, this brood occasionally producing males, although in the proportion of one or two males to hundreds of females; the second form occurring in the autumn, and exclusively composed of females. Without offering any opinion as to the other dimorphic form, Mr Cameron remarked that the specimen which he exhibited could not be placed in any of the modern genera, and that a new genus would require to be formed for its reception—this, indeed, having been already done by Reinhard, without that naturalist having seen the insect. He likewise stated his conviction that it was extremely doubtful if the two so-called dimorphic forms described by Walsh pertained to the same species.

## PAPERS READ.

I.—*On the Asphondyliae of the Glasgow district.* By Mr FRANCIS G. BINNIE.

Those abnormal swellings and outgrowths found upon plants of all orders, and familiarly known as “galls,” present one of the most interesting fields for study that it is possible to select. The majority of these diseased growths are the work of insects, among which two families stand pre-eminent as gall-makers—viz., the Cynipidae among the Hymenoptera, and the Cecidomyiidae among the Diptera.

The productions and habits of the latter family—the Cecidomyiidae, or Gall-midges—I have made it my object to investigate, and have already got together a considerable amount of material, which I trust may furnish matter for various papers before this Society, and which will probably embrace several new species.

I have selected the genus *Asphondylia*, not because I have much that is new to advance, but from the very interesting habits of the species composing it, and from the well-marked characters which distinguish it from the other genera of the family—viz., the absence of distinct whorls of hairs on the pubescent, cylindric, and sessile joints of the antennae. Some of the largest species of the group are to be found in this genus. The pupa is provided with two projecting tooth-like processes at its anterior end, to assist it in forcing its way through the tissues of the enclosing cell when about to assume the perfect state.

In the Glasgow district I have observed the following species :—

*A. sarothamni*, Lw.—This species is characterised by its size, and by having 15-jointed antennae in the male, 14-jointed in the female, with the terminal joint markedly shorter than the preceding one.

This species forms galls on the common broom (*Cytisus scoparius*, Link) of three well-defined kinds.

1. Axillary, and having the appearance of a large swollen bud. The gall is smooth, with indications of ribs, pointed at the apex, one-celled and thin-walled, length, 3–3½ lines. It makes its appearance in early spring, each gall containing a single larva, which goes through its transformations within the gall, emerging by a somewhat ragged hole near the apex. The perfect insect begins to appear towards the end of May. This seems to be the form of gall described by Winnertz (*Linnaea Entom.*, viii., 283), and Kaltenbach (*Die Pflanzenfeinde*, p. 107).

2. Also axillary, but usually crowded together in some numbers on the apical portions of the twigs. It is elongate and cylindric, length, 3–6 lines; open at the apex, which is usually two-lipped, from which a passage, filled with dense interlocking white hairs, leads into the thin-walled cell at the base, containing a single larva, one line and a quarter long, bright orange or reddish orange, and minutely tubercled. The gall makes its appearance at the end of summer, and continues through the autumn. The larva leaves the gall to pupate in the earth, the perfect insect emerging probably the following spring. I have never bred the imago from this gall, and feel somewhat doubtful whether it may be referred to *A. sarothamni*.

3. A galled pod. The part affected becomes inflated, is oval or round in shape, circular in transverse section, and projecting equally on both sides of pod. It is thin-walled, forming an internal cavity which contains a single larva, and the galled portion retains its green colour after the rest of the pod has become black. The perfect insect emerges by a hole in the side. The gall is found during the summer, and the present species has been bred from it by Mr Traill.

Gall No. 1 is pretty common, No. 2 is abundant, and both are generally distributed in the district. No. 3 I have seen only in one locality, near Milngavie, and have failed to find it elsewhere where No. 2 is abundant.

*A. ulicis*, Verr.—This species was first recorded and named by Mr J. W. H. Traill, M.A., F.L.S. ('Scottish Naturalist,' ii., 172), and Mr Verrall afterwards gave a full description of the perfect insect from dried specimens (Ent. Mo. Mag., xi., 224).

It is readily distinguished from its congeners, by its 13-jointed antennae in both sexes, with the *two* apical joints globular and abruptly shorter than the preceding joint, which equals the two taken together. It is also a large species, having an alar expanse of 5 lines. According to Mr Verrall, the small transverse veinlet near the base of the wing is seemingly absent. I cannot see any indication of it in my specimens, but I might observe that Winnertz describes this veinlet in *sarothamni* as being very pale. In his description Mr Verrall omits to mention the two longitudinal furrows on the thorax. The species does not seem to be known on the Continent, being probably overlooked.

The gall is found on the furze (*Ulex europaeus*, L.), and consists of the two sepals of the flower, the inner whorls having entirely disappeared. It is somewhat inflated, but is not very noticeable until the flower is past, when, from retaining the form of an unopened flower-bud, it is very conspicuous. The larva goes through its transformations within the gall, and the perfect insect emerges in July and August by a hole near the apex, leaving the empty pupa case in the opening.

The pupa is at first uniform reddish-brown, paler beneath; afterwards, middle dorsal region of abdomen becomes darker, then head and thorax darker brown, dorsal portion of abdomen assuming a blackish shade; antennae, wing, and leg-cases appear almost jet-black. The thorax is glossy, with the exception of a medial dorsal line. There is no cocoon.

It seems generally distributed in the district, as I have taken it on the moors near Milngavie, on the Kilpatrick hills, and in Kilsyth glen.

*A. pimpinellae*, Lw.—I have observed inflated seeds in the umbels of *Angelica sylvestris*, L., at Mugdock Wood, which I have little doubt may be referred to this species. Mr Traill (Scot. Nat., i., 125) has recorded the ordinary gall of this species, which occurs on *Pimpinella saxifraga*, L.

*A. genistae*, Lw., which forms galls on *Genista germanica*, is a British species, but from its habitat need not be looked for in our

district. Schiner (Fauna Austr. Dipt. ii, 396) suggests the probability of it being only a variety of *A. sarothamni*.

In these notes I have altogether disregarded five species given by Walker as British.

II.—Notes on *Cecidomyia trifolii*, Fr. Lw., and its Gall.

By Mr FRANCIS G. BINNIE.

The species was only described in 1874, by Dr Franz Loew (Verh. der K.K. Zool-bot Gesell. xxiv.), but the gall had previously been recorded for Britain by Mr J. W. H. Traill, M.A., F.L.S. (Scot. Nat. I., 195).

This species belongs to the genus *Cecidomyia*, as restricted by Loew; and the character of the antennae, stalked in the male and sessile in the female, places it in a sub-division of the genus whose members are extremely difficult to distinguish from one another. The habit of the larva, however, offers a ready means of distinction when correlated with other differences; and usually a good specific character is to be found in the number of the antennal joints. In the present species these are 14–15 in both sexes.

The gall is found on *Trifolium repens*, L., during the summer. It consists of a folded leaflet, a pseudo-cell being formed in the vicinity of the mid-rib, the walls of which become inflated and more or less fleshy, often tinged with red externally, and one, two, or all the leaflets of the triplet may be affected. Each leaflet is inhabited by 1–2 larvae; on one occasion 4 were found. They are white when young, and gradually change to orange at maturity, when they attain a length of three-fourths of a line. The insect generally goes through its changes within the gall, the larva spinning a white cocoon. About this time, however, numbers of the cells are to be found empty, from which, in the absence of any indications of the ravages of an enemy, it may be inferred that a certain number of the larvae descend to the earth to pupate.

The perfect insect begins to emerge towards the end of August, and at intervals for some time afterwards, and larvae, pupae, and imagos may all be found during that period. The galls occur commonly in the Possil district and near New Kilpatrick, and are probably generally distributed. I have never found this species affecting *Trifolium pratense*, for which Dr Loew records it. My observations on the economy of the species differ in some minor

points from those of the above writer. The gall, according to him, is found in spring, the perfect insect appearing towards the end of June. This may be an earlier brood. The habit of the larva, as observed by him—social, 2-4 in a cell—is probably an effect of the larger size of the leaflets of *T. pratense* as compared with those of *T. repens*. It will be observed that on one occasion I found four inhabiting a single cell; this, however, seems very exceptional here.

III.—*On Uniformity of Method in recording Natural History Observations, especially as regards Distribution and Migration; with specimen tables of a plan proposed.* By Mr JOHN A. HARVIE-BROWN, F.Z.S., corresponding member.

The want of some definite and generally adopted method for registering in tabular form observations on Natural History, more particularly as applied to the subjects of distribution and migration, has long been felt. We have no higher authority for this statement than the author of the most important Zoo-geographical publication that has ever been published: I mean "The Geographical Distribution of Animals." Mr Wallace, the author, complains of the heavy task of collecting, and sifting the innumerable records of authors in various publications, in no two of which, perhaps, are they arranged upon the same plan. In summing up this part of his work, Mr Wallace says:—"Till every well-marked district, every archipelago and every important island, has all its known species of the more important groups of animals catalogued on an uniform plan, and with an uniform nomenclature, a thoroughly satisfactory account of the geographical distribution of animals will not be possible."

Whilst acting on the hint conveyed in this passage, and endeavouring to bring the matter more prominently forward, I do not do so in the belief that the plan about to be proposed, and which has lately been adopted by me in one or two papers treating of the distribution of the birds of North Russia (*Annals and Mag. Nat. Hist.*, 1877), even approaches perfection, nor do I put it before you necessarily for imitation, but simply for the purpose of giving the subject ventilation, and of starting it for discussion. No one, I am sure, could suggest, with more certainty of being attended to, some final uniform method to be adopted, than the author just quoted, and I have not hesitated in some

measure to avail myself of the hints conveyed in the pages of his grand work, which may now be considered the common property of all workers in this branch. My object now is to agitate for an uniform method in treating of the distribution of species in minor areas, and not to consider the more general and wider aspect of the subject in relation to the great primary regions of the earth. This part of the subject stands already on a secure basis, thanks to the work of some of our leading naturalists, foremost amongst whom are the laurels due to Dr P. L. Selater, who was the first to grasp the varied facts at his command, and mould them into the one great plan of the Zoological regions, as at present adopted by Mr Wallace, and followed by nearly all workers in Distribution;\* a plan which has stood the test of discussion and criticism since its inauguration by Dr Selater in 1856, and which appears again, with scarcely any alteration, in Mr Wallace's work.

Much may be learned by a study of Mr Wallace's methods, as shown in the tables appended to the sections treating of the different great regions; however, I humbly consider that method is even more necessary in the genesis of such work than in its final results, and that in smaller areas there are more minutiae available for record than are perhaps necessary in wider generalizations.

What we require, then, to consider may be stated thus:—

“An uniform method to be established for the registration of facts connected with the distribution and migration of species in *limited areas*, which can be made available by field naturalists, and afterwards by cabinet naturalists, for wider generalization.”

It is not my intention here to review or criticise the methods of previous authors at length, but I may be permitted shortly to speak of a few by name, referring you to personal study of their methods, for comparison and adoption, or for rejection in part or in whole.

Beginning at home, I will first instance a most excellent paper, by Mr A. G. More, “On the Distribution of Birds in Great Britain during the nesting season” (*Ibis*, 1865, p. 1). As applied to a Zoologically-known area, it has much to recommend it, but it can scarcely be applied to a partially or wholly unknown

\* *Vide* Selater (Jour. Proc. Linn. Soc., vol. ii., Zoology, p. 130); Gunther (Proc. Zool. Soc., 1858); Huxley (Proc. Zool. Soc. 1868).

area, as the divisions are extremely arbitrary, and however suitable to the district under treatment, are not of sufficiently general scope to be applicable to other countries. Therefore we must look at Mr More's paper rather in the light of a practically finished work, than as a model to workers in less known areas.

The same may almost be said of another work, that by Dr Salvadori, or rather of the tables contained in it—"Fauna d'Italia, Uccelli; Introduzione." In these the author introduces a much larger set of observations than Mr More does, and records the faunal value of each species in each of three zones, viz., *Zona settentrionale*, *Zona centrale*, and *Zona meridionale*, and also the insular groups, or *Italia insulare*; and in each of the columns allotted to these zones he indicates the species which are—stationary, *s*; summer residents, *me*; winter residents, *mi*; of regular passage, *pr*; of irregular passage, *pi*; of occasional or accidental occurrence, *a*; etc. As will be seen by the specimen given below, any of the above particulars relating to the species can easily be found by the aid of the perpendicular columns opposite the names of the species. This plan of Salvadori's has more *power of applicability* than Mr More's, but the symbols or contractions admit, I think, of improvement still in that respect.

SPECIMEN OF SALVADORI'S TABLE I.

SPECIES.	ZONA SETTENTRIONALE.					ZONA CENTRALE.				Z. MER.	ITALIA INSULARE.			
	Piedmonte.	Ticino.	Lombardia.	Tirol.	Veneto.	Emilia.	Nizzardo.	Liguria.	Toscana.	Romano.	Napoletano.	Sicilia.	Sardegna.	Malta.
21. <i>Accipter nisus</i> , .....	pr	pr	s me	pr me	pr	pr	s ?	me	pr	pr	pr	pr s	mi	pr
86. <i>Panurus biarmicus</i> ,...	s	s	me	a	me ?	me	a	me	s	s	s	s		
95. <i>Lophophorus cristatus</i>	s ?	s ?	s	s	s	...	s	s						
96. <i>Sitta caesia</i> , .....	s	s	s	s	s	s	s	s	s	s	s	s		
98. <i>Certhia familiaris</i> ,.....	?	?	s	?	?									
174. <i>Anthus ricardi</i> ,.....	pi	a	pi	...	pi	pi	a	pi	pi	a	...	pi	...	a
406. <i>Colymbus septentrionalis</i> ,.....	mi	mi	mi	mi	mi	mi	mi	mi	m	mi	mi	mi	mi	pi
411. <i>Podiceps minor</i> ,.....	s	s	s	s	s	s	s	s	pr	s	s	s	s	pr

Again, M. Severtzoff, in his "Fauna of Turkestan,"\* may be

\* "Vertikalnoe e Gorozontalnoe Raspredalenie, Turkestanie Javotnie," Moscow, 1873. (Translation in the 'Ibis,' 1875, p. 96, by Mr H. E. Dresser).

taken as the type of another class of writers, who introduce yet another useful element into their tables of distribution. He gives tables of both horizontal and vertical distribution, which are matters of the utmost importance, and which should never be lost sight of.

These, and many other examples of modes of registration by different authors, which I might give you, do not, however, appear to me to supply the desideratum of *general applicability* throughout. At the same time, I am inclined to consider Mr Severtzoff's divisions to be the most easily applicable to all countries, whatever their physical aspects or contours may be, but with certain modifications. Thus, while the four horizontal divisions of Turkestan adopted by Mr Severtzoff may be most suitable to that country—viz., north-west, north-east, south-west, and south-east,—it might be desirable to introduce others in countries of greater magnitude or different contour, or more varied physical aspects, as Salvadori has done with his "*Italia insulare*," or, as will be seen later, I have done in my treatment of the Distribution of Birds in North Russia. Generally speaking, however, I am inclined to adopt this method of division, and therefore I would suggest :—

1st, That the horizontal divisions of a limited area or country, Zoologically-known or Zoologically-unknown, be determined by their relative positions according to the compass, with such additional districts as may be considered convenient, such as *central* or *insular*.

2d, That vertical divisions be determined in each country by their altitudes above the sea; and that they be further individualized by having appropriate names bestowed upon them, according to the physical aspects peculiar to each.

*Examples.*—In Norway I would, for instance, propose four vertical districts (or five, if we include the adjoining fjords and seas), viz. :—(1) *Littoral*, or sea and shore; (2) *Pine tract*, or sea-level up to upper limit of pine growth; (3) *Birch tract*, or to upper limit of birch growth; (4) *Fjeld tract*, or *Mountain tract*, to summits of about 8000 feet; and (5) *Insular*, or outlying islands. But this last, in the case of Norway, is perhaps unnecessary.

Transylvania, again, I would divide as follows :—(1) *Field lands*, or plains and valleys; (2) *Foot hills*, or oak tracts, say to an

elevation of 2000 feet, or about 800 feet above the high level of the *Field lands*; (3) *Beech tracts*, or lower mountain slopes, say to an elevation of about 3000 feet; (4) *Pine tracts*, or central mountain slopes, 4000 to 5000 feet; and (5) *Lichen tracts*, or upper mountain slopes and summits, 5000 feet to about 8000 feet.

So much, then, for the division of an area into districts.

As regards migratory movements, I think, as far as possible, all records connected with this subject should be kept separate from those of distribution. I am aware that it is not possible altogether to ignore migration in a treatment of distribution, but we can, to a certain extent, give such records a secondary importance, by recording simply the occurrence of such species and no more, leaving for a separate table of migratory movements the entry of more detail.

We now come to the use of symbols as a means of expressing the faunal value of the species in the columns.

Professor Newton of Cambridge, in a Paper in the "Transactions of the Norfolk and Norwich Natural History Society," (1870-1, p. 24), has explained a method of registering Natural History observations, which his brother and himself followed out during a period of ten years' residence at Elvéden, in Norfolk. By those who are desirous of keeping exact daily records of migratory movements, I believe no better plan can be followed, and I would recommend to such a careful study of his article. Professor Newton tells us:—"However good an out-door naturalist any man may be, let him adopt the plan here described, and he will become a better one" (p. 29), as the keeping of such records "ensured continuously our careful attention, forcing us to take notice of everything that caught the eye." I will only further say here that Professor Newton recommends what I may call a *progressive system of symbols*, having its chief recommendation in its "variability, combined with simplicity," and "a capability of expressing various meanings, especially in combination, and its freedom from complication." Bearing this advice in view, I would then suggest for approval the following code of symbols for recording observations on Distribution, and which can be used either in the field for daily work, or in the study for bringing into workable order the records of previous authors.

## SYMBOLS.

Insufficient data (or absence),	...	...	...	...	...	...	a blank space.
Probable presence,	...	...	...	...	...	...	⋮
Actual presence, or first actual record,	...	...	...	...	...	...	↓
Rare, rarer,	...	...	...	...	...	...	·↓·∴
Once, twice, or thrice—seen, shot, identified; or occurred, recorded, added to the fauna,							↓ ↓ ∥
Common,	...	...	...	...	...	...	∥
Very common,	...	...	...	...	...	...	++
Very abundant,	...	...	...	...	...	...	∴
Locally distributed,	...	...	...	...	...	...	⊙
Generally distributed,	...	...	...	...	...	...	○

Besides the above, there must be an additional symbol for absence, for using in combination, thus:—

Once absent, now present,	...	...	...	...	...	...	↓ or ↓
<i>Vice versa</i> ,	...	...	...	...	...	...	↓ or ↓

If it be desired to record the breeding of the species, add the following symbols or letters:—

Breeds,	...	...	...	...	...	...	β
Did breed, but does not now,	...	...	...	...	...	...	g

Additional symbols may be made use of to express the following meanings in connection with vertical distribution, but they are not likely to be so generally useful as the others:—

In the mountains, or high up,	...	...	...	...	...	...	△ or Λ
In the valleys, or low down,	...	...	...	...	...	...	▽ or ∇

Directions of the compass can be indicated, of course, by unfeathered arrows:—

In the North,	...	...	↑	In the South,	...	...	↓
„ East,	...	...	→	„ West,	...	...	←
„ North-East,	...	...	↗	„ North-West,	...	...	↖
„ South-East,	...	...	↘	„ South-West,	...	...	↙

The Seasons—Spring,	...	Sp.	Summer,	...	Su.
Autumn,	...	Δ.	Winter,	...	W.

SPECIMEN TABLE (No. 2).

Of a proposed new List of (European) Birds. Designed alike for use in the Field and in the Study—as printed on this cross-ruled paper.

1. Vultur monachus.

2. Otogyps nubicus.

3. Gyps fulvus.

4. Neophron percnopterus.

5. Gypaetus barbatus.

6. Aquila chrysaëtus,

7. Aquila imperialis,

EXPLANATORY.

Opposite each species there ought to be one or two rows of squares—31 in each row—for daily records for one or two months, or for full scope for other tabulated records.

No black lines ruled, but simply red cross-ruling, with wide margins at top and bottom of list of species for headings of tables and foot notes, and also at left side for references.

SPECIMEN TABLE (No. 1).

Distribution of the Birds of North Russia, north of 64° 30' N. lat.

		W.	C.	E.
Aquila chrysaëtus,	N			√
	S			
Aquila albicilla,	N			
	S			
Pandion haliaëtus,	N			√
	S			
Buteo vulgaris,	N			
	S			
Buteo desertorum,	N		√	
	S			
Buteo lagopus,	N			√
	S			
Buteo ferox,	N			
	S			
Milvus migrans,	N			
	S			

EXPLANATORY.

The *black* lines are not to be ruled, but are added afterwards by the recorder as required.

Having as yet worked out only the Distribution of the *Northern Division* (N.), I leave the spaces for the *Southern Division* (S.) blank.

Migrant passing north in spring (by a feathered arrow),

„ south in autumn, „ ...



We now come to consider the question:—How are we to apply the above proposed method practically?

Lately I have had occasion to work up the Distribution of the Birds of North Russia, and I have found note books on the following plan of the greatest service.

A quarto note-book, faintly cross-ruled with red ink, having squares about the size shown in the specimens, (see Tables 1 and 2). The paper should be ruled thus throughout, and additional necessary ruling may be done in black as required. Such a note-book may be made available for many useful purposes where tabular arrangement is required; as, for instance, tabulating measurements of a number of specimens, records of thermometric and barometric readings, tides, indexes, records of successive authors in any given country. It might even be useful in drawing a map to scale, or indicating the course of a river or positions of the islands of an archipelago. It has an infinite number of advantages over a plain or simply ruled note-book.

Further, I would suggest that a new List of Birds—say those of Europe—be printed upon this cross-ruled paper (Table 2), leaving a wide margin on the left and at top for headings, and at bottom for foot notes. I am convinced that such would, when fully known, be invaluable either for daily records in the field, by a system of symbols, or in the cabinet for working out the records of previous authors. I can speak so far from personal experience of it, that, though not having the lists actually printed, I have found the method to answer admirably and prove a very great saving of time. Almost any form of tabular arrangement can be applied in such cross-ruled note-books, of which the specimen sheets, above referred to, illustrate some of the uses to which they can be put.

Specimen Table 1 shows the Distribution of Birds in North Russia, divided into two primary Divisions—northern and southern; and each of these Divisions into three *Districts*—north-west, north-central, and north-east,—and south-west, south-central, and south-east. For further particulars of this I would refer you to a paper I have for some time past been engaged upon, viz.,

“The Distribution of the Birds of North Russia,” Parts I., II., and III. (Annals and Mag. Nat. History, 1877); Part I., “The latitudinal Distribution of Birds of North-east Russia, north of 64° 30' N. lat.”

Specimen Table 2 is intended to show the plan of a “New list of European Birds,” upon the principle explained above.

Such, then, is my method as it at present stands; and should any member of this Society, or other naturalist, have any suggestions to give for its improvement, modification or elaboration, I would be glad if they would bring them forward for discussion.

I have just received, through the courtesy of H.H. Dr E. Rey and Hellwig of Leipzig, a new list of European Birds,\* by Dr E. Rey, bearing date, 1875. Upon opening it, I found with pleasure that it was arranged upon almost the exact plan which I have proposed above as regards the ruling; the horizontal lines, however, being dotted lines, and the perpendicular only, continuous lines. Ten columns are placed opposite the names of the species.† Might I suggest to Dr Rey that, in the next edition of his most useful list, he should increase the number of columns, to admit of the list being used as a daily register in the field, for say one month (31 columns), and also that the horizontal lines and the names of the species be printed a good deal wider (quite double as wide as at present), to admit of more daily notes being entered by symbols. If this be done, the 8vo form can still be retained, the linear arrangement being made continuous across two pages, and the list of species being printed only on the left hand side.

It is not my intention here to enter into any criticism of Dr Rey's list, beyond the single remark, that I think the rules of nomenclature of the British Association do not appear to have been strictly adhered to, especially as regards the insertion and use of brackets with the names of authorities, and the “rule of priority” appears also to have been disregarded. Thus, “*Passer domesticus*, Koch,” should stand as *Passer domesticus* (L.)

\* “Verzeichniss der Europäischen Brütvogel und Gäste, nach den neuesten Ermittlungen, Zusammengestellt von Dr E. Rey.” Leipzig, 1875.

† It is only due to myself to state that this is the first I have seen of Dr Rey's list, and I cannot be charged with not having sooner acknowledged it, as the idea of the cross-ruling occurred to me quite independently of any other person's suggestions.

A discussion took place on various results of recent explorations, when some interesting statements were made by several members on points bearing on natural history which had been established by the Arctic and Antarctic expeditions. Mr Harvie-Brown mentioned that the nesting-place of the Knot—*Tringa canutus*—had now been discovered, and although its latitudinal range is restricted, its longitudinal range may be widely extended. The Knot is perhaps more generally distributed than any other species, but hitherto its breeding haunts could not be fixed with any certainty. He also stated in evidence of the rise of the land in the Arctic zone, at a comparatively recent date, that in Northern Russia—the shores of the Petchora Gulf being thickly strewn with piles of drift wood carried down by the great rivers—he had observed that where the tundras approached the margin of the Arctic sea, and formed banks of a considerable height, they were strewn for some distance inland with drift wood, which must have lain there for a very long period, and which must have been deposited when the tundras were almost on a level with the water.

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## SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

DECEMBER 21ST, 1876.

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

## ADDRESS BY THE PRESIDENT.

Professor Young proceeded to discuss the geological bearings of some of the results arrived at by the Challenger and other exploratory expeditions. He showed an enlargement of the map prepared by Mr John Murray of the Challenger staff, and on it pointed out the distribution of the various deposits referred to in Mr Murray's paper, read in section D of the Glasgow meeting of the British Association. The red clay suggested reference to Professor Ramsay's theory as to the origin of the red rocks in the stratigraphical series. Professor Ramsay founded on the improbability of peroxide of iron tinging deposits in the open sea, whereas peroxide of iron and manganese were found to be the

colouring nucleus of the red clays. But while this part of the theory did not admit of general application, the conclusions arrived at regarding the conditions under which the old red sandstone and permo-triassic strata were laid down remained untouched, since these latter were sandy deposits, shale being very subordinate.

The occurrence of a non-calcareous accumulation in the deepest waters was next discussed, as bearing on Professor Hull's views regarding calcareous rocks. After stating the still debated issue as to the decalcification of the *Globigerina* ooze and the conversion of the non-calcareous part into red ooze, Dr Young suggested that perhaps we have not yet recognised the deepest water accumulations, which, if the events of the remote past are identical with those of the present, must have corresponded to the mountain limestone or the chalk. Again, the area over which the calcareous material might be spread was shown by the distribution of the coral mud at the present to be far greater than that occupied by the animals whose skeletons went to make up the deposit. Moreover, oscillations of the ocean floor might bring into seeming succession to each other accumulations which were in reality contemporaneous, and Dr Young dwelt on this as helping to bear out the suggestions contained in his British Association address, to the extent, that the thickness of the stratified deposits, and, as a consequence, the time required for their deposition, might be over-rated. The uniformity of aspect presented by the deep sea fauna has an important bearing on the views of Salter and others, who regard the wide distribution of mountain limestone fossils as evidence of the greater uniformity and consequently smaller number of types of animals in the earlier period. If we have to do with the inhabitants of deep waters in these limestone fossils, there might have been, and probably was, at these early times, as great a diversity as now.

After glancing at the controversy regarding ocean circulation, and pointing out wherein the data were as yet incomplete, on which a satisfactory judgment could be based, Dr Young referred to the question of the possible increased salinity of the existing seas, and asked if Mr Buchanan's results, when fully wrought out, might not support, by the constancy of high specific gravity below certain depths, the notion that the ocean might be, as has been suspected on theoretical ground, saltier than it once was; in fact, that

the ocean might prove to be on a large scale what the Dead Sea was on a small one. Dr Young next referred to the occurrence of coal of cretaceous age in the far north, and the bearing of this fact on the possible change of the earth's axis of rotation. He spoke of Nordenskiöld's and Judd's objections to the current doctrine of a glacial epoch and polar ice-caps, and of Professor Ramsay's caution against exaggerating the importance of glacial deposits and treating them as of equal value with the Silurian or Carboniferous strata; lastly, he referred to the distribution of the manganese deposits as shown by Mr Murray, but left it to Mr Young to discuss this point in reference to the limestone at Cunningham Bedland, which Mr Young had got analyzed.

#### SPECIMENS EXHIBITED.

Dr Young exhibited the type specimens of Ellis and Solander's corals, which, to the number of nineteen, he had identified in the Hunterian Museum; also a case of Bohemian trilobites received from Dr A. Fritsch.

Mr John Young, F.G.S., exhibited specimens of a small reticulated sponge found by Mr James Armstrong, of the Glasgow Geological Society, in the same deposit of rotted Carboniferous limestone at Cunningham Bedland, near Dalry, in which the sponge spicules, *Acanthospongia Smithii*, exhibited at a former meeting, were obtained. Mr Young stated that it was of interest to know that, besides the occurrence of siliceous sponges in this deposit, there was the evidence of the presence of sponges belonging to other groups in the same family. Mr Young also exhibited a sample of the peculiar reddish-brown mud in which the sponges and other organisms are found. This mud is the inorganic residue of the limestone left in the eroded fissures of the rock through the action of water charged with carbonic acid. From its resemblance in colour to the manganese mud found by the Challenger expedition over certain of the deeper parts of the sea bottom, it had occurred to Mr Young that this residue of the rotted limestone might also contain manganese, and he therefore had a small quantity tested at the laboratory of Glasgow University, when it was found that the mud, when fused with carbonate of soda, gave a decided greenish tinge, forming a manganite of soda. No quantitative analysis of the amount of manganese in the mud had been made, but it was thought that there could not be less than

2 to 3 per cent. present. Mr Young stated that it would be interesting to determine whether the manganese had entered into organic combination with any of the numerous organisms found in this bed of limestone, or had been chemically precipitated as a deposit from the sea water. From what he had read of the manganiferous mud found by the Challenger, he was inclined to hold to the opinion already expressed, that it was the result of decalcification of the Globigerina ooze, the manganese having been extracted from the sea water and entering into the composition of the animal shell structure of these minute organisms. He therefore did not agree with the other expressed view that it had been floated to these deep tracts of the sea bottom in company with other inorganic elements. If the former view should prove to be the correct one, we might naturally expect that manganese would be present to a small extent in many of the limestones of organic origin in all the formations. In the Carboniferous limestones of the West of Scotland he knew of limestones that yielded a reddish mud on erosion by carbonic acid. It would therefore be interesting, as bearing on the red mud found by the Challenger, to prove to what extent they also are manganiferous.

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#### ANDERSON'S UNIVERSITY BUILDINGS.

JANUARY 9TH, 1877.

Mr James Ramsay, V.P., in the chair.

Messrs. Alexander B. Stewart and Charles Malloch were elected life members; and the Rev. H. B. Tristram, LL.D., F.R.S., C.M.Z.S., Canon of Durham; Messrs. Andrew Malloch Bayne, Peter Marshall, A. D. Newlands, James Lyle, Robert Marshall, and Thomas Scott Forrest, ordinary members.

#### SPECIMENS EXHIBITED.

Mr John A. Harvie-Brown, F.Z.S., exhibited a rare Little Rail, *Ortygometra affinis*, Grey, from New Zealand, and remarked that Buller ("Birds of New Zealand," page 183) describes, but does not figure this bird. He tells us that it "closely resembles the Australian *O. palustris*, but is distinguishable by its somewhat larger size, and the absence of white markings on the primaries."

He tells us, also, that "This handsome little crane is found in both islands; but it is everywhere extremely rare and difficult to obtain. It frequents the sedgy banks of creeks and rivers, and the reed-covered lagoons near the coast. . . . Very little is at present known of its breeding habits."

This specimen was shot by Mr J. R. Cook, in Canterbury province, New Zealand. Mr Cook stated that it was the only one he had shot during a residence in New Zealand of twelve years. As this bird is so rare, Mr Harvie-Brown said that he thought it well to give a description of this specimen, which is appended.

*Ortygometza affinis*, Grey. "Voyage of the Erebus and Terror," 14. Buller, page 183.

Measurements—Bill at front,  $\frac{11}{16}$  inch; middle toe and claw,  $1\frac{3}{8}$  inches; wing, from carpal joint,  $3\frac{3}{8}$  inches; length  $6\frac{1}{2}$  inches. Buller gives as total length, 7.5 inches. The difference may result from the specimen described by him having been measured in the flesh.

Description—Bill bluish-black, faded apparently from dark green or olive. Crown, and neck above, dark yellowish-brown, with blackish centres to the feathers. Back, scapulars and wing coverts, yellowish-brown, tinged with faint olive, many feathers being laterally marked with blackish, and some having one or two irregular white spots on the outer webs. Cheeks, and breast down the centre and under parts, bluish-grey. Throat greyish-white. The yellowish-brown of the upper parts extends down the sides of the breast and flanks. Sides of the abdomen blackish-brown, broadly but irregularly barred with white, as are also the under tail coverts. Tail feathers same as longer bastard wing feathers, but without the white spots. Primaries smoky brown.

Mr James Lumsden, F.Z.S., exhibited a specimen of a hybrid between the Black Grouse, *Tetrao tetrix*, and the Capercaille, *Tetrao urogallus*, and on the table had placed examples in illustration of these two species. He said that at the November meeting of the Society in 1872, he had the pleasure of exhibiting a very fine female of this kind. The one he now showed was a male, and he had little to add to the remarks which were made on the occasion referred to. These hybrids have been long known in Sweden, but some years ago Russian and German naturalists, thinking they had made a discovery, elevated the bird into a

separate species, calling it at first *Tetrao intermedius*, and afterwards *Tetrao medius*. Further particulars will be found in Mr Lloyd's "Game Birds and Wild Fowl of Sweden and Norway."

Mr Lumsden also exhibited a Hare, hybrid between *Lepus timidus* and *Lepus variabilis*, which was shot last month near Dumbarton moor, where blue hares were turned out a few years ago. It is somewhat curious that the editors of the new edition of "Bell's British Quadrupeds" do not seem to have been at all sure of hares of this description occurring in this country, and say that hybrids are reported to be known in Switzerland, but that the statement requires further confirmation. It is reported that they are not uncommon in some places in Perthshire.

Mr James Coutts exhibited examples of ancient pottery from Peru, of which he gave a full description. They were formed of fine clay, and in appearance resembled bronze. Of various patterns, they were highly ornamented, the designs being ingenious and sometimes grotesque. They are supposed to belong to the period of the Incas, and after the Spanish Conquest were found in large numbers in the burying places. They are still found in ancient graves along with human remains, and various implements, such as chisels, and hatchets, formed of highly tempered copper.

#### PAPERS READ.

I.—*Notes on the Old World species of Athalia.* By Mr PETER CAMERON.

On examining lately my specimens of *Athalia*, I have become aware of the existence of a species new to the British fauna; and an examination of Stephens' collection has shown me that one of the reputed British species must, for the present at least, be deleted from our lists. It may then be of advantage to say a few words regarding our native species, as well as the other old world forms.

*Athalia* is rather a peculiar genus, and its systematic position has been by no means decided, none of the authors who have studied the Tenthredinidae having placed it in the same position. For instance, it is placed by Hartig between *Selandria*, sensu str., and *Allantus*, sensu str.; by Stephens between *Fenusa* and *Selandria*; by Dahlbom between *Amasis* and *Hylotoma*; by Westwood between *Schizocerus* and *Sciopteryx*; and by Thomson between *Cryptocampus* and *Phyllotoma*. There can be no doubt

that it has likenesses and affinities with various widely separated genera, and the authors above named have apparently been guided in their conclusions by relying upon the relative importance of one organ more than another, or it may be through mere superficial resemblances. It is, indeed, highly probable that it is a very ancient genus. The general resemblance, in form and coloration, of the species to such very different forms as *Hylotoma rosae*, etc., is very curious. Another interesting fact is the very wide distribution of the species over the old world. Looking at the matter in all its aspects, and taking also into account the form and habits of the larva, I cannot help thinking that Hartig has put the genus in a more natural position than the other authorities.

The species may be separated as follows:—

- A. Mesonotum smooth, shining, glabrous; breast rufous. *glabricollis*.
- B. Mesonotum densely pubescent.
  - a. Mesonotum more or less luteous.
    - Apex of tibiae and tarsi annulated with black. *spinarum*.
    - Tibiae partly, and tarsi totally black. *tibialis*.
  - b. Mesonotum black.
    - 1. Tarsi annulated with black.
      - a. Mouth white.
        - Pronotum and tegulae luteous. *rosae*.
        - Pronotum and tegulae black. *haematopus*.
      - b. Mouth luteous. *annulata*.
    - 2. Tarsi not annulated.
      - Tibiae partly, and tarsi quite black. *lugens*.

#### 1. GLABRICOLLIS, Thomson.\*

This species differs from *spinarum*, by the black, smooth, almost glabrous mesonotum; from *rosae*, by the non-pubescent mesonotum, larger size, and by the breast being always luteous. I have hitherto confounded it with *rosae*, and it was its larva, and not that of *rosae*, which I described under the last mentioned name in the "Scottish Naturalist," vol. ii., p. 197–199. The larva does not differ from that of *spinarum*, and like it feeds on cruciferous plants, but does not, so far as I know, frequent the turnip. It has occurred in Clydesdale, Berwickshire (Hardy), and Aberdeen (Trail). From England I have seen a specimen, taken by Mr J. G. Marsh (captured in the London districts, I believe), and this specimen offers the peculiarity of having the scutellum luteous.

\* Hymen. Scand. i., 171.

With *glabricollis* the antennae are generally pale luteous on the under side. According to Thomson, it is met with as far north as Lapland.

## 2. SPINARUM, Fab.

This is the insect formerly too well known under the name of "nigger," "black Jack," "black canker," or the saw-fly of the turnip, and whose anatomy has been so well described by Newport in his classical prize essay. Its ravages on the turnip appear to have been first noticed in Britain about 1788, and between that and 1840 it committed very great damage, but of late years scarcely anything has been heard of it; indeed, it now seems to be very rare, and I have never seen a recently captured specimen. I know not if it was ever injurious to the turnip in Scotland, or if it has been met with in Scotland at all. Mr James Hardy tells me that he recollects seeing the larvae in Berwickshire, but they may possibly have been those of *glabricollis*.

*Spinarum* has a very wide distribution. It extends very far north, and eastwards to Japan and India, the Oriental specimens differing from the European in having less black on the mesonotum.

## 3. TIBIALIS, Cameron.

A common East Indian species, easily recognised by the more or less luteous mesonotum and blackish tibiae and tarsi.

## 4. ROSAE, Linn.,

is the commonest form, and is very prone to vary, especially in the coloration of the breast and pleurae, and to a less extent in the markings on the tarsi. Dours says that the larva feeds on roses, but this is doubtful. It is fond of frequenting various flowers. Mr James Hardy writes me that he has noticed that it has a great partiality for the flowers of *Ajuga reptans*. In the British Museum there is a specimen from the west coast of Africa; which has the breast and pleurae quite black, and the wings rather yellower than is usual, but otherwise is scarcely to be distinguished.

## 5. HAEMATOPUS, Klug.

This is a South African species. It is easily separated from *rosae* by the totally black thorax and tegulae, and is also consider-

ably larger. Klug does not mention the colour of the mouth, but in some specimens in my collection (agreeing otherwise with the description) that is white. In an example in my collection there are still, firmly attached to one of the fore tarsi, two pollinia of an orchid; they point straight out, and afford clear evidence that this *Athalia* aids in the fertilization of these curious plants.

#### 6. LUGENS, Klug,

is a commonly distributed species. I have taken it near Gloucester, Manchester, and in our neighbourhood at Kilsyth Glen, and Mr Morris Young has captured it on the Gleniffer braes. Under the name of *Athalia abdominalis*, Fab. (which is a synonym of *lugens*), Kaltenbach (quoting Bouché, Stett. Ent. Zeits. xii., p. 290), describes a larva which may refer to *lugens*. He states that the female bores into the young branches and leaf-buds of *Clematis erecta*, and deposits her eggs therein; and in course of time a bladder-like swelling is formed, wherein the brown-headed larvae live until they are about half-fed, a period extending from 14 to 20 days; after this they become external feeders, assume a brownish-green colour, and devour the edges of the leaves for 14 to 20 days more, when they drop down to the earth, where they pass the winter. Supposing this to refer to *lugens*, it is certain that it must have some other food-plant besides *Clematis*, since it is found in places where no *Clematis* is native, or grows at all—in Clydesdale, for example. There is probably some confusion about the matter.

#### 7. ANNULATA, Fab.,

is apparently the rarest of the species. It is described as British by Stephens, but there are no specimens of it in his collection in the British Museum, those under the name of *annulata* being *rosae*. I think the species is certain to be British, but it must at present be erased from our lists. Kaltenbach says that he found the larva in July, and again in September and October, on *Veronica beccabunga*, whose leaves it eats on the under side. The larva is dull black, whitish on the sides, and spins a cocoon in the earth. According to the same author, the fly appears in the Spring and during the Summer on flowers, especially those of *Heracleum*.

I may add that I have found a similar larva on *Veronica*, but

did not rear the insect. Dahlbom figures a larva, which he got from Drewsen in spirit, as that of *annulata*; it was of a glaucous colour, and covered with distinct tubercles, which are well shown in the figure (Prod. Hymen. Scand., pl. ii., fig. 44).

Dours (Cat. Syn. Hymén. de France, p. 19), records *Athalia graelsii*, Dufour, as feeding on *Pastinaca sativa*, one of the Umbelliferae, but I have not been able to find out where this species is described, if described at all. It inhabits the south of France.

POSTSCRIPT.—Since writing the above, I have seen an English specimen of *annulata*, taken by the Rev. T. A. Marshall, F.L.S., so that this species may again be included in our catalogues. Mr Marshall's specimen differs from a Continental one I possess, in the four posterior tarsi being distinctly annulated with black, and the clypeus luteous, while in the European example the tarsal joints are scarcely annulated and the clypeus only very faintly luteous. There is a form of *rosae* which resembles *annulata* in having the pleurae and sternum black, but it is easily to be distinguished by the mouth being white. Other distinguishing points are that *annulata* has the first abdominal segment black, the coxae black at the base, and the anterior tarsi scarcely annulated.

II.—*On some Varieties of the Common Partridge (Perdix cinerea), with remarks on the Causes of Variation in Species.* By Mr JOHN A. HARVIE-BROWN, F.Z.S.

I have brought for exhibition this evening two extremely handsome birds, varieties of the Common Partridge, which have been obligingly forwarded by Mr George Sim, Naturalist, Aberdeen; also three others of a commoner variety, which were given to me by my friend Mr A. Burn Murdoch.

The two former—the stuffed specimens—were shot by General Shaw on the estate of Glasshaugh, near Portsoy, along with four others. One of this fine variety, which was killed about the end of November, was sent to the Banff Museum, and other four, which were shot in the beginning of October, were sent to Mr Sim, to be preserved for the owner. Mr Sim writes me that they had been seen in different coveys for some weeks before being shot. Since these have been killed, the people in the neighbourhood have reported to General Shaw that similar birds have been seen in previous years about the same place. Mr Sim also

informs me that the females, of which there were four, are all alike in plumage, being brown on the breast, while the upper parts are beautifully marked with transverse bars of light brown over a ground colour of drab, the brown being of greater density in some individuals than in others. The males differ markedly from the females, having a preponderance of the rich grouse-like chestnut-brown on the back as well as on the breast. Mr Sim had previously compared these birds with Sir William Jardine's description and plate of his *Perdix cinerea*, var. *montana* (Nat. Lib., Ornith., vol. iv., plate 2), and found them to agree with that variety.\* Mr Robert Gray mentions ('Birds of the West of Scotland,' p. 242), a pair of birds which he tells us "agreed precisely" with Sir William Jardine's bird, and which he saw in Dundee. These had been killed on the higher grounds of Forfarshire, and the keeper distinguished them by name as *hill partridges*. As I have heard the term applied in various districts, hill partridges are simply smaller and darker birds, living generally on the higher ground bordering the moors, and often found amongst the heather itself. Still, in the present instance, it would almost appear as if this variety had been induced by food and locality, if we look at the almost perfect grouse-colour, especially of the male.

Actual melanism is, as we know, caused in some species in confinement by an over-diet—or an exclusive diet—of oily hempseed, and I believe this will also be found to cause melanism in wild species, as for instance in this Yellow-hammer; or, as I am inclined to imagine, *may* be the cause in this North Russian Sand Martin. Is it not possible also that some peculiar food may have in like manner affected these and other partridges, (obtained, be it remarked, in the same locality)? Might not a continuous diet of this food, whatever it may have been, influence the colour, reaching through the pores of the skin, extending down the feathers, or affecting the growth and colour of the new feathers during the moulting season? Or again, if in course of time the blood became impregnated by some subtle poison or property of the food, might not these birds in breeding perpetuate the new stock? I believe the causes of variation in wild species are not fully worked out, and that there is room for inquiry and careful

\* The Editorial criticism in this connection (Zool. 1877, p. 229), applies to the incomplete newspaper report of this paper. I have explained the inaccuracy in a note to the June No. of the Zoologist.—J. A. H. B., May 19th, 1877.

investigation here. As all particulars connected with such varieties are, I believe, worth recording; and as naturalists are, I think, rather apt to attach too little importance to what are considered "mere varieties," without attempting to account for the cause, I would suggest to members of this Society that, always, *particularly* careful notes be taken by them of all varieties of our common species which may come under their notice, such as, contents of stomach, weight, measurements, nature of locality where found, especially if the bird or other animal has been known to frequent it for any length of time. Mr Sim, with his usual care in all matters of importance, has done this as regards these partridges, and sends me full notes. These two birds weighed  $13\frac{1}{2}$  and 15 ounces respectively. Extent of wings  $19\frac{1}{2}$  inches, and length from bill to the point of tail  $12\frac{1}{2}$  inches, in each specimen.

I now come to mention the other birds, of which specimens are before you. Two are males and one is a female. This variety—having the white horse-shoe on the breast—does not appear to maintain distinctions with regard to sex as the other variety appears to do, as here we have a male and a female precisely the same, and another male, while it attains the white horse-shoe, differs from the others in having the neck and chin buff, the others having these parts white.

These three partridges were shot out of the same covey by Mr A. Burn Murdoch at Gartencaber, in the south of Perthshire, in October, 1875. They are all young, well-grown birds; but, as Mr Burn Murdoch remarks, must have been late hatched, and would have been too small to shoot in the beginning of September. He writes concerning them as follows:—"I also killed one old bird of ordinary plumage, which I believe belonged to the same covey, *but* as it was a driven bird, and as there were others in the vicinity, it is *not* a certainty that it really belonged to the original lot. There were, I think, eight birds in all. I have had a good many thousand birds off that district through my hands in the last twenty years, and never had one with such peculiarity of plumage as to attract notice, except in the case of one covey many years ago, the birds of which were distinctly lighter in general colour than ordinary, but retained the usual chestnut of the head and breast."

It is not so easy in the case of albinism to suggest a cause for the departure from the type, but possibly it might

be found in the absence of a proper supply of the usual food, and a consequent constitutional change; a want of the usual colouring principle, or from sickness, or wounds; in such instances, it would increase with age, and become hereditary, as it undoubtedly is.

Since the above was written, I have heard of another covey of these birds showing the same variety, with the horse-shoe white. Mr Arthur Dundas told me that this winter he shot three of these birds on Carronhall estate, near Falkirk, one of which was an *old* bird. All, both old and young, had brown or buff chins and throats, and white horse-shoes on the breasts, like specimen No. 3.

When on the subject of variation in species, I may make a few remarks upon this unusually dark form of our common sand martin, which I believe has every bit as much right to be considered a good species as dozens of other constant varieties have. This bird was shot by me on the Petchora River, in north-east Russia, in 1875. All the sand martins observed by us either at Archangel or eastward have this dark phase of plumage, and at Archangel there are legions of them nesting in every suitable situation. Now what is remarkable about these sand martins is, that in them the reverse of the following general rule is exemplified: "Continental forms of birds are usually brighter and lighter coloured than insular ones, and eastern European forms are almost invariably lighter than their western representatives." I may here instance one or two of many cases which occur to me of the above rule, so as to put the case of the sand martins of North Russia from a stronger point of view.

Our English marsh tit, *Parus palustris*, when compared with the more northern Norwegian form, *Parus borealis*, will be found to be very much darker. When compared again with the Siberian marsh tit, *Parus kamschatkensis*, which we found in the Petchora, the difference becomes marked indeed, the latter being very much lighter—*mealier*—than our bird.

*Parus cinctus*—the Lap tit—of northern Scandinavia is darker than *Parus griseescens* of Dresser from Siberia, while the form we procured on the Petchora shows an intermediate phase. *Pratincola rubicola*, our stonechat, has the rump spotted. The eastern brighter form, *Pratincola indica*, has the rump unspotted; we found this also on the Petchora.

These examples will illustrate the general rule, and make the case of the striking exception in the sand martin more patent.

I do not pretend to be able to account for this curious departure from the rule, but again merely suggest, that possibly food may have something to do with it. Nor can I say what this food actually is, but I cannot divest myself of the idea that the poisonous and innumerable mosquitoes form a large part of their food supply. Unfortunately our friend Piothich did not examine the contents of this bird's stomach, and so put this question of its food beyond doubt; but what are all these pests created for if it is not to supply food for the legions of birds that haunt the tundras and river banks in summer? Is it not possible that if the sand martins feed mainly upon mosquitoes—I wont say entirely—that the effects of the quantity of the poison which they swallow may affect their colour? In other words, is it not possible that there is a property in the said poison capable of affecting the blood without injury to the bird, and yet, through the blood, causing this marked variety of plumage?

Professor Thomson of London once asked me to catch and bottle as many Persian bugs as I could (at that time I contemplated a visit to Persia), these bugs being so venomous that their bites are sometimes almost fatal. He wished to express the poison afterwards, and discover its properties and composition, if possible. If mosquito poison could be treated in a similar way, possibly it might be proved to contain some property which might have the effects I suggested, and if it could be analyzed, no doubt an antidote to the poison might also be discovered, which to poor humanity exposed to its tortures would be an unspeakable relief. But there is no need to go further into what after all is mere hypothesis, and what may just as likely as not prove to be altogether wrong. Still I think the subject is worthy of some attention from this point of view.

III.—*On the Biscacha (Lagostomus trichodactylus, Brookes), a South American Rodent.* By Mr ERNEST GIBSON, Buenos Ayres.  
Communicated by Mr HARVIE-BROWN, F.Z.S.

The biscacha cannot be regarded merely as an interesting subject for observation by the naturalist, or as affording some moonlight sport for gun and revolver; for, in the province of Buenos Ayres, it ranks with the thistle and the "Tuco-tuco"

(*Ctenomys brasiliensis*?) in its wide distribution and abundance, and is equally detested by all camp (country) people. The landowner reckons up his loss in pasturage, and the common Gaucho gets a "cropper" as he is running some animal, so poor biscacha is pretty equally anathematized by all parties. What the rabbit has proved in Tasmania the biscacha is in the provinces of Cordoba, Santa Fe, and Buenos Ayres, with the sole difference that *Lagostomus trichodactylus* is indigenous. In the Sierra of Cordoba or Tandel, or in the great plains of Buenos Ayres, down as far south as Bahia Blanca, it is equally at home; and, except where vigorous means are taken to put it down, always increasing. The damage it does consists in the ground occupied by each "Biscachero" or biscacha warren, the destruction of all pasture for a radius of several yards, and the invariability of nothing but weeds, thistles, etc., ever growing on the site of an old biscachero. In some places, where the biscacheros are particularly numerous and close together, three or four acres of ground would not afford sustenance for a single sheep; to use a Spanish phrase, the ground is "pelado"—bare, naked. Five biscachas are reckoned to one sheep, in the consumption of pasture, and it is astonishing to find how much pasturage is lost on any "estancia" (stock farm) where biscachas are abundant. As a case in point, I may cite one of some 64,000 acres, where the lowest estimation of the biscachas is 60,000,—or rather less than one to each acre; and they occupy the room of 12,000 sheep! All these are of course rough estimates, and based upon observations in one district alone, but I believe they are applicable to nearly the whole province. Various are the means used to extirpate this pest, but only two may be said to be both practicable and thorough. Among the ineffectual methods may be classed shooting, drowning out, and smoking out;—the latter operation being performed with a machine which forces the fumes of burning sulphur, Chili pepper, old boots, etc., etc., through the burrows. But where their thorough eradication is desired, digging out is the plan resorted to. Gangs of Basque or Italian labourers are engaged, the biscacheros counted, and the price per biscachero agreed upon; the payment not to be made until a fixed time after the work is finished, to guard against any reappearance of biscachas. In one estancia where they were thus exterminated, furrows had to be run with a plough across the land, in order to get the biscacheros properly counted; and the total

cost of the work was about £1000. What also have been tried—with perfect success—on this estancia, are traps, similar to the fox-traps used at home, though not quite so large or strong. These are inspected once or twice every night and once again in the morning. At first, some nights will give a biscacha for every trap, but as they diminish all except two or three of the runs are closed, and the superfluous traps carried on to the next biscachero.

The number of burrows in a biscachero rarely exceeds forty or fifty, and one of that size occupies about three or four hundred square yards; but their usual dimensions are about one-third of that area. On averaging twenty biscacheros in one locality, I found they contained thirty-five denizens each; and yet of these twenty only four were large ones, while some two or three consisted of only one or two burrows each. But as for giving an idea of the ramifications of an old biscachero, it can only be done by comparing it to a labyrinth,—such are the number and extent of its excavations. Where the ground permits of it (*i.e.*, where the elevation of the land above the sea exceeds six feet), there are sometimes three tiers of burrows in the subterranean colony. It is said they always dig down to water, but as yet I have failed to verify the statement. Where three or four passages meet, there is generally a large excavation, known as a “sála” (Spanish hall), and in these “salas” the biscachas congregate in event of any drowning or digging out.

Their most curious habit is the collection of sticks, bones, dry thistle stalks, bois de vache, etc., etc.; which débris is scattered *over* the biscachero, never taken into the burrows. Naturally, there are many stories extant of lost watches, pocket-books, and other valuable articles having been recovered by examining all the biscacheros in the vicinity; but practically speaking, such cases can but be unusual, for it is only when the loss occurs in the immediate neighbourhood of a biscachero that it is worth while looking for it there. An old native who had watched their method of collecting all this rubbish, described it as being done in a very desultory manner. A biscacha would find a stick or a bone at some yards distance, and after dragging it a short way towards the biscachero would tire of it and leave it, till another repeated the operation—gambolling and jumping about with it; so sometimes two or three nights would elapse before the article reached its destination.

The biscacha breeds twice in the year, in March or April, and in August or September,—corresponding to autumn and spring,—and the litter is two or three in number. The young do not seem to leave the burrows till they are about six weeks old; at least I premise so from never having shot or trapped them under that age.

Their cry is almost indescribable, consisting of the most extraordinary combination of squealing, grunting, and braying conceivable, and is uttered in a most ludicrous tone of vehement indignation and execration. I have known of natives belonging to the upper provinces, who, in travelling south, had passed a night in the vicinity of a biscachero, and consequently were kept on the alert by these diabolical sounds. Jaguars they knew, and pumas also, but from what unknown wild animals proceeded such portentous sounds as these!

All biscachas will bite savagely when laid hold of, but an old buck will also attack any one who impedes its road, following him up in quick jumps; and from the size of its incisors and muscular configuration of its head, its bite is bad to contemplate and worse to receive. I have also noticed that—in common with most rodents—the wound is slow to heal, the teeth probably not being clean.

Their appearance through the day is of very rare occurrence. Where they are seldom disturbed, they emerge shortly before sundown, but in other cases not till dark. They see well at night, but have not much power of vision through the day.

They swim pretty well, taking readily to the water if pursued.

Notwithstanding the disproportionate length of its fore and hind legs, a full-sized biscacha will run very rapidly for two or three hundred yards, but after that it gives in all at once.

Their sense of smell is very small.

They are very tenacious of life, and it requires no light blow to fracture the thick cranium they possess. In this respect they present a strong contrast to the “Nutria,” (*Lutra brasiliensis*, Linn.?), for the skull of the latter is as fragile as that of the former is massive.

Taking them on the whole, biscachas may be regarded as rather stupid animals. No amount of trapping puts them on their guard against the traps. When drowned out, it is true,

they will bolt for the nearest biscachero, but if foiled there, they either run about at random, or stop and look stupidly at their pursuer till he hits them over the head.

Their flesh, unless when old, is excellent, closely resembling that of the rabbit. But most people have a repugnance to try it, probably prejudiced by the forbidding aspect of the animal.

Their skins are almost worthless, and very difficult to separate from the body; so that their marketable value is no incentive to their destruction.

Associated with the biscacha, we find the Brazilian or rabbit owl (*Pholeoptynx cunicularia*), while the burrowing ground woodpecker (*Geositta cunicularia?*) confidently digs its habitation in the brow of one of the burrows. Foxes and wild dogs frequently take up their abode in a biscachero, enlarging one of the burrows for that purpose. I have also found tiger cats (*Felis tigrina*, Linn.?), "peludos" or armadilloes (*Dasypus villosus?*), two species of "comadreas" or opossums (*Didelphi?*), polecats (*Viverra mephitis*, Linn.?), and various species of rats and mice, but never yet a snake, under any circumstances.

In some parts of the province a species of small wild melon, pretty indeed, but bitter to the taste, is common, growing frequently upon the biscacheros, but the biscachas do not seem to eat it, nor yet is there any association to be found between them, as that half inferred by Proctor. Their staple food indeed consists of succulent grasses and a trefoil called "carretilla," but when they can get at maize or wheat, they commit great devastation among it.

In conclusion, though the biscacha is a very interesting rodent, no landowner seems to appreciate it properly; and I am afraid that even the naturalist, whose horse has come down with a sudden crash and shot the unwary rider over its head, sums up his observations on it in a manner more emphatic and concise than instructive!

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30TH JANUARY, 1877.

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

Mr James Smith was elected an ordinary member.

## SPECIMENS EXHIBITED.

Mr Francis G. Binnie exhibited specimens of *Chaetopteryx villosa*, Fab., from the river Allander, near Milngavie. This is an addition to the list of Trichoptera given in the "Fauna and Flora of the West of Scotland," Glasgow, 1876. It seems to be the only British representative of the genus, which numbers eight species in Europe, according to the recent monographic revision of M'Lachlan. This species is strictly autumnal in its habits, but individuals have been captured as late as November.

## PAPERS READ.

I.—*Observations on the Study of the Phytophagous Hymenoptera.*  
By Mr PETER CAMERON.

Having often been asked privately for information regarding the methods of studying the plant-feeding Hymenoptera, I have thought that it might not be entirely useless to describe to the members the instruments for capturing, manner of preserving and rearing, as well as the books required for the study of these tribes. I may, however, add, that I do not intend to go very minutely into the general methods of collecting, etc., for information on this subject is to be had in such works as Knaggs' "Lepidopterist's Guide," but only to give some practical hints that will be of use to the commencing Hymenopterist.

First, then, with regard to their capture. The instruments required for this purpose, consist of (1) a sweeping net, such as is used by Coleopterists, with which the herbage, etc., is swept backwards and forwards, and in this way those species which are more particularly attached to herbaceous plants may be obtained; (2) a good stout alpaca umbrella of the "Sarah Gamp" order, to hold inverted beneath trees and bushes, which are beaten over it, a good sharp rap on a branch being sufficient. The insects are thus collected in the open umbrella, the contents of which are examined after a sufficient number of trees have been gone over, and desirable specimens caught and placed in a collecting bottle. (3) A light muslin net, such as is used by butterfly collectors, may sometimes—and especially in very sunny weather—be advantageously carried, but as a rule, the two articles just mentioned will be found sufficient, for, generally speaking, any

species seen flying (and it is very seldom that individual species can be recognised on the wing) may be caught with the sweeping net, unless it be made too heavy, or even with the hand or hat, for the insects do not fly fast nor very far; they usually alight after a flight of 10 or 12 feet, and their movements can be followed without much trouble. Many species frequent flowers, especially Umbelliferae, Compositae, and Ranunculaceae, this being more particularly the case with the species of *Tenthredo*, *Allantus*, and *Cephus*, as well as with the parasitic Cynipidae (the latter attaching themselves to Umbelliferae) but the *Tenthredos* and *Allanti* do not frequent the flowers for the purpose of eating pollen (although I believe they do eat it), but rather to prey on other insects, some of them, e.g., *Allantus nothus*, *Tenthredo mesomela*, being very carnivorous, so that the collector must be careful not to place them alive in a non-killing bottle or box along with other insects.

Beating is most productive in the evening or during a dull day, for if the weather is very bright, the creatures are continually on the alert, never resting long in one place, and fly at once out of the umbrella, unless the collector is very sharp. In the sunshine, therefore, there is more chance of their capture with the sweeping net, because it can be used with greater freedom, and the flies cannot so readily make their escape. Many of the smaller species—*Blennocampa*, *Phaenusa*, among the sawflies, and most of the Cynipidae, have a habit of tucking the wings, antennae, and legs close to the body when disturbed, and of falling to the ground as if dead, in which position they are very difficult to see.

The best time for collecting sawflies in Scotland is during May, June, and the early part of July. For the Cynipidae autumn is most productive for the parasitic and inquiline species. Some of the gall-makers appear very early, thus I have found species of *Aphilothrix* in January, others in June and July, e.g., *Trigonaspis megaptera*, *Spathogaster baccarum*. It may be added that the species of both families live but a very short time in the perfect state, and hence the collector has always to be upon the move should he aspire to have a good collection.

The best collecting places are around the edges of woods where brushwood is plentiful; or in open clearings in woods; along the sides of fields and hedges, and in marshes among rushes and horse-

tails, where the species of *Dolerus* are mainly to be found. The mountains yield a few species, but unless one happens to be on them on a very calm day, and when the insects have just emerged, there is not much chance of anything being found.

Having caught the specimens, the next business is to have them killed and brought home, and it is obvious that if these two processes can be combined, some trouble will be saved. This I contrive to do in the following manner:—when caught, I place at once the flies in a “killing bottle” formed of a wide-mouthed bottle of strong glass, into which is placed half an ounce of cyanide of potassium, over this is sprinkled some dry plaster of Paris, and over that again a layer of wet plaster of Paris; whenever this has dried, and all superfluous moisture has been wiped away, the bottle is ready for use. When properly prepared, it will last for a couple of years, and this mode of killing will, I think, be found one of the most convenient to use. But care must be taken to keep it in the dark as much as possible, never in the direct rays of the sun, or moisture will accumulate, and then the insects will get spoiled. If kept quite dry it will not require anything else inside, but if moist, small pieces of blotting paper, or sawdust from which all fine dust has been removed, may be placed in it. Furthermore, the insects must never be left beyond a few hours in this bottle, or otherwise their colours are apt to alter, yellow being changed to vermilion. I have never seen this take place with wasps or sawflies, but it occurs very readily with ichneumons, *e.g.*, *Bassus*, more especially if they have only recently been disclosed. And of course care must be taken that the bottle will not fall into the hands of any ignorant person who might injure himself with this deadly poison, although it is difficult to see how this could be done unless it were used as a drinking cup! It will also be found of advantage to have a small muslin bag attached to the cork of the bottle, for the purpose of containing small Cynipidae, Chalcididae, etc., which are introduced into the bag by means of a glass tube, or a quill inserted into the cork, the quill or tube being also provided with a separate stopper. By this method small insects are not so readily lost (by becoming attached to the hairy bodies of bees, or otherwise damaged), nor do they get wetted should the bottle contain moisture; while the larger and commoner species are put into the bottle itself. By

following this plan we get all the advantages of two bottles out of one. In addition to carrying this bottle it will be as well to have a few pill boxes or glass tubes for the purpose of holding any choice or rare specimens.

Besides having a tendency to discolour yellows if the specimens are kept too long in it, cyanide tends to stiffen the limbs, and this makes the "setting" of the insects a little troublesome, but I avoid this by removing them at once into a damping dish (I use a wide-mouthed glass) containing moistened sand, the specimens being put upon this in a smaller glass or shell (a mussel will do), and the whole covered in with a cork or damp cloth; by next morning all the limbs, etc., are relaxed, and the insects are in beautiful condition for setting.

Some prefer to bring home all their captures in tubes or pill boxes, (and I admit that this is best in the case of bees), or in a bottle with bruised laurel leaves, though small insects are very apt to get lost among the pieces of laurel; or in a box saturated with ammonia. Each of these methods has its advocates, and the tyro must just find out by experience which is the best; after all, it is a matter of little moment which plan is followed, provided that the specimens are obtained in a state fit for examination. It must, however, be stated that cyanide is not a good medium for killing aculeate Hymenoptera, as it renders them too stiff; they are best killed with sulphur.

Having at length got the specimens killed and relaxed, the next process is to prepare them for the cabinet. For this purpose two methods may be followed: the flies may be pinned or set out with gum tragacanth on card-board. Each of these plans has its advantages and disadvantages; but there is this peculiarity between them, that so far as the mere question of facility of studying the specimens is concerned, it is a matter of little consequence with the pinning process whether the specimens are "set" or not, *i.e.*, whether the wings and legs are stretched out by means of braces on a setting board, and allowed to remain there until they have thoroughly dried in that position, or whether the limbs are allowed to hang any way, there being merely a pin stuck through the thorax, and nothing further attempted. With either way all the parts can be examined; and it is obvious that if they are not set much time will be

saved the student, but on the other hand they do not look very well; there is no uniformity among them—they have in many cases an unnatural appearance, and the peculiar *facies* of the individual species is not so readily seized by the eye, so that if it were only from an aesthetic point of view, proper setting is to be recommended; indeed, it is almost universally followed in this country, and it may be added as universally neglected on the Continent. But if the flies are to be carded, it is absolutely necessary that the antennae, legs, wings, etc., be properly displayed, or the species in many cases cannot be identified. Besides, it is not always easy to display on cardboard all the specific characters, especially those on the underside; but if they be set a little on their sides, with only one wing gummed down—if care be taken to show the mouth so that its colour, form of the clypeus, etc., may be visible; if one of the antennae be left loose (in some species the underside differs in colour from the upper); if one of the tarsi be left loose, so that the form of the claws can be noted; and lastly, if properly prepared gum be used, and if it be not too lavishly employed, there can be no difficulty experienced in scrutinizing the species, while if these matters are neglected, proportionate trouble will be met with. Carding possesses advantages over pinning in so far that the specimens are not so readily damaged; they can be handled with greater freedom and security; they do not become troubled with verdigris (and pinned specimens are much affected with it, and if so, can hardly be cleaned); should they become dirty it is a simple matter to re-card them, while it is almost impossible to repin a pinned specimen without leaving an ugly hole in the thorax. As regards speed there is not much difference to choose between carding and pinning; with practice, forty or fifty may be set in an hour either way; but in one respect carding has the advantage, viz.:—that the specimens are ready for the cabinet in a day or two after being arranged, while with the other method the specimens must remain on the setting board from four to six weeks, according to the species and state of the atmosphere.

It is obvious that if the smaller Braconidae, Chalcididae, Oxyura, and Cynipidae are to be pinned, it is utterly impossible that the limbs can be stretched out, and with some of the groups, unless great care be taken, the structure and form of the thorax (an important part with Oxyura and Cynipidae) will be distorted, if not

obliterated entirely. These, then, must be pinned with fine wire from beneath (not above), and if it can be avoided, the point should not project above the mesonotum at all. The wire is then stuck into a piece of pith (that from the stalk of Jerusalem artichokes will do), and through this pith an ordinary pin is driven, by means of which it is placed in the cabinet. I possess a collection of Continental Chalcididae and Cynipidae set on this plan, and I am not quite sure but that for general study it is better for the Micro-Hymenoptera than carding; it also saves time, for it is not easy to spread out the organs of insects less than a line in length, while if not properly carded the specimens are worthless. For want of this care the type collections of Chalcididae, etc., made and described by the late Francis Walker are an eyesore, and scarcely of any value.

Should the student prefer to use pins, he ought to get long ones, and place the specimens well up, as by this they are rendered safe from the attacks of Psocidae, while also they can be better examined. There can be no doubt that a collection of insects set on long pins will last three times as long as one set on short ones.

It may be added that the plan, advocated by the Rev. T. A. Marshall, of washing over the card-board with a weak solution of carbolic acid, is an effectual preventive from mites, etc., attacking the insects mounted on the cards treated in this way; and it is also a wise plan to wash over the cabinet and store boxes with the same fluid.

Having said so much on the preparation of the perfect insects, let us now say something regarding the larvae, a branch which, notwithstanding its great interest, has been too much neglected. It ought never to be forgotten that the mere naming of species and the formation of a collection are but the A B C of entomology leading on to the development and anatomy, without a knowledge of which the student may truly be said to know nothing, no matter how many species he may be able to name. The study of the larvae of the Phytophagous Hymenoptera is, however, by no means easy, for it is not at all a simple matter to rear them, this being a good deal owing to the fact that they hibernate over the winter. It is true that this does not apply to those species which are double brooded, but still the first brood is, as a rule, much smaller than the autumnal one, and in Scotland at least, there are

very few double brooded species. It seems, however, to be the universal opinion that the larvae of Tenthredinidae and Cynipidae are much more troublesome to rear than those of Lepidoptera; and it need scarcely be said that when their rearing is carried on in a large city, the difficulties of the investigation are enormously increased. For instance, look how hard it is to get fresh food for the larvae.

Tree or bush-feeding larvae may be obtained by beating the foliage over an umbrella. For those feeding on ground plants a sweeping net is requisite, but it must be handled cautiously, for they do not bear much rough handling, and more success will be had with larvae picked off the plants by the hand than with those obtained by the net. Of course, before this can be done successfully, a knowledge must be gained, in the first place, of the food plant; and in the second place, of the peculiar habits of the larvae, which can only be acquired through observation and experience. For example, some larvae can only be found during the night, never during the day time; others have a peculiar habit of resting curled up in a ring on the underside of the leaf, scarcely visible at all from above; and whenever any thing comes near, down they drop at once to the ground, where they are lost among the herbage. With such species the only plan is to place the open hand cautiously beneath the leaf and gently tap it, when the creature will at once drop down. Searching by hand is not always tedious work, for most larvae are more or less gregarious, and wherever one is discovered more will without doubt be found.

*Inter alia* it may be noted that sawfly larvae devour the leaves differently from those of Lepidoptera. They eat in a cleaner manner, either making an oval or oblong cut in the edge, or in the centre, and they cut through most of the nerves, while caterpillars eat the leaves in a ragged, irregular fashion, generally leaving the nerves standing. By watching for these indications of their presence, I have often been enabled to detect larvae hitherto unknown to me.

In attempting to rear larvae at home, the methods recommended in such works as that of Knaggs, already referred to, will do. The great secret is to keep the creatures in as natural conditions as possible, but of course this is not always easy. Whether they be kept in flower pots, jam pots, or bottles, they should not be

kept too dry nor too moist; if the former, they do not eat readily, and appear not to be able to secrete sufficient silk to make the cocoons; if the latter, they suffer from diarrhoea. If the right conditions are obtained, it is generally possible to get them to spin up, so here it is that a knowledge of their habits becomes of use, and fortunately the various divisions follow more or less the same manner of pupation.

To commence with the larger species, the *Cimbicidæ*, whose larvae are readily known by their large size (generally over one inch), the colour greenish, with or without green or bluish stripes, and dusted over with a white powdery substance. They fasten their cocoons to the bark of the trees which they frequent, and hence no mould is required in their breeding cages; they spin them readily enough to the sides, or to the cocoons already formed. *Abia*, however, pupates in the earth. So also with the *Hylotomidæ*, which will spin on the sides of the cages or in moss.

The *Nematidæ* are the easiest of all to rear. They are easily recognised by having only fourteen ventral legs, slender forms, and generally they feed more or less gregariously along the edge of a leaf. They will spin in mould, moss, or cocoa-nut fibre, the last to be preferred as the cleanest, and not so liable to mould. To the larger species (*Croesus*, etc.) it is desirable to give roomy cages, as they have a habit of throwing the after part of the body about in all directions, and often as many as eight to ten feed on a single leaf. Willow, birch, gooseberry, hawthorn, grasses, are the commonest food plants. To this group belong most of the gallmakers, which are not difficult to rear if the galls be kept fresh as long as the inhabitants are feeding. Some of the *Nematidæ* change colour at the last moult, throwing off all markings, hairs, tubercles, and becoming of a uniform colour.

The *Blennocampidæ* are very small, mostly slimy and slug-like, or covered with spines. They affect willows, oaks, roses, and fruit trees. They spin in the ground.

The larvae of *Emphytus*, *Taxonus*, *Poecilosoma*, etc., have long slender bodies, 22-footed, and when at rest (*Emphytus* at least) remain sitting rolled up on the under surface of the leaf, with the tail turned up from the centre of the ball. They feed on rosaceous plants as a rule, and it is to be noted that they do not spin cocoons nor go down to the earth to spin, but bore into the pith of the plant which they frequent, as with *Emphytus cinctus*, or if they be

feeders on herbaceous plants they bore into various other plants with stems thick enough to contain them. If nothing else is supplied they will form a neatly rolled cell in the earth, but it is better to provide them with cut bramble stems, or what will do equally well, with corks into which they will bore.

Those of *Tenthredo*, *Allantus*, and *Dolerus*, require mould. They feed on willows, birches, or herbaceous plants (*Scrophularia*, *Umbelliferae*, etc.) They are very difficult to rear, and comparatively few of their histories are known.

The *Lydides* either live solitarily in rolled up leaves, or spin leaves together in company. They are not easy to breed, and pupate in the earth.

The best time for larvae is during the autumn, from August to October. Some species occur early (e.g., *Blennocampa lineolata* in June), more particularly those which are double brooded, and these should be especially sought after, for they are easily reared, the whole period of their transformations only lasting five or six weeks, while the autumnal broods remain as larvae over the winter till the spring, and it is during this time that havoc is made in their numbers; it may be owing to too much dryness, too much moisture, mould, or want of vitality in the creatures themselves.

If possible, a collection of the larvae should be made, and this is not difficult, as the only method available is to preserve them in spirit or some other fluid, for they cannot be inflated and dried like some of the *Lepidoptera*. I have tried various fluids, and have no hesitation in recommending Goadby's fluid as one of the best and least expensive. If this be used, care must be taken to put good corks in the bottles or tubes employed, or otherwise the salt will evaporate and accumulate in a crust round the cork; should this happen the fluid of course gets deteriorated. A mixture of glycerine and alcohol will also do, but I have not much experience of it.

We pass now to the gallmaking *Cynipidae*. In order to rear these with any success, it is absolutely necessary that the galls should only be gathered after they have become fully developed, when most of the moisture and sap has disappeared, and the enclosed larvae have ceased feeding. It is to be remarked that the gallmaking *Cynipidae* feed only on the juice (which seems to contain a good deal of starch) while the sawfly gallmakers feed on

the cellular substance. If this rule be neglected, there is no chance of any of the tenants being reared. The galls may be kept either in wide-mouthed glass bottles, or in jam-pots covered with glass (the top of the pot having been ground down so as to allow the glass to fit closely); great care must be taken to see, before placing the galls in the pots, that all superfluous moisture has evaporated, or otherwise they will turn mouldy; but, on the other hand, if they be kept too dry the creatures will perish, so that between the one extreme and the other it is not easy to hit the happy medium. With very succulent galls, it is necessary to expose them to the air of a room before placing them in the breeding jar, or otherwise they are sure to turn mouldy, and even after they have been put into the receptacle it is as well to take off its lid now and again.

In rearing gallflies I have succeeded well by following the plan here described: I take a pickle bottle, put the galls at the bottom, securing them there by some contrivance, cover the mouth with a piece of muslin, and then place the bottle mouth downwards in earth, which is moistened regularly; by this method I reared *Neuroterus lenticularis* from galls plucked in July long before they were developed. Or this plan may be reversed by placing mould at the bottom and the galls at the top, the mould being moistened occasionally. It may be added, however, that the galls of *Neuroterus* are found in abundance developed beneath oaks in the spring, and they need not be collected till then.

In breeding from galls one word of caution is required; it is that the greatest care must be taken that every gall is kept in a distinct bottle, and that all unnecessary leaves, twigs, etc., be removed, or confusion is certain to arise, not only among the gall-makers themselves, but erroneous observations may be made on the innumerable parasites and inquilines; for, fortunately or unfortunately, all galls are infested with them to an astonishing degree, and they form one of the most interesting chapters in the history of the gallmakers.

The dried galls are best mounted on stiff cardboard, or they may be kept separately in pill boxes.

There is little to be said about the parasitic Cynipidae, for the very good reason that very little is known about them, and they offer a wide field for the observing naturalist. They seem to be attached mostly to Diptera and Aphidae.

To guide the student, I have drawn up the following list of the food plants of the Tenthredinidae and Cynipidae. In this list, those having gallmakers are marked\*, leaf miners<sup>o</sup>, and those frequented by unknown species†:—

Clematis Vitalba	Cotoneaster vulgaris
——— erecta	† Comarum palustre
Ranunculus bulbosus	* † Rosa canina, etc.
o ——— repens	* ——— Eglanteria
† ——— Ficaria	* ——— centifolia
Aquilegia vulgaris	* ——— spinosissima
Berberis vulgaris	o Agrimonia Eupatoria
* Papaver Rhæas	* Potentilla reptans
* ——— dubium	† Fragaria vesca
Daucus Carota	Geum urbanum
Brassica campestris, var.	Spiraea Ulmaria
Napus and Rapa	† Alchemilla vulgaris
Sinapis arvensis	Circaea lutetiana
Sisymbrium officinale	Ribes Grossularia
† Cardamine pratensis	——— montana
Hypericum perforatum	Pastinaca sativum
† Viola palustris	Aegopodium Podagraria
o Tilia parvifolia and	Bupleurum falcatum
Europaea	Heracleum Sphondylium
Geranium Robertianum	Anthriscus sylvestris
Impatiens Noli-me-tangere	Sambucus nigra and racemosa
* o Acer pseudo-platanus	Viburnum Opulus
o ——— campestre	Lonicera Xylosteum
† Sarothamnus scoparius	Symphoricarpus racemosus
† Trifolium pratense and	† Valeriana officinalis
† repens	Scabiosa succisa
† Lotus corniculatus	† Petasites vulgaris
Robinia pseudo-acacia	† Solidago Virgaurea
Prunus communis, etc.	* Centaurea Scabiosa and Jacea
——— padus	Achillea Millefolium
o Rubus idaeus	* Hieracium sylvaticum
* o ——— fruticosus, etc.	* Campanula Trachelium
* Pyrus Aucuparia, communis,	* Rhododendron
etc.	* Vaccinium Vitis-Idæa
Crataegus Oxyacantha	† ——— Myrtillus

Lysimachia vulgaris	+ Myrica Gale
Fraxinus exelsior	Fagus sylvatica
Syringa vulgaris	Corylus Avellana
Ligustrum vulgare	Carpinus Betulus
Jasminum	* † o Quercus—most of the species
* Vinca minor	+ Juniperus communis
* Verbascum nigrum	+ Pinus sylvestris
* Scorzonera humilis	Abies communis
Scrophularia nodosa	+ Taxus baccata
+ Veronica Beccabunga, officinalis and chamaedrys	+ Iris Pseud-acorus
* † Nepeta Glechoma	+ Agraphis nutans
Stachys erecta	+ Asparagus officinalis
+ Plantago major, media, etc.	Convallaria multiflora
+ Chenopodium album	+ Narthecium ossifragum
+ Polygonum Bistorta, Aviculare, etc.	Carex—various species
+ Rumex Acetosella, acutus, etc.	+ Triticum repens, etc.
+ Euphorbia	+ Festuca pratensis, etc.
+ Urtica dioica	+ Poa—various species
o Ulmus campestris and montana	Bromus—various species
* o Populus tremula and nigra	Phragmites communis
* o Salix—most of the species	+ Aspidium Filix mas
Betula alba	+ Asplenium Filix-foemina
Alnus glutinosa and alba	* Pteris aquilina
	+ Equisetum limosum
	Eucalyptus

II.—*On the Natural History of Donegal, with some account of its Archæology.* By Mr JAMES A. MAHONY, Corresponding Member.

A glance at a map of Donegal will show that it is a county of considerable extent, generally very hilly, and with a coast line of the most irregular character.

Lough Swilly, Mulroy bay, and Sheephaven, are arms of the sea penetrating southwards from the Atlantic for 12 to 16 miles, and which modify the climate so much that when snow falls, as it does only rarely, it never lies, but disappears in a very short time.

These deep fiords with their marine fauna and flora; the coast outside beaten by the Atlantic surge; the numerous fresh water

loughs, many of them of considerable size; the bogs, mountains, woods, marshes, sands, and cultivated ground, all together present a variety of conditions most favourable to the student of natural history.

I propose now briefly to describe the general Natural History of the county, giving some account of the Geology, Botany, Zoology, and Archaeology of the districts, but reserving more special references to points of interest for some future occasion.

*Geology.*—The distribution of the primary and metamorphic rocks composing the “back-bone” of county Donegal, calls for no special remark. In very local patches and in very small quantities the more valuable minerals and metals occur, but although companies have been formed to develop the so-called mineral wealth, smokeless chimneys and unsightly ruins are all the results which mark the site of conspicuous failure.

Lead, copper, and silver have been at various times sought for, but though found to exist, they were not in such quantities as would pay.

Occasional specimens of gold are found in the quartz, and Mr Harte, county surveyor, has obtained numerous garnets from Gweedore district.

The post-tertiary deposits are everywhere met with, and are often full of interest. The boulder clay is general over the county, but, unlike its equivalent near Glasgow, is usually an agglomeration of sand and hunch-backed pebbles and large stones; tough, stony clay, like the “till” of the West of Scotland, does not exist, so far as I know. It is largely developed on the northern coast at Bloody Foreland, where it forms the sea-cliff 100 feet in height, the matrix being a drab-coloured clay. Overlying the boulder-clay in many places can be seen a coarse gravel, highly charged with peroxide of iron, and, where this is overlaid by turf, the stratum of gravel in contact with the turf is seen to be white instead of a reddish colour like the rest. This appears to be caused by the deoxidation of the iron by the organic matter of the turf. I may here mention that bog iron ore is to be found wherever the land is most bleak and barren. Hundreds of tons of this bog ore are shipped annually from Donegal, mostly to Liverpool and London, where it is used for the purification of gas instead of lime, than which it is reported to be more effectual in removing ammonia and sulphur.

Along the shores of Lough Swilly a light blue clay is found about forty feet above the present sea level. It contains numerous fragments of shells, mostly recent species, and seems to mark the old sea-beach. In one bed, a mile from Ramelton, where the clay is used for brickmaking, I got a part of a deer's horn, which is very completely fossilized, and from the evidence the specimen itself presents, I have no doubt it was used at one time as a small *pick*. These post-glacial and recent clays require working up in the north of Ireland.

Bog is the surface deposit over a large portion of the county. In some places I have found it as much as twenty feet deep, and trees occur abundantly, the fir being more frequent than the oak. I was surprised on visiting, some time ago, Inniskeragh (an island in the Rosses district, west of Torry), to find the sea beating against a seven-foot cliff of bog. I could trace patches of it, too, below the water, and each wave had a peaty fringe—the debris torn from shore and sea bottom. In different places round these Rosses islands the stumps of trees can be seen submerged, and further west, the structures known as “smelting pots,” and which were used some centuries ago for reducing iron, have been seen from a boat on a calm day in three fathoms of water.

There can be no doubt that these facts point to a comparatively recent depression of the land, and from all I have observed, the depression is still going on, although at no place have I found the phenomena so marked as in the Rosses district.

*Botany.*—The influence of plant life in modifying geological conditions is not so often referred to nor so well understood as its influence in modifying climate. An instance of the former came under my notice last summer, in Fannett, thirteen miles north of Ramelton. The shores of that district are very sandy, and no part of them more so than Glassagh, so that the kelp made from the seaweed cast in there brought only a low price. However, some years ago the Earl of Leitrim planted all the bare sand above high water mark with “bent,” and ever since then the sand of the shore has been gradually disappearing, till now it consists of clean stretches of granite rock and beautiful pebbly strands, enabling the cottars to secure the weed free from sand, and get the highest price for their produce. The rationale of the change is this:—The small river which flows into the

Atlantic there was constantly detaching the sand from its banks and carrying it, as also the clouds of sand blown into it by every breeze, down to the sea. The sea, thus perennially fed, cast up the sand all along the shore. The bent now holds the sand together, and already has provided enough vegetable soil by its decay to permit of the growth of a sort of sward composed of *Viola tricolor*, *Anthyllis vulneraria*, *Erqidium cicutarium*, some coarse grasses, and some of the arenaceous mosses. The consequence is that the stream, even in winter, comes down uncontaminated, and the sea—no longer fed as of yore—has washed the Glassagh shore down to its rocky base.

On this same Fannett coast the marine algae may be studied without much effort, as every tide washes in very perfect specimens of many of the deep sea species; while the rock pools are brilliant with *Cladophorae*, *Chylocladiae*, and *Polysiphoniae*. I never saw anywhere such an abundance of *Codium tomentosum*; and *Laurencia pinnatifida* is also to be found in every pool. The economic uses of the algae, decried as useless by old Virgil, is well illustrated here in early summer. In May the old frond of *Laminaria digitata* becomes constricted, and is pushed off by the new frond, and the first storm drives in masses of this weed, forming often a bank four or five feet in depth. The natives call this, in Erse, the *scie weagh*, meaning the "May fleece," and when it is coming in, the scene along shore is an animated one. In one bay I have counted seventy carts, the horses up to the girths in the sea, and men and girls round about forking up the precious crop, which is then spread out above high water mark and dried, and thereafter burned into kelp. About 400 tons of kelp are made in this Fannett district, which has a coast line of only six miles; and these 400 tons imply the gathering and saving of 8,500 tons of wet seaweed. 2,000 tons more are secured for manure—the farmers coming seven or eight miles for it when the *scie weagh* is in.

There is another busy time when the "harvest weed" comes ashore. This may arrive any time from the beginning of August till the end of September, but the weed then consists of the variety *stenophylla* of *Laminaria digitata*. I think this variety should be elevated to the rank of a species, for, apart from its structural differences, it ripens at a different season; it sheds not only its frond but also a portion of the stipes in-

variably ; and its chemical constitution is entirely different from the true *L. digitata*.

Many tons of *Chondrus crispus* and *Gigartina mammillosa* are also collected on this shore. After being bleached and dried they form the article of commerce called "Carrageen moss," used largely in stiffening cloth, and as an article of food. It is sometimes the principal ingredient in so called "calves'-foot jelly."

Leaving the shore, and going further west to Cloghaneely and Rosses, one cannot but be struck by the abundance of the Royal Fern, *Osmunda regalis*. Instead of being the nearly extirpated rarity it is in the Clyde valley, it is here a common weed, fringing with its beautiful fronds the wayside ditches, and in marshy grounds growing in clumps, like a little forest. It is not beloved of farmers, for in their system it is classed with rushes, "fog" (mosses), and Marsh Marygold, which are all to be banished by drainage "when the times mend." Ferns, generally, are not so specifically numerous as in Scotland. One looks in vain for *Allosorus crispus*, *Polypodium dryopteris*, *Aspidium lonchitis*, *Ophioglossum vulgatum*, etc., but within fifteen minutes' walk of Ramelton can be seen *Ceterach officinarum*, *Asplenium ruta-muraria*, *Osmunda regalis*, *Scolopendrium vulgare*, *Hymenophyllum wilsoni*, and *H. tunbridgense*, while *Polypodium phegopteris* and *Aspidium oreopteris* occur near Mulroy bay. *Asplenium marinum* is found here and there near the shore, but is not common.

The Holly (*Ilex aquifolium*) is in remarkable profusion all about Ramelton, and this, with the luxuriant clothing of ivy over the trunks of old oaks, makes bits of fresh colour which the eye delights to rest on all the year round. All this holly, I am convinced, is natural, growing, as it does, on nearly every spot of rough land, on the rocky river-banks, and in all the woods; but it is noticeable that only the plants growing in the open bear berries, those in the woods being, with a very rare exception, infertile.

In the vicinity of this village is a good example of a natural wood, called "Drumonaghan planting," though the substantive is a misnomer. None but truly indigenous trees are to be found, and many of the oaks and elms are evidently very old. In another natural wood at Ballyconly, three miles northwards, grows that rare orchid, the *Aceras anthropophora* or Green Man-orchis. In all the rivers and lochs one cannot fail to meet the yellow and white water-lilies, and the splendid spikes of the cat's-tail (*Typha latifolia*)

adorn the marshy shallows. The mosses would well repay working up, but I have not looked into them yet. Meantime I append a list of the rarer flowering plants and ferns occurring near Ramelton.

*Zoology.*—A sail to Torry island on a calm day in summer would delight the heart of the student of marine zoology. On leaving the shore, the boat glides over a stretch of laminaria-covered bottom, only a few fathoms deep, and through the clear water can be seen the large sea-urchin, *Echinus sphaera*, prowling over the brown seaweed in the society of numerous star-fishes. Further on you may pass through a shoal of thousands of Medusae, and out in the deep water of the Sound of Torry you are almost sure to meet a shoal of Dog-fish (*Spinax acanthias*) if the weather is fine. On one occasion we were able to strike them with oars, so numerous were they swimming on the surface, with half of the back out of the water as they sported in hundreds round about. On that same trip, when near the Torry shore, I saw for the first time the beautiful zoophyte, *Cydidippe pileus*. As these little creatures extended and drew up their long tendril-like tentacles, glowing all the while in bright colours in the evening sunlight, they seemed far more beautiful in the great ocean aquarium than when within the limits of a glass case.

The estuarine shores of Lough Swilly yield numerous species of mollusca, and which have been well wrought out by the Rev. Mr Falconer of Rathmullan. In some places, as at Fort-Stewart and Ballgreen, the whole littoral zone is covered with the shells of *Anomia ephippium* and *Pecten striatus*, locally called "Leitrigans," while thousands of valves of the oyster, *Ostrea edulis*, recall the days when that succulent bivalve could be bought here for threepence per hundred!

In the river Leannan, which flows into Lough Swilly, the salmon-fishing is prolific enough to justify a local merchant in paying £500 a year for the privilege of netting. The fishing lasts from February till August, this being what is called an early river. I took the temperature of the water for a season, and found it to be a few degrees higher, on an average, than that of some other Irish rivers where the salmon is later.

As for Mammalia, the Otter (*Lutra vulgaris*) is too common in the river Leannan, preying on the salmon, of which it eats only a mouthful or two from the back. The Squirrel (*Sciurus*

*vulgaris*) is not recorded as occurring in the North of Ireland, but I saw it twice in Drumonaghan wood in 1875. I have heard that Lord George Hill of Ballyarr kept some in confinement some time ago, and it may be that those I saw were "escapes" from his place, but I have not been able to confirm the truth of this.

We have the Stoat (*Mustela erminea*), and also a smaller member of the genus, lighter in colour, and with no black tuft on the end of the tail. A specimen of the latter will be submitted to the Society shortly, to determine whether it is the *M. vulgaris* or not.

The Pine Marten (*Martes abietum*) is sometimes spoken of as the "Ferret," and is seen now and again. Mr Samuel Stewart of the Rooghan followed one for a considerable distance not long ago, but had no means of capturing it. He says they are in the habit of taking possession of nests abandoned by the Magpie. He saw, he informs me, a pair of Badgers (*Meles taxus*) in the gap of Barnes—a rocky pass, ten miles from this—and one at Lough Salt, about the same distance in a more easterly direction.

It seems to be true, so far as my experience goes, that there are no moles, toads, nor snakes in Ireland.

Captain Pepper, now of Castlebar, informs me that he got specimens of the old British or Black Rat (*Mus rattus*) in an island in Mulroy bay, about four miles from Ramelton. I purpose endeavouring to confirm this during the summer.

Donegal can give a good account of birds, from the lordly Eagle downwards. The Golden Eagle (*Aquila chrysaetus*) has been shot often; one was captured alive near Dunfanagby, and is now in the possession of Mr Alford of Falcaragh. Mr Hill of Ramelton has had a Peregrine Falcon (*Falco peregrinus*) in a cage for many months, and it seems hearty and contented; the Merlin (*Falco aesalon*) I have been able to keep living for four months in confinement, feeding it on raw beef, and some of my neighbours have succeeded in making tolerable pets of the Barn Owl (*Strix flammea*), and of another species which agreed best with the description of the Tawny Owl (*Syrnium aluco*); it was neither the Barn Owl nor the Long-eared Owl. The Raven (*Corvus corax*) builds near Malinhead, and an occasional pair of these birds are seen at Innistrathull and the coast round about. Some years ago they were frequent visitors here, and Mr Robert Greer of Aughnish

shot one after he had seen it, he says, lift an egg in its bill which had been dropped by a duck, and hide it some distance off in a "cow-track,"—that is, a depression in the ground caused by the cow's feet. This bird used to be seen about Ramelton, but not since 1858, when one was well known for its capturing stray fowls, but always escaped the gun.

As for the birds near at hand, there is a sufficient variety to maintain one's interest in these charming neighbours. The Song Thrush (*Turdus musicus*) makes musical the dawn and the gloaming, from February on till the middle of April. One particularly fine performer sings from a horse-chesnut in the garden, and with such effect that the village folk will come over sometimes, specially to hear what they call "the Irish nightingale," though in other parts of Ireland that title is given only to the Sedge Warbler (*Salicaria phragmitis*). The Magpie (*Pica caudata*) is constantly with us, and a colony of Jackdaws (*Corvus monedula*) builds in some of the old chimneys. The Wren (*Troglodytes vulgaris*), Bullfinch (*Pyrrhula vulgaris*), and Swallow (*Hirundo rustica*) build about the place, and we are infested with Blackbirds (*Turdus merula*). In the winter you may see any day on the river behind my house the Common Heron (*Ardea cinerea*), the Water-hen (*Gallinula chloropus*), and the Cormorant (*Phalacrocorax carbo*); while in early summer, or sometimes even on a winter's day, one may mark the gleam of the Kingfisher (*Alcedo isipida*) in his swift flight up the stream. Widgeon (*Anas penelope*), Teal (*Anas crecca*), and Bernicle geese (under which name are known both *Anser torquatus* and *A. leucopsis*) frequent the muddy flats of the Swilly in winter, and are shot in numbers by those enthusiastic enough to lie out all night in a flat-bottomed boat.

*Archaeology.*—By the student of antiquity this county of Donegal is held in reverence, as the birthplace of Saint Columb, and numerous are the legends connecting him with every hill and island and lough.

The island of Torry is said to have been the scene of his missionary labours and miraculous exploits; but be that as it may, it is full of interest to the antiquary.

Besides two old crosses—one of them of limestone, which must have been brought from a great distance—and the ruins of a preaching station, it contains a round tower in fair preservation. This round tower is of small dimensions—the height not exceed-

ing 51 feet, while the diameter is 17 feet 2 inches. It is built of red granite boulders, seemingly untouched by chisel or hammer, and every little crevice is most carefully built in with smaller stones and chips, so that even without the shelly lime, which has been used only in small quantity, the structure would be most substantial and firm. Irish round towers are all, indeed, so carefully built, and resist so effectually climatic influences, that the poet speaks of them as "the conquerors of time;" and when one was blown down a few years ago, it lay unbroken at length and entire on the ground like a huge cannon.

In the districts of Fannett and Rossgull shell-mounds can be counted by the score; the most typical being in the latter quarter. To reach them you start from the village of Carrigart, the journey then being over a sandy waste about two miles broad, on which the landlord has considerably placed finger posts to guide the traveller. After other two miles of rocky land are got over you arrive at Dundoan, and here the shell mounds are frequent. They are invariably near the shore and above high water mark, being readily recognisable even some distance away by their rising in rounded outline eight or nine feet above the level of the sandy shore. They all contain heaps of rough stones, which may be the remains of the hut, but the bulk of the mound is composed of the shells of such edible molluscs as *Littorina littorea*, *Patella vulgaris*, *Buccinum undatum*, *Cardium edule*, and *Cardium echinatum*. Bones also of horse, cow, sheep, and pig are common, and almost always split up, an entire bone being rare. Fragments of stone bearing the marks of fire are the only other remains indicative of man's presence. These shell mounds are less rich in remains than those of the Hebrides, some of which I described in a paper read before the Society on March 29th, 1870.

As to the age of these Donegal kitchen-middens, I would not be disposed to claim for them a high antiquity. That they are not of yesterday, however, is clear from the fact that on the shore adjacent neither periwinkles nor limpets can now be got, and the oldest inhabitant has no tradition even of the origin of the mounds.

They probably mark the site of the summer residence of Donegal folk of the fifteenth or sixteenth century, who annually left their mountain pastures to eke out their scanty food supply by laying under contribution the shell-fish of Mulroy water.

Of greater age, generally, are the lake dwellings or "crannoges," of which there are a few examples in this neighbourhood. Owing to the extensive drainage which has been going on during the last few years in Ireland, the level of the lakes has been lowered, and thus have been revealed some of these old dwellings long lost to sight. These crannoges are small islands, built upon piles, entirely in the water, and surrounded by a stockade driven into the bed of the lake, and bound together by horizontal beams of oak, which were morticed to the piles, and on them seem to have been erected the dwellings and other buildings of the inhabitants. One such has recently been exposed in Portlough, on the other side of Fort-Stewart, four miles from Ramelton. The island in the centre of this lough rests on piles, and several objects connecting it with man have been discovered. In the crannoges there are generally found a few large slabs of stone, which seem to have been used as hearth-stones. They would indicate that there was only one kitchen for the island, for here are found the bones of sheep, oxen, deer, and fish. In Lough Columbkille, near Milford, there is a small island which may be an example of the lake dwelling, as there are apparent signs of a causeway out to the island, and the stones which are heaped on it have evidently been placed there by man.

The Swiss lake dwellings are certainly much more ancient than these Irish crannoges, for flint arrow heads and stone celts form a notable proportion of the remains found in them, but the implements associated with the Irish lake dwellings are mostly of iron. Moreover, there is documentary evidence of the occupation of lake fortresses in the time of Elizabeth, and of some at an even later date. The following passage is from a letter, dated 1567, in answer to an enquiry from the English Government as to what castles or forts O'Neill had, and "of what strength they be":—

"For castles I think it be not unknown to y<sup>r</sup> honours he trusteth no point thereunto for his safety, as appeareth by the raising of the strongest castles of all his countreys, and that fortifications he only dependeth upon is in sartin *fresh water loghes* in his countrey, which from the sea there cometh neither shippe nor boat to approache them. It is thought then in the said fortified islands lyeth all his plate, which is much, and many prisoners. The islands hath in war before been attemptid, and

now of late again by the L<sup>d</sup> deputy Sir Harry Sydney, which for want of means for safe conduct upon the water it hath not prevailed."

This district is rich in paleolithic remains. Three miles hence, near to Milford, are two cromlechs; on a hill in the townland of Gortnavern, overlooking Kerrykeel, is an excellent example, spoken of by the country people as "the giant stones;" near Cranford, six miles away, there are three cromlechs; half a mile from Gortahork is another, which I stumbled on quite by accident. Their general character is the same throughout. On two, or sometimes three, large boulders rests a massive slab, often four or five tons in weight, but generally of the same geological character as the smaller supporting stones, whether grey granite or gneiss. It is difficult to conceive how these early people lifted and placed such ponderous stones, and difficult, too, to determine the purpose to which they were devoted. In some cases fragments of what appeared to be a funeral urn was found in the soil adjacent, which would indicate that the cromlechs were intended to mark the last resting place for the ashes of some hero, but they probably were also used for sacrifice as altar stones. I hope to return to the more minute discussion of some of the subjects referred to in this general sketch at some future time.

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#### I.—THE BIRDS OF COUNTY DONEGAL.\*

(Some on the authority of Mr Hill of Ramelton).

Golden Eagle, . . . .	<i>Aquila chrysaëtus</i> (Linnaeus).	Captured near Dunfanaghy.
Peregrine Falcon, . . . .	<i>Falco peregrinus</i> , Gmelin.	Captured near Creeslough.
Kestrel, . . . .	<i>Falco tinnunculus</i> , Lin.	Woods at Ramelton.
Merlin, . . . .	<i>Falco aesalon</i> , Gmelin.	Claragh.
Sparrow Hawk, . . . .	<i>Accipiter nisus</i> (Linnaeus).	Moyle Hill.
White or Barn Owl,	<i>Strix flammea</i> , Linnaeus.	
Tawny Owl, . . . .	<i>Syrinum aluco</i> (Linnaeus).	
Pied Flycatcher, . . . .	<i>Muscicapa atricapilla</i> , Linnaeus.	
Dipper, . . . .	<i>Cinclus aquaticus</i> , Bechstein.	Common on river Leannan.

\* The nomenclature followed is that of Harting's Handbook of British Birds, London, 1872.

Songthrush, . . .	<i>Turdus musicus</i> , Linnaeus.
Fieldfare, . . .	<i>Turdus pilaris</i> , Linnaeus. Very common.
Blackbird, . . .	<i>Turdus merula</i> , Linnaeus.
Ring Ouzel, . . .	<i>Turdus torquatus</i> , Linnaeus. On river Leannan.
Hedge Sparrow, . . .	<i>Accentor modularis</i> (Linnaeus).
Redbreast, . . .	<i>Erythaca rubecula</i> (Linnaeus).
Stonechat, . . .	<i>Saxicola rubicola</i> (Linnaeus).
Wheatear, . . .	<i>Saxicola aenanthe</i> (Linnaeus).
Garden Warbler, . . .	<i>Sylvia hortensis</i> (Gmelin).
Chiff Chaff, . . .	<i>Phylloperuete rufa</i> (Latham).
Common Wren, . . .	<i>Troglodytes parvulus</i> , Koch.
Blue Titmouse, . . .	<i>Parus caeruleus</i> , Linnaeus.
Long-tailed Titmouse	<i>Acredula rosea</i> (Blyth).
Pied Wagtail, . . .	<i>Motacilla yarelli</i> , Gould.
Grey Wagtail, . . .	<i>Motacilla boarula</i> , Latham.
Ray's Wagtail, . . .	<i>Motacilla rayi</i> , Bonaparte.
Tree Pipit, . . .	<i>Anthus arboreus</i> , Bechstein.
Sky Lark, . . .	<i>Alauda arvensis</i> , Linnaeus.
Shore Lark, . . .	<i>Alauda alpestris</i> , Linnaeus.
Yellow Bunting, . . .	<i>Emberiza citrinella</i> , Linnaeus.
Chaffinch, . . .	<i>Fringilla coelebs</i> , Linnaeus.
Goldfinch, . . .	<i>Fringilla carduelis</i> , Linnaeus.
Linnet, . . .	<i>Linota cannabina</i> (Linnaeus).
Twite, . . .	<i>Linota flavirostris</i> (Linnaeus).
House Sparrow, . . .	<i>Passer domesticus</i> (Linnaeus).
Greenfinch, . . .	<i>Coccothraustes chloris</i> (Linnaeus).
Bullfinch, . . .	<i>Pyrrhula vulgaris</i> , Temminck.
Starling, . . .	<i>Sturnus vulgaris</i> , Linnaeus.
Raven, . . .	<i>Corvus corax</i> , Linnaeus.
Carrion Crow, . . .	<i>Corvus corone</i> , Linnaeus.
Rook, . . .	<i>Corvus frugilegus</i> , Linnaeus.
Jackdaw, . . .	<i>Corvus monedula</i> , Linnaeus.
Magpie, . . .	<i>Pica caudata</i> , Fleming.
Jay, . . .	<i>Garrulus glandarius</i> (Linnaeus). Seen twice at Kilmacrenan.
Green Woodpecker, . . .	<i>Picus viridis</i> , Linnaeus.
Cuckoo, . . .	<i>Cuculus canorus</i> , Linnaeus.
Kingfisher, . . .	<i>Alcedo ispida</i> , Linnaeus.
Swallow, . . .	<i>Hirundo rustica</i> , Linnaeus.
Martin, . . .	<i>Hirundo urbica</i> , Linnaeus.
Sand Martin, . . .	<i>Hirundo riparia</i> , Linnaeus.
Swift, . . .	<i>Cysselus apus</i> , Linnaeus.
Ringdove or Woodpigeon,	<i>Columba palumbus</i> , Linnaeus.

Pheasant, . . .	<i>Phasianus colchicus</i> , Linnaeus.
Red Grouse, . . .	<i>Tetrao scoticus</i> , Latham.
Grey Partridge, . . .	<i>Perdix cinerea</i> , Latham.
Quail, . . .	<i>Coturnix vulgaris</i> , Fleming.
Golden Plover, . . .	<i>Charadrius pluvialis</i> , Linnaeus.
Lapwing, . . .	<i>Vanellus cristatus</i> , Meyer.
Common Redshank, . . .	<i>Totanus calidris</i> (Linnaeus).
Common Sandpiper, . . .	<i>Tringoides hypoleucus</i> (Linnaeus).
Sanderling, . . .	<i>Calidris arenaria</i> (Linnaeus).
Woodcock, . . .	<i>Scolopax rusticola</i> , Linnaeus.
Great Snipe, . . .	<i>Gallinago major</i> (Gmelin).
Common Snipe, . . .	<i>Gallinago media</i> , Leach.
Jack Snipe, . . .	<i>Gallinago gallinula</i> (Linnaeus).
Curlew, . . .	<i>Numenius arquatus</i> (Linnaeus).
Whimbrel, . . .	<i>Numenius phaeopus</i> (Linnaeus).
Common Heron, . . .	<i>Ardea cinerea</i> , Linnaeus.
Common Bittern, . . .	<i>Botaurus stellaris</i> (Linnaeus).
Water Rail, . . .	<i>Rallus aquaticus</i> , Linnaeus.
Land Rail or Corn Craik,	<i>Crex pratensis</i> , Bechstein.
Moorhen, . . .	<i>Gallinula chloropus</i> (Linnaeus).
Coot, . . .	<i>Fulica atra</i> , Linnaeus.
Wild Swan or Whooper,*	<i>Cygnus musicus</i> , Bechstein.
Grey Lag Goose, . . .	<i>Anser ferus</i> (Gmelin).
Bernicle Goose, . . .	<i>Anser leucopsis</i> , Bechstein.
Sheldrake, . . .	<i>Tadorna vulpanser</i> , Fleming.
Wild Duck, . . .	<i>Anas boschas</i> , Linnaeus.
Wigeon, . . .	<i>Anas penelope</i> , Linnaeus.
Teal, . . .	<i>Querquedula crecca</i> (Linnaeus).
Golden Eye, . . .	<i>Clangula glaucion</i> (Linnaeus).
Eider Duck, . . .	<i>Somateria mollissima</i> (Lin.). Seen in Mulroy.
Goosander, . . .	<i>Mergus merganser</i> , Linnaeus.
Great Northern Diver, . . .	<i>Colymbus glacialis</i> , Linnaeus.
Black-throated Diver, . . .	<i>Colymbus arcticus</i> , Linnaeus.
Great-crested Grebe, . . .	<i>Podiceps cristatus</i> (Linnaeus).
Red-necked Grebe, . . .	<i>Podiceps rubicollis</i> (Gmelin).
Guillemot, . . .	<i>Uria troille</i> (Linnaeus).
Little Grebe, . . .	<i>Podiceps minor</i> (Gmelin).
Cormorant, . . .	<i>Graculus carbo</i> (Linnaeus).
Shag, . . .	<i>Graculus cristatus</i> (Faber).
Gannet, . . .	<i>Sula bassana</i> (Linnaeus).
Arctic Tern, . . .	<i>Sterna hirundo</i> , Linnaeus.
Little Gull, . . .	<i>Larus minutus</i> , Pallas.

\* The Black Swan, *Cygnus atratus*, Latham, has been seen three times on Loch Fern since 1868.

Black-headed Gull, . . .	<i>Larus ridibundus</i> , Linnaeus.
Kittiwake, . . .	<i>Larus tridactylus</i> , Linnaeus.
Common Gull, . . .	<i>Larus canus</i> , Linnaeus.
Great black-backed Gull, .	<i>Larus marinus</i> , Linnaeus.
Storm Petrel, . . .	<i>Procellaria pelagica</i> , Linnaeus.

II.—SOME OF THE RARER PHANEROGAMOUS PLANTS AND FERNS  
FOUND IN COUNTY DONEGAL.

*Phanerogams.*

Celery leaved Crowfoot, . . . . .	<i>Ranunculus sceleratus</i> .
Globe flower, . . . . .	<i>Trollius Europaeus</i> .
Hairy Rock-cress, . . . . .	<i>Arabis hirsuta</i> .
Common Whitlow-grass, . . . . .	<i>Draba verna</i> .
Thyme-leaved Flax-seed, . . . . .	<i>Radiola millegrana</i> .
Tutsan, . . . . .	<i>Hypericum Androsaemum</i> .
St. Marsh John's Wort, . . . . .	————— <i>clodes</i> .
Meadow Crane's-bill, . . . . .	<i>Geranium pratense</i> .
Musky Stork's-bill, . . . . .	<i>Erodium moschatum</i> .
Common Agrimony, . . . . .	<i>Agrimonia Eupatoria</i> .
Mare's-tail, . . . . .	<i>Hippuris vulgaris</i> .
Water Purslane, . . . . .	<i>Peplis Portula</i> .
Rose-root, . . . . .	<i>Sedum Rhodiola</i> .
Biting Stonecrop, . . . . .	————— <i>acre</i> .
London-Pride, . . . . .	<i>Saxifraga umbrosa</i> .
Starry-Saxifrage, . . . . .	————— <i>stellaris</i> .
Sea-Holly, . . . . .	<i>Eryngium maritimum</i> .
Wild Celery, . . . . .	<i>Apium graveolens</i> .
Lamb's Lettuce . . . . .	<i>Fedia olitoria</i> .
Nodding Bur-Marigold, . . . . .	<i>Bidens cernua</i> .
Water Lobelia, . . . . .	<i>Lobelia Dortmanna</i> .
Cow-berry, . . . . .	<i>Vaccinium Vitis-Idaea</i> .
Black Bear-berry, . . . . .	<i>Arctostaphylos Uva-Ursi</i> .
Intermediate Winter-green, . . . . .	<i>Pyrola media</i> .
Common Gromwell, . . . . .	<i>Lithospermum officinale</i> .
Common Comfrey, . . . . .	<i>Symphytum officinale</i> .
Mountain Speedwell, . . . . .	<i>Veronica montana</i> .
Marsh Speedwell, . . . . .	————— <i>scutellata</i> .
Water Fig-wort, . . . . .	<i>Scrophularia aquatica</i> .
Gipsy-wort, . . . . .	<i>Lycopus Europaeus</i> .
Variogated Hemp-Nettle, . . . . .	<i>Galeopsis versicolor</i> .
Pale Butter-wort, . . . . .	<i>Pinguicula Lusitanica</i> .
Sea-blite, . . . . .	<i>Suaeda maritima</i> .
Pale-flowered Polygonum, . . . . .	<i>Polygonum lapathifolium</i> .
Water Pepper, . . . . .	————— <i>Hydropiper</i> .

Crowberry, . . . . .	<i>Empetrum nigrum.</i>
Dwarf-Spurge, . . . . .	<i>Euphorbia exigua.</i>
Wall-Pellitory, . . . . .	<i>Parietaria officinalis.</i>
Least-Willow, . . . . .	<i>Salix herbacea.</i>
Common Juniper, . . . . .	<i>Juniperus communis.</i>
Common Yew, . . . . .	<i>Taxus baccata.</i>
Common Tway-blade, . . . . .	<i>Listera ovata.</i>
Heart-leaved Tway-blade, . . . . .	——— <i>cordata.</i>
Green Man-orchis, . . . . .	<i>Aceras anthropophora.</i>
Broad-leaved Garlic, . . . . .	<i>Allium ursinum.</i>
Lesser Water-Plantain, . . . . .	<i>Alisma ranunculoides.</i>
Great Reed-mace, . . . . .	<i>Typha latifolia.</i>
Floating Bur-weed, . . . . .	<i>Sparganium natans.</i>
Grassy Pond-weed, . . . . .	<i>Potamogeton gramineus.</i>
Spreading Millet-grass, . . . . .	<i>Milium effusum.</i>
Water Whorl-grass, . . . . .	<i>Catabrosa aquatica.</i>
Common Quaking-grass, . . . . .	<i>Briza media.</i>

*Ferns, etc.*

Common Ceterach, . . . . .	<i>Ceterach officinarum.</i>
Pale Mountain Polypody, . . . . .	<i>Polypodium Phegopteris.</i>
Heath Shield-fern, . . . . .	<i>Aspidium Oreopteris.</i>
Sea Spleen-wort, . . . . .	<i>Asplenium marinum.</i>
Scottish Filmy-fern, . . . . .	<i>Hymenophyllum Wilsoni.</i>
Tunbridge Filmy-fern, . . . . .	——— <i>Tunbridgense.</i>
Common Osmond royal, . . . . .	<i>Osmunda regalis.</i>
Common Moon-wort, . . . . .	<i>Botrychium Lunaria.</i>
Lesser Alpine Club moss, . . . . .	<i>Lycopodium selaginoides.</i>
European Quill-wort, . . . . .	<i>Isoetes lacustris.</i>

III.—*A New Species of Sulcoretepora.* By Dr YOUNG and  
Mr JOHN YOUNG, F.G.S. With a Plate.

*Sulcoretepora Robertsoni*, Y. & Y.

Polyzoary erect, cylindrical, branching dichotomously; branches  $\frac{1}{2}$  to  $\frac{3}{4}$  of an inch apart, nearly circular in section; diameter about  $\frac{1}{2}$  a line, the greater thickness at the points of bifurcation; the angle of divergence about  $45^\circ$ . Cells oval, depressed, usually arranged round the stems in 8 to 10 parallel rows, each row containing 18 cells in  $\frac{1}{4}$  of an inch, the cells being about their own length apart. Irregular tuberculated ridges separate the rows of cells, giving the stem and branches an angular cross section.

Between each pair of cells, in a longitudinal series, 1 to 3 pores occur, normally above each cell aperture, and in well preserved specimens tubercles surround each cell-area more or less completely.

The genus *Sulcoretepora* was founded by D'Orbigny in 1847, with the following definition:—"Cells in series in furrows on one side of simple depressed branches." In the genus thus defined have been included, since 1847, species having the cells dispersed all round the stems.

To this genus are referred the following species found in the Glasgow district, viz.:—*S. parallela*, Phil., *S. varicosta*, M'Coy. The species above described differs from all those previously recorded, by its small size, circular section, dichotomy, and surface ornamentation. We have pleasure in naming it after Mr David Robertson, F.L.S., F.G.S., to whom we owe the loan of some of the specimens figured.

The cells are not always equally distributed round the stem; thus stems, usually the thicker ones, may have the cells on one face fewer and smaller, and even reduced, as in fig. 1, to orifices not larger than those already referred to as pores. Again, as in fig. 8, the cells may be of unequal size, the pores remaining equal. This is most frequent near the points of bifurcation where new rows become intercalated between those of the stem. We have already described and figured Carboniferous Polyzoa\* in which pores occur in the longitudinal series, as in *Glaucanome stellipora* and *Actinostoma fenestratum*. The present species seems to render more probable the avicularian character of these orifices, every gradation of aperture being seen, from the cell slightly smaller than usual, down to pore-like openings. Further, the tubercular ridges which bound the cells are, as in figs. 3, 5, and 11, seen to surround small cell apertures and also the intercellular pores. No ovicells are to be recognised.

*S. Robertsoni* is moderately common in a thin bed of light-grey shale (Lower Limestone series) at Trearne, near Beith, but the specimens are somewhat worn. Fragments have been found in shale at Brockley near Lesmahagow, and at Auchenskeoch near Dalry, but at both these localities the species seems to be rare.

\* Quart. Journ. Geol. Soc. Lond., Vol. xxx., p. 681.

## EXPLANATION OF THE PLATE.

*All the Figures were drawn with the Camera lucida.*

Fig. 1.—Stem showing (obverse ?) face with cells of various sizes, some no larger than pores.  $\times 40$ .

Fig. 2.—Portion of stem showing cell without pores; groups of pores without cells; and an intercalated row of cells.  $\times 40$ .

Fig. 3.—Well preserved fragment showing tubercular ridges surrounding cells, pores, and (aborted ?) cells. At one point in the left hand row a space is enclosed between two transverse tubercular ridges, but no cell nor pore is visible in it.  $\times 120$ .

Fig. 4.—Transverse division of cell aperture, the upper chamber seeming to replace pores.

Fig. 5 shows cells of various sizes, and pores, surrounded by tubercular ridges. In the middle row one cell is transversely divided, while immediately below it two cells are associated with one group of pores.

Fig. 6 shows numerous tubercular ridges, some without intervening cells.

Fig. 7.—Single cell, from worn specimen, with two pairs of pores.

Fig. 8.—Bifurcating stem, showing confluence of intercalated rows, irregular arrangement of pores, and abortion (?) of cells at angle of bifurcation.  $\times 60$ .

Fig. 9.—Branch  $\cdot 028$  in diameter, showing, in left hand row, transverse division of a cell, while in each of the two upper cells of the same row, the lowest of the three pores is included by a  $\Lambda$  shaped ridge within the same area as the cell aperture.

Figs. 10 and 11.—Fragments showing irregularity in number, size, and position of pores.

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FEBRUARY 27TH, 1877.

Mr James Ramsay, Vice-President, in the chair.

## SPECIMENS EXHIBITED.

Mr John Kirsop exhibited a horn and portion of the skull of the extinct ox *Bos longifrons*, found at Pollokshaws Road in sandy clay six feet below the surface. It had been forwarded by Mr Gillespie, inspector to the Water Commissioners, and is the second recorded specimen found in the West of Scotland. Mr Kirsop also showed a collection of fishes from the river Amazon, and from Rio Grande do Sul, South America. The collection embraced examples of a flying fish of the gurnard family *Prionotus*; a trunk fish, *Ostracion*; a skate or ray, *Raia*; a spinous globe fish, *Diodon*; a sucking fish, *Echineis*, 21 inches in length; a speat fish, *Loricaria*; and two species of lobsters. These had been forwarded by Mr James Albert Smith, and with





his permission were presented by Mr Kirsop to the Hunterian Museum.

Mr John Young, F.G.S., showed a series of small turbinated corals from the weathered limestone, found at Cunningham Bedland, near Dalry, varying in size from a quarter to half an inch in length. These corals apparently belong to the genus *Cyathaxonia*, and are characterized by their deep cup or calice, prominent central columella, and by having the septa well marked, and continuous from the outer edge to the bottom of the calice. One species of this genus, *Cyathaxonia cornu*, Michelin, has already been noted in the catalogue of the Western Scottish Fossils, Glasgow, 1876, as being found in the limestone shales at Brockley, near Lesmahagow, but it probably differs from the species found at Dalry in not being adherent. Prof. Milne Edwards and Prof. De Koninck describe the genus *Cyathaxonia* as being adherent by its base in some species and being free in others; *C. cornu* being free, *C. Konincki* being adherent. Mr Young said he was therefore inclined to identify his specimens with this latter form. Those exhibited from Cunningham Bedland seemed to have become adherent in nearly every instance to the spines of *Producti*, the groove of attachment to the spines being well seen in most specimens. In a few specimens, Mr Young had found the outer theca of the corallum completely encircling the spine of the *Productus*, which had since been dissolved away, leaving an open tube through which he had passed strong hair bristles to represent the spines. The carbonate of lime in these corals had since their entombment been replaced by silica, which had resisted the weathering influences of the air; hence the specimens show their deep cup and internal structure very clearly. The only other adherent turbinated corals he had yet seen from our Scottish Carboniferous strata were two specimens found by Mr David Robertson at Shiells quarry, near East Kilbride, but they, from their difference in size and broad base of attachment, evidently belong to a different genus from *Cyathaxonia*.

Mr Young exhibited two other groups of small turbinated corals belonging to the genera *Lophophyllum* and *Zaphrentis*, which showed no attachment by their theca, even in the most perfect specimens. He therefore concluded that not only these

genera, as well as many of the larger turbinated corals found in our limestone strata, had been free organisms, and had grown in the sediments in which they are now entombed without any visible mode of attachment, being possibly supported by the surrounding mud in an upright position. Only in a few rare instances have any of the larger turbinated corals been found with marks of attachment, and these were seen to have been in the younger state; these, therefore, differ from the adherent form of *Cyathaxonia* now exhibited, in this respect, that the latter is not known to have had a free existence in any later stage of its history.

## PAPERS READ.

I.—*Notes on some Spiders collected in the West of Scotland in 1876.*

By Mr HENRY C. YOUNG.

Very little has yet been done in collecting, or forming a catalogue, of Scottish spiders, the only published local lists I know of being those of Messrs Hardy in Berwickshire and Traill in Aberdeenshire, while up to the present time there is no general list of Scottish spiders published. The specimens I exhibit to-night comprise 20 genera and 39 species, which form but a very small proportion of the known British spiders. I hope, however, to make considerable additions to this number from time to time, as I am convinced that the district will produce a much greater variety of species than those I have already taken, there being many spiders common in other parts of Scotland which I have not yet seen in the vicinity of Glasgow.

The principal authority on the order in this country, the Rev. O. P. Cambridge, has examined my specimens, and I have followed the arrangement published by him in the Transactions of the Linnaean Society.

*Harpactes Hombergii*, Scopoli.—Of this species I took several specimens at Arthur's Seat in May, but have not yet found it near Glasgow. It is common in the North of England.

*Segestria senoculata*, Linnaeus.—This species is very common in the district, and seems to be generally distributed in Great Britain. It is longer lived than most spiders, not attaining maturity for two years. It passes the winter in a kind of silken tube under stones, where it may be found at all times.

*Cheiracanthium nutrix*, Westring.—This is an extremely rare spider; the specimen I exhibit was taken near Milngavie. When Blackwall's large work was first published, only one British specimen was known. It has since been met with, but is still exceedingly rare.

*Amaurobius fenestralis*, Stroem.—This is one of the commonest spiders we have, and may be found at any time under stones, beneath the bark of trees, and in other similar situations.

*Tegenaria Derhamii*, Scopoli.—This seems to be the usual spider found in houses in this district.

*Erigone Douglasii*, Cambridge.—This spider is known to science by only two specimens: the first was taken by Mr Douglas in Kirkcudbrightshire, in 1875, and the other specimen, which I exhibit to-night, was taken by myself in Cumbernauld Glen in April, 1876. Both these specimens are females: the male is not yet known, and until more specimens are found it is impossible to say anything regarding its distribution.

The following is a complete list of the species exhibited, with the localities where they were found:—

*Harpactes Hombergii*, Scopoli.—Several specimens taken at Arthur's Seat in May.

*Segestria senoculata*, Linn.—Common everywhere.

*Clubiona reclusa*, Cambridge.—Is not uncommon in various localities in the district; I have taken it at Milngavie and Kenmuir.

*Cheiracanthium nutrix*, Westr.—1 specimen taken near Milngavie.

*Amaurobius fenestralis*, Stroem.—Common everywhere.

*Tegenaria Derhamii*, Scopoli.—Common in buildings.

*Tetrax denticulata*, Oliv.—Taken near Milngavie.

*Theridion sisyphium*, Clerck.—Common in the district.

*Theridion pallens*, Blackwall.—1 specimen taken by the Allander.

*Nesticus cellulanus*, Clerck.—1 specimen taken in Cumbernauld Glen.

*Phyllonethis lineata*, Clerck.—Common.

*Erigone rubens*, Blackwall.—1 specimen taken by the Allander.

*Erigone Douglasii*, Cambridge.—1 specimen taken in Cumbernauld Glen in April.

*Erigone acuminata*, Blackwall.—Not uncommon: taken at Strathblane, Cumbernauld Glen, etc.

*Pachygnatha Clerckii*, Sundevall.—1 specimen from the Allander.

*Pachygnatha Degeerii*, Sund.—1 specimen from the Allander.

*Linyphia tenebricola*, Reuss-Wider.—Taken at Kelvinside, Kenmuir, etc.

*L. variegata*, Blackwall.—Taken at Cadder and Kenmuir.

*L. socialis*, Sund.—Taken at Loup of Fintry and Cadder.

*L. concolor*, Reuss-Wider.—1 specimen taken at Cadder.

*L. triangularis*, Clerck.—Taken at Moffat, Milngavie, and Bearsden.

*L. peltata*, Reuss-Wider.—Taken at Cumbernauld and Cadder.

*L. pusilla*, Sund.—1 specimen taken at Blairmore.

*Meta segmentata*, Clerck.—Common.

*M. Merianae*, Scop.—Not common: taken at Baldernock and by the Allander.

*Zilla-x-notata*, Clerck.—Not common.

*Z. atrica*, Koch.—Common.

*Epeira cucurbitina*, Clerck.—1 specimen taken at Cadder.

*E. diademata*, Clerck.—Common.

*E. cornuta*, Clerck.—1 specimen taken by Allander.

*E. quadrata*, Clerck.—Taken at Ben Voirlich, Clober, etc.

*Xysticus cristatus*, Clerck.—Common.

*Trochosa ruricola*, De Geer.—Taken in several localities.

*T. terricola*, Thorell.—Common.

*Lycosa amentata*, Clerck.—Common.

*L. pullata*, Clerck.—Common.

*L. monticola*, Clerck.—1 specimen from Innellan.

*Tarentula pulverulenta*, Clerck.—Taken at Ben Voirlich.

*T. andreniora*, Walckenaer.—1 specimen taken at Loup of Fintry.

II.—On *Pisidium fontinale* and *Planorbis complanatus*, two fresh-water shells new to Scotland, and *Helix villosa*, a land shell new to Britain. By Mr DAVID ROBERTSON, F.L.S., F.G.S.

I may mention that the two shells new to Scotland and the one new to Britain, which I now bring before you, have been in my possession for a considerable time. Although I have not made land and freshwater shells a study, yet I have at all times picked up any that came in my way, generally without further

notice at the time than consigning them to a pill-box, with the name of the locality and the conditions under which they were found, till an opportunity might occur for closer inspection and arrangement.

The first shell is the little bivalve *Pisidium fontinale*, var. *Henslowana*, taken in the Glasgow and Paisley canal. It is the *Pisidium Henslowana* of Shepard. It was first discovered by Prof. Henslow in the River Cam, near Cambridge, and occurs in many of the northern, eastern, and south-western counties of England, as well as in South Wales and in Cork, but it has not hitherto been discovered in Scotland. It is not an uncommon thing for such small shells to be overlooked by being mistaken for closely allied species, but in this case the most cursory inspection would discover the remarkable little elevated plate on each valve near the umbo, which at once distinguishes it from all its congeners.

The second shell is *Planorbis complanatus*; it is found moderately common in Lochend Loch, Edinburgh. Jeffreys says: "It inhabits marshes, ponds, canals, ditches, and standing water everywhere in England, Wales, and Ireland, but I am not aware of any Scotch locality."

This shell is readily distinguished from its nearest ally *Planorbis carinatus*, by the keel being placed below instead of in, or towards the middle of, the periphery. It is somewhat singular that while this shell is so plentiful all over England, Wales, and Ireland, the small patch of water near Edinburgh, known as Lochend Loch, is its only known locality in Scotland. There is another remarkable circumstance connected with this loch. Some few years ago Mr James Bennie of the Geological Survey of Scotland sent me some mud from it, for the purpose of examination for Ostracoda. Amongst others, a few valves were found of a species, *Goniocypris mitra*, which Prof. G. S. Brady and I discovered in the fens of Norfolk, which are rather of a brackish character, and we could detect it nowhere else, leading us to think that the species was peculiar to that flat district; we were therefore surprised to find it in this distant isolated fresh-water loch. Further search was made for living examples, but although dead valves were common, the living animal was not met with. The same may be said of *Planorbis complanatus*, which probably arises from the fact that the loch is being filled up through the emptying of the town

refuse into it. I fear that before this time all that lived in that once pure water may be poisoned by, or buried under the debris of, the streets.

I find that lochs and ponds in the neighbourhood of towns are in general more rich in mollusca, ostracoda, and other microzoa, than those in more secluded localities, where water-fowl, which feed greedily on molluscs and other aquatic animals, congregate in greater abundance.

However, this suburban immunity of aquatic animals is only partial, for what they gain in one way they may lose in another. Where relieved from the presence of water-fowl, they may be attacked by the deleterious products of sewage, but even when so exposed, it is astonishing how some animals survive and thrive abundantly, while others of the same class succumb. This explains in a great measure why some species often prevail and are differently associated in different localities. At the Glasgow terminus of the Paisley Canal in Eglinton Street, where the water is strongly charged with the sewage from neighbouring factories, the little ostracod *Cypris compressa*, swarms in the most filthy mud at the bottom, and is plump and sleek as if quite at home, while scarcely any of its usual associates are to be found. The same may be said of the estuary of the Clyde. Over the muddy flats near Langbank,\* the small invertebrate fauna is unusually sparse, with the exception of one or two forms, which are in great abundance.

Of the third shell I have to bring before you, *Helix villosa*, four living specimens were taken on the flat ground or moors near Cardiff, by Mrs Robertson.

As I was not able to refer them to any British species, they were submitted to Mr Jeffreys, who pronounced them to be *Helix villosa* (Draparnaud), and has recorded the species in *Annals and Mag. Nat. Hist.*, Jan. 1877, as an addition to the British mollusca. *H. villosa* inhabits Germany, France, and Switzerland, and it often occurs at a considerable height above the level of the sea. Mr Jeffreys refers to *H. alpestris*, a British variety of *H. arbustorum*, as having similar habits. It is met with on the Swiss Alps, in the region of perpetual snow, as well as in the

\* Transactions of the Geol. Soc. of Glasgow, Vol. V., Part I., p. 112.

marshes and on the banks of English rivers, being an example of the great elasticity such animals seem to possess in accommodating themselves to different conditions of habitat and temperature.

Since writing the above notes I have learned that *Planorbis complanatus* has been before recorded as occurring in Scotland by Mr William Haddin in his paper on the Distribution of the *Helicidae*,\* but what adds to the interest is that his specimens, which he names *P. marginatus*, were also taken in Lochend Loch, which appears still, so far as known, to be its only Scottish habitat.

### III.—Notes on an adherent form of *Productus*.

By Mr JOHN YOUNG, F.G.S.

Mr Young remarked that the recent discovery by Mr James Bennie, of the Geological Survey of Scotland, of a small adherent form of *Productus* was a point of considerable interest, when taken in connection with what are supposed to have been the uses of the long tubular spines which are fixed chiefly upon the auricular expansions of the ventral valves of many species of *Producti*. Various opinions have been given as to the uses of these spines, but that entertained by some Palaeontologists is, that they were used to moor the shells in the mud in which they lived, some species, such as *Productus semireticulatus*, having the spines as long as from four to six inches. In the interesting little form of *Productus* discovered by Mr Bennie, and which has been figured and described by Mr Robert Etheridge, jun., F.G.S., in the "Quarterly Journal of the Geological Society of London," Vol. xxxii., p. 454, under the provisional name of *Productus complectens*, we have the interesting fact revealed, that here there is a small form of *Productus* in which the tubular spines are adherent to foreign bodies, such as the small stems of crinoids, which they have often circled or embraced while the crinoid was yet in the living state, the crinoid in some instances having afterwards completely enfolded the *Productus*. Specimens of this *Productus*, in various stages of envelopment by the crinoid, are figured by Mr Etheridge, the complete enfolding being indicated by a swelling on the stem of the crinoid. It has been conjectured

\* Proc. Nat. Hist. Soc. Glas., Vol. I., p. 247.

that this form of *Productus* may only be the young fry of some of our well known species, such as *Productus longispinus*, the shell becoming free after a certain stage of development. Mr Young said that he was, however, inclined to regard the adherent form as distinct. Mr Bennie's specimens were collected from Carboniferous limestone strata in the East of Scotland. In the West of Scotland this small adherent form has not yet been satisfactorily identified, but an example of an apparently much larger adherent form of *Productus* attached to a thick crinoid stem, has been found at Auchenmade limestone quarry, near Dalry, by Mr John Smith of Eglinton Iron Works. Unfortunately nothing but the adherent spines remain attached in this specimen. It was, therefore, with the view of calling the attention of the members to these adherent forms of *Producti* that Mr Young now brought the subject before the meeting, in the hope that other discoveries will show whether they are to be considered as distinct species or not.

IV.—*Notes on the State of Vegetation in the Public Parks in January, 1877, and of the temperature and rainfall in 1876, as compared with the previous year.* By Mr DUNCAN M'LELLAN, Superintendent of Parks.

Mr M'Lellan stated that in January 1876 there were found in flower at the various Public Parks of Glasgow, 17 species and 9 varieties of plants, while in the same month of 1877 there were only 8 species and 4 varieties; and that the difference might be accounted for by taking into account the great amount of rainfall during the last three months of 1876. Taking December as an example, there were only six days without rain, while during the corresponding month of 1875 there were 18 dry days. With excessive moisture, therefore, and a consequently low temperature, vegetation was almost at a standstill during January 1877, and a number of plants of delicate foliage suffered severely. Wet weather seems to retard vegetation to a greater extent than severe frost, the effects being longer felt. After a hard frost in December vegetation starts rapidly, but after a continued drenching the improvement is very slow. In the remarks submitted by Mr M'Lellan in September 1876, on the extremes of heat and cold during the spring and summer months, it was shown that the

weather on the whole had been favourable to flowers and trees. The first part of the year was rather backward, but with a brilliant summer and autumn there was a display of flowers in the Parks beyond expectation. In August and September last trees ripened their wood well, and they promise fair for this season. In January 1877 there were only 4 dry days, 9·39 inches of rain fell, the greatest amount in twenty-four hours being on the 30th.

The register in the Queen's Park showed as the result for 1876, compared with 1875—

	1876.	1875.
Rainfall in inches, ... ..	37·31	35·85
Highest temperature, ... .. (Aug. 15)	85°	(July 7) 82°
Lowest temperature, ... .. (Feb. 11)	16°	(Dec. 8) 12°
Average for the year, ... ..	45·6°	46·8°
Dry days, ... ..	195	198

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### MARCH 27TH, 1877.

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

Mr H. B. Bailey, Newton, Mass., U.S., was elected a corresponding member.

### SPECIMENS EXHIBITED.

Mr John Young, F.G.S., exhibited a specimen of the beautiful Glass-rope Sponge, *Hyalonema Sieboldi*, from the seas of Japan, recently presented to the Hunterian Museum by Mr J. P. Bisset. This sponge illustrates the fossil species, *Hyalonema parallelum*, found in the Carboniferous limestone strata near Dalry, Ayrshire, in having the stem made up of a twisted bundle of fine siliceous rods, and in the form of the siliceous spicula found in the body of the sponge. Mr Young stated that Dr Young and himself recently measured a bundle of the rods of *Hyalonema parallelum*, on a block of limestone at Trearne Quarry, near Beith, and found the length to be nearly 12 inches. The most interesting point which they had discovered in connection with these siliceous rods in the fossil species was, that many of the rods terminated with anchor-shaped processes.

The Rev. James E. Somerville, B.D., forwarded for exhibition a

number of sponges, hydrozoons, and polyzoons, cast up on the shore of the Firth of Tay, near Broughty Ferry. They belonged to several genera and species common to British waters, as the subjoined list shows: Spongidae—*Chalina oculata*, *Halichondria panacea*; Hydrozoa—*Thuiaria thuia*, *Plumularia falcata*, *Sertularia operculata*, *Sertularia filicula*; Polyzoa—*Gemellaria loriculata*, *Flustra truncata*, *Flustra foliacea*, *Flustra membranacea*.

Mr John Kirsop exhibited an interesting series of specimens from the Cygnet River, Kangaroo Island, South Australia, forwarded for exhibition by Mr George Brown of Rothesay. These consisted of a series of fine large horny sponges, remarkable for their shapes and for the beauty of the interwoven horny texture of their skeletons; a number of shells belonging to the genera *Haliotis*, *Cassis*, *Patella*, *Marginella*, and *Fusus*; also a fine mass of a large tubicolar annelide belonging to the genus *Serpula*. There were also shewn an interesting species of *Cidaris*, in which the large club-like spines terminated at their upper ends in hollow cup-shaped cavities; and a portion of the bony palate of a fish, *Myliobates*, one of the Rays, in which the large crushing teeth are arranged on the same plan as that seen in the genus *Psammodus*, found in our Carboniferous limestone strata. Mr Young, who made some remarks on the collection, stated that many of the specimens, from their rarity, would form very interesting additions to the natural history collection of any of the Glasgow museums, donations of well-preserved objects being always gratefully received.

Mr James Coutts exhibited a specimen of Millerite, a sulphide of nickel, which is a rare mineral, found in the form of golden-coloured hair-like tufts of crystals in the cavities of shells, and in fissures of the limestone at Dockra, near Beith. It was first discovered at this place about three years ago, and there is as yet no other known Scottish locality.

#### PAPERS READ.

I.—*Further Notes on the Cecidomyidae, with descriptions of three New Species.* By Mr FRANCIS G. BINNIE.

In continuation of my former remarks on this group, I now bring forward some new species, together with various observations on the economy of some known species, and on their occurrence in this district.

CECIDOMYIA PILOSELLAE, *sp. n.*

Male: yellow, with a slightly ochreous tinge, paler beneath; pubescence pale. Vertex and upper portion of hind-head fuscous; eyes black; antennae 12-jointed, two basal joints swollen and pale yellow, the rest dusky yellow, joints sessile. Thorax with three short brown dorsal stripes; halteres uniform yellow. Abdomen with large anal forceps, the size of the head, oval in shape, with a prominent projecting tooth on lower margin. Legs pale whitish yellow, shining white beneath. Wings flavescent, root yellow, somewhat iridescent; costal and first longitudinal nervures pale yellowish brown, second nervure darker and more fuscous, third very pale; second longitudinal nervure joins margin *before* apex.

Length, a little over half a line.

After death the yellow assumes a deeper ochreous tinge.

This species is abundantly distinct from the *C. hieracii* of Fr. Loew (Verh. d. k. k., zool.-bot. Gesell. in Wien, 1874, pp. 145 and 321).

The larva is scarcely  $1\frac{1}{4}$  line long, yellow or orange yellow, and minutely tubercled. It enters the earth to undergo its transformations, spinning a white cocoon. The pupa-case, after the perfect insect has emerged, is white.

It affects the leaves of *Hieracium pilosella*, Lin., the margin of the leaf being involutely rolled, and on its inner face the ordinary long hairs are generally modified into a more or less dense pale white pubescence, about one-sixteenth of an inch long.

From leaves collected in Kilsyth Glen on the 6th August, I reared a single male on the 29th of the following month: the above description is taken from it. I have also gathered leaves inhabited by larvae, near Milngavie, towards the end of September.

CECIDOMYIA QUERCÛS, *sp. n.*

Female: head blackish fuscous; epistoma and palpi dusky reddish orange; eyes black, margin behind shining white, with a fringe of long hairs; there is a tuft of long, pale or white hairs over the mouth, and the palpi are pale-haired; the third joint of palpus is twice as long as the second, and the last is equal to the two preceding taken together; antennae very short, only one-fourth the length of body, 12-jointed, fuscous, except the two basal joints, which are dusky yellow, joints sessile, cylindric, as

broad as long, with medial constriction scarcely perceptible. Thorax reddish orange, with three dorsal blackish fuscous stripes which have in certain lights a whitish appearance, the side stripes extend to scutellum; between these stripes, seated on a somewhat dusky ground, are two rows of dark hairs, shining white in certain aspects, and outside the stripes are two more similar rows, four altogether; scutellum yellow; breast greyish fuscous; halteres pale yellow or very pale yellowish white, club dusky at base, and in certain aspects glistening white. Abdomen orange-red or flesh-red, paler beneath, with the usual broad dorsal black bands of scale-hairs, and the hind margins of segments above with scattered fringe of long, partly black hairs, especially the two apical segments; ovipositor long, pale ochreous yellow, basal joint greyish fuscous at base above, no lamellae. Legs proportionately short and stout, fuscous, paler beneath, and somewhat shining white. Wings dark grey (roots yellow), iridescent; costa deep fuscous, first and second longitudinal nervures paler fuscous, third very pale; second longitudinal nervure curves slightly upwards at the transverse nervure, and slightly convex to hind margin at the middle, proceeds thence straight to margin, which it joins before apex of wing; third longitudinal nervure has the stem straight, the lower branch of fork is a continuation of the stem, proceeding with a moderately sharp but gradual curve downwards to margin, which it joins at an oblique angle, the upper branch leaves at a sharp angle with immediately another abrupt bend in the opposite direction, and thence proceeds straight to margin.

Length (ovipositor retracted), half a line.

The male also has the antennae 12-jointed, joints sessile. I succeeded in rearing only a single example amongst the large number of females.

After death all the yellowish parts of thorax and abdomen assume, more or less, a fuscous tinge, and the dorsal stripes of thorax become undistinguishable; scutellum and halteres become dusky yellow, and basal joint of ovipositor changes to dark fuscous; the remaining joints are a little more ochreous than in life.

The 12 sessile joints of the antennae in both sexes, and the thoracic stripes, distinguish this species readily from its allies. *C. saliceti*, Winn., which produces similar deformations on the willow, is larger, and differs in colour and in the antennae.

Of the species affecting the oak, *C. cerris*, Kollar, is about the same size, and has the antennae also with 12 sessile joints in both sexes; but is markedly distinct, having no dorsal stripes on the thorax, the scutellum not being yellow, and the legs being dusky yellow.

The larva varies from three-quarters of a line to one line in length, is white when young, but on attaining full growth, ochreous yellow, often bright orange yellow; body-margins paler. The larvae live gregariously, during summer, among the leaves of slightly arrested and twisted terminal shoots of the oak, *Quercus robur*, Lin., which they leave to pass their transformations in the earth, spinning each a white cocoon.

The perfect insect makes its appearance in September.

The deformation when fresh is not very noticeable, but after the departure of the larvae it withers rapidly, assumes a blasted appearance, and is then very conspicuous.

Mr Cameron discovered this gall near Cambuslang, and brought me specimens, and he tells me that he has observed similar larvae inhabiting the diseased cup of the acorn. I afterwards found it very abundant in Mugdock Wood, and have also observed the withered shoots in Cadder Wilderness. It would seem, therefore, to be a common and generally distributed species in this district.

#### CECIDOMYIA CERASTII, *sp. n.*

Male:\* antennae fuscous, 15-jointed, joints stalked. Thorax fuscous, sides at wing-roots testaceous; dorsum with two rows of hairs, and probably (in life) with three fuscous stripes; scutellum dusky testaceous. Abdomen dark fusco-testaceous. Legs fuscous. Wings with pale grey pubescence; costa deep fuscous; second longitudinal nervure pale brown, straight, reaching margin before apex of wing; third, very pale.

Length, nearly three-quarters of a line.

The larva, one line long, is brilliant orange or reddish-orange. It is gregarious, and undergoes its transformations within the gall. Two males emerged in the autumn, but escaped my notice until after they were dead.

The gall is found on *Cerastium viscosum*, Lin., is terminal, and owing to the internodes not being developed, consists of a cluster

\* Described from dried specimens.

of leaves more or less fleshy at the base. It is common in the Possil district during the summer and autumn months.

Mr J. W. H. Traill, M.A., F.L.S., describes similar galls on *C. glomeratum* (Scot. Nat., ii., p. 31).

CECIDOMYIA BETULAE, *Kaltenbach.*

During last autumn I found the catkins of birches, in Mugdock Wood and at Bishopton, inhabited by larvae of a *Cecidomyia*, which I have no doubt is this species. I hope, however, to settle the point by rearing the perfect insect this spring.

The larvae were short, dumpy, and flattened, orange in colour, and very sluggish in their movements. All were enclosed in compact, egg-shaped, white cocoons, either inside a seed (a common position), or in the interstices between the scales.

CECIDOMYIA GALII, *Winnertz.*

Mr Traill (Scot. Nat., i., p. 156) recorded the galls of an unknown species found upon *Galium palustre*, Lin.

Similar galls, on the same plant, occur in this district, at Possil Marsh and in Mugdock Wood, from which I have reared the perfect insect, and find it to agree in every respect with Winnertz's description of the above species (Linnaea Ent., viii., p. 235).

The larvae are orange, usually a number in each gall, and go through their changes within it, each spinning a white cocoon.

The perfect insect emerges in August and September.

The gall is terminal, occasionally axillary, and is a compact globular mass of altered leaves, not unlike, in external appearance, the fruit of a *Stellaria* or other Caryophyllaceous plant. It is found during the summer months. This forms another addition to the list of species of the genus *Galium* affected by *C. galii*.

CECIDOMYIA PRUNI, *Kaltenbach.*

In the January number of the "Scottish Naturalist" for the present year, Mr Traill records (iv., p. 14) for Britain, and describes the purse-like galls of this species on *Prunus communis*, Huds., var. *spinosa*, Lin.

I found the galls moderately common in September last year in Mugdock Wood, but was too late for many larvae, only seeing one solitary straggler, from which the subjoined description was made.

Larva: length barely two lines, elongated, flattened, deeply incised between segments, anal segment with six prominent tubercular points or teeth, arranged in two groups of three each; central two-thirds of larva of uniform width, sharply tapering to head; posterior segments narrower and abruptly truncate; colour brilliant orange.

Kaltenbach states in his "Pflanzen-Feinde" (p. 175), that the yellow larvae are found in May, and that they leave the gall in June to pupate in the earth. According to Dr Franz Loew (Verh. d. k. k., zool.-bot. Gesellsch. in Wien, 1875, p. 30), each gall is inhabited by from 2-10 orange-yellow larvae, 3.5 mm. long, and that they go to the earth towards the end of June. Dr Loew gives a good figure of the gall (l. c., Taf. ii., fig. 3), as found on *Prunus domestica*, Lin.: it appears somewhat more elongate than those I have seen here on *P. communis*, var. *spinosa*. Several of the empty galls had a small round perforation in the side, the work of an inquiline probably, as such galls I found to have traces of frass inside. The rightful inmate would emerge by the slit on the upper face of the gall.

The perfect insect is, so far, unknown.

#### CECIDOMYIA PUSTULARIS, *Bremi*.\*

Oak-leaves having one or more lobes of the margin folded to underside, are very common in Mugdock Wood, occurring also in Cadder Wilderness. Similar productions are described by Bremi under the above name. I have never found larvae inside, being probably too late in the year in my searches. Kaltenbach (l. c., p. 676) and Müller (E. M. M., vii., p. 88) have done so, and the latter describes the adult larva as one line long, and white, and that 2 or 3 larvae live in a fold.

#### HORMOMYIA MILLEFOLII, *Loew*.

Last autumn I was fortunate enough to breed two specimens of the male of this species, of which I made a careful description at the time, supposing the male to be undescribed. Whilst engaged, however, in the preparation of the present paper, I

\* During the progress of this paper through the press, Dr F. Loew has described the perfect insect in the Verh. d. k. k. zool.-bot. Gesell. of Vienna for 1877 (p. 14), under the name *Diplosis dryobia*, giving a figure of the leaf with its folded lobes (l. c., Taf. i., fig. 5).

found that among the more recent contributions of Dr F. Loew is a detailed description of it (l. c., 1875, p. 26). Upon collating his description with my own, I find an exact agreement in all except the following points:—He states the number of antennal joints as 19; in my description I note 18, which a careful re-examination of my dried specimens bears out. There may, as in some other species, be a slight variability in the number. In my notes I describe the apical tarsi of the legs as yellow;\* Dr Loew is silent on this point, simply stating, “Beine . . . fahlbraun.”

The rearing of the male places this species definitely into the genus *Hormomyia*, where it was doubtfully collocated by Schiner (Fauna aust. Dipt. ii., p. 380). The compressed and sunken head, arched and laterally compressed thorax, and the long abdomen, taken in connection with the characters of the wings and antennae, leave no room for doubt; these characters, as Dr Loew states, being not nearly so marked in the female. For a minute account of these points, I would refer you to Dr Loew's article (l. c., *supra*). In the same Transactions (1874, Taf. ii., fig. 3) is an excellent figure of the gall in its mature form.

#### GALLS OF UNKNOWN SPECIES.

I conclude this paper with descriptions of two galls, whose makers, so far, I have not succeeded in rearing to the perfect state.

*Lychnis diurna*, Sibth.—The gall consists in the calyx becoming more or less inflated at the base. Sometimes the calyx never opens, at others the petals project more or less. It becomes more or less tinged, especially towards the apex, with pink, and the calyx-ribs are usually picked out with darker pink.

A number of larvae inhabit the inflation between calyx and petal. They are barely a line and a half long, shining, and vary in colour from white to bright orange-yellow.

This malformation is not uncommon at Kenmuir Bank and near Milngavie during the autumn months.

Mr C. G. Barrett (Ent. Mo. Mag. viii., p. 205), in a note on the earlier stages of a beetle, *Hypera polygoni*,—the larvae of which occur in the shoots of *Lychnis vespertina*, which are prevented from

\* In the dried insect they are conspicuously pale yellowish-white.

growing, and form into pseudo-galls, resembling great buds, three or four inches long,—states, that happening to open one of these galls, he saw plenty of the minute orange-coloured larvae of a *Cecidomyia*.

The larvae of a Continental species, *C. lychnidis*, Heyd., live gregariously in deformed, woolly, leaf and terminal buds of *Lychnis dioica*, and we may possibly find the above two forms are to be referred to it.

*Angelica sylvestris*, Lin.—About the middle of September, I observed, among the umbels of this plant in Mugdock Wood, numerous flowers conspicuously larger than the rest. Closer inspection showed that the carpels were swollen and pinkish in colour; the petals were somewhat fleshy, and had not unfolded; stamens were present, but the styles of the pistil seemed aborted. The length of the galled flower was scarcely two lines.

In each galled flower was a single larva, colour bright orange-yellow, length three-quarters of a line to nearly one line, last segment emarginate, on each projection a number of bristles seated on tubercles, similarly to others on different parts of the body.

The larva inhabits the cup of the flower, and *not* the carpel, as I ascertained by very careful examination.

I made a slight reference to this gall in a previous paper on the genus *Asphondylia*; and as I stated, it will probably turn out to be the work of *A. pimpinellae*, Fr. Lw., which forms galls resembling these on *Pimpinella saxifraga*, Lin., and the galls of which species Mr Traill (Scot. Nat., i., p. 125) has recorded for Scotland.

Similar malformations of the flower have been observed in various other umbelliferous plants, as *Pastinaca sativa*, Lin., *Daucus carota*, Lin., and others, all most likely to be referred to the same insect. But in all these forms, so far as known, the larva seems to inhabit the carpel and not the flower-cup.

Having this fact before me, I was careful to assure myself of its true position in the examples I have met with on *Angelica*.

In the discussion which followed the reading of this Paper, Mr Peter Cameron stated that he had first found the larvae of *Cecidomyia quercus* on the banks of the Clyde, near Newton, in abortive acorns, in which several lived in company, and their presence caused the cup to become split and twisted. It seems

very probable that it is the same species which inhabits the leaf buds and the acorns, for they occur on the same tree. Although he had bred specimens in the autumn, he was inclined to believe that this was owing to their having been reared in a room, for at present he had a considerable number collected in autumn which have not yet become mature. He had sent specimens to Dr Franz Loew, who stated that they were undoubtedly a new form. The acorns in which they were found were only about the size of a small pea.

## II.—*The Mammals of the Neighbourhood of Loch Lomond.*

By Mr JAMES LUMSDEN, F.Z.S.

In the country which borders on Loch Lomond there has been found a large proportion of the land mammals of Britain; but as in other districts, several species which were at one time common are now rarely or never met with, the advance of agriculture and the greater attention paid to the preservation of game having been most destructive to many of our wild animals, as well as to our rapacious birds.

Within late years a great change has taken place in the mammalian fauna of this district. At one time Wild Cats were well known, and Martens, if not often seen, betrayed their presence by their thieving habits; Polecats were not uncommon; Rats, except a few of the harmless *Mus Rattus*, Rabbits, and Squirrels were unknown, and mountain Hares seldom met with. How changed is it now! The Wild Cat, Marten, and Polecat extinct, the Brown Rat swarming in and around all farm steadings, Rabbits plentiful on hill and low country alike, and the Mountain Hare numerous on all the higher ranges. Squirrels are also common in all the plantations, and are extending their distribution.

The nature of the ground round Loch Lomond renders the district peculiarly suited for all kind of mammals. In the agricultural land at the southern end of the loch are found Moles, Shrews, Mice, and Voles, while the more rugged ground at the northern end gives shelter to the wilder animals and Mountain Hares.

So far as we know, no complete list of the mammals found throughout the Loch Lomond district has ever been drawn up, although the subject has not been neglected by naturalists and

others. The Rev. Mr Stewart published a list of the mammals of the parish of Luss in the "Statistical Account of Scotland," 1790. The works of Mr John Colquhoun are full of most interesting notes on the habits and natural history of the wild animals of the Dumbartonshire woods and moors; and Mr Robert Gray has given information about some of the more interesting mammals of the district, in his sketch of the Zoology of Loch Lomond, in Messrs. Maclure and Macdonald's "Guide to the Trossachs and Loch Lomond." In the "Fauna and Flora of the West of Scotland," Glasgow, 1876, Mr E. R. Alston has given, in detail, a sketch of the mammals, which of course includes those of the Loch Lomond district.

In the notes to the following list I have not therefore attempted fully to describe the habits of any of the existing species, as that has already been ably done by other pens, but have only endeavoured to record the present as compared with the past state of the mammalian fauna of the neighbourhood of Loch Lomond.

## CHEIROPTERA.

## VESPERTILIONIDAE.

COMMON BAT, *Vesperugo pipistrellus* (Schreb.).

Very common.

LONG-EARED BAT, *Plecotus auritus* (Linn.).

Not uncommon, but not so numerous as the last named species.

## INSECTIVORA.

## ERINACEIDAE.

HEDGEHOG, *Erinaceus europaeus*. Linn.

Common, and in many places would be numerous were it not killed down by gamekeepers, who all wage war against it. I have found young ones, with their eyes not yet open, as late as 28th of September, which I think is almost a proof of the hedgehog occasionally breeding twice in the year.

## INSECTIVORA.

## TALPIDAE.

MOLE, *Talpa europaea*. Linn.

Very common. Although trapped on all the arable land in the district, this species still holds its own, as the numerous woods and plantations offer it a secure retreat.

## INSECTIVORA.

## SORICIDAE.

COMMON SHREW, *Sorex tetragonurus* (Herm.).

Not uncommon; often found lying dead on roads and foot-paths.

## CARNIVORA.

## MUSTELIDAE.

BADGER, *Meles taxus* (Schreb.).

The "Brock" is still a native of some parts of our district, and is, I am glad to say, strictly preserved on some of the estates in the neighbourhood.

COMMON OTTER, *Lutra vulgaris*. Erx.

Although much reduced in numbers since Mr Stewart included it in his list of the quadrupeds of the parish of Luss, the Otter is still found on a few of the streams which flow into the loch.

COMMON WEASEL, *Mustela vulgaris*. Linn.

Common; the variation in size of this species is very marked.

ERMINE WEASEL OR STOAT, *Mustela erminea*. Linn.

Found on all the hills in the neighbourhood of the loch. The time of changing from winter to summer fur seems to be very variable. I have obtained specimens in winter dress on the 8th of February, and on the 11th of the same month have found others in full summer fur, except a slight ring of white on the tail, just above the black tip.

POLECAT, *Mustela putorius*. Linn.

At one time common, the "Foumart" is now quite unknown, except by name, on the hills round Loch Lomond.

PINE MARTIN, *Martes abietum*, Ray.

This species has also been banished from our district. I have not heard of one being seen or trapped for many years. It was, however, at one time well known in the neighbourhood, but has been killed down, as in most other parts of Scotland. It is very doubtful if the Beech Martin, *M. foina*, has ever occurred in Scotland. Mr E. R. Alston states that all the specimens shown

him as Beech Martins have proved to be only light coloured specimens of the present species.

## CARNIVORA.

## FELIDAE.

WILD CAT, *Felis catus*. Linn.

The "British Tiger," as Pennant calls it, is now also a thing of the past on the banks of Loch Lomond. At one time it was well known, and specimens have at no very distant date been taken, both on the Luss estates on the west side of the loch, and on the Duke of Montrose's property on the east. A fine pair from the latter district are now in the Hunterian Museum, Glasgow, presented by the late Duke.

## CARNIVORA.

## CANIDAE.

COMMON FOX, *Canis vulpes*. Linn.

A few are sometimes killed on Ben Lomond and some of the other hills, but their numbers have been much reduced within the last twenty or thirty years.

## RODENTIA.

## SCIURIDAE.

COMMON SQUIRREL, *Sciurus vulgaris*. Linn.

Very common in all the woods round the loch. According to Mr John Colquhoun,\* the first squirrel ever seen in the district was "in the autumn of 1830," when the "strange beast" paid for its enterprise with its life, after being chased from tree to tree by the boys of the neighbourhood. The species is gradually extending its range over Scotland. In some places an occasional raid is made against them, on account of the damage they do to larch and spruce plantations by nipping off the tops of the young shoots. Squirrels seem to be fond of a variety of food,—young shoots of trees, acorns, beech and hazel nuts, and I have observed them eating fungi, and can vouch for their liking for cherries.

## RODENTIA.

## MURIDAE.

LONG-TAILED FIELD MOUSE, *Mus sylvaticus*. Linn.

A very common species; often caught in considerable numbers

\* "Lecture on the Ferae Naturae of the British Isles," by John Colquhoun, Edin., 1873.

in gardens, where they do much damage to newly sown peas and to bulbous roots.

COMMON MOUSE, *Mus musculus*. Linn.

A pest in nearly every house ; troublesome while they live, but more so when they die below the floors, where the decay of their fat little bodies causes a most objectionable smell.

BLACK RAT, *Mus rattus*. Linn.

This, the only species of rat at one time known in Britain, is now nearly, if not entirely, extinct all over the country. In our district it was common, but is now quite unknown, the Brown Rat having proved too strong for it. Mr William Colquhoun informs me that the Black Rat kept entirely to houses or buildings, and seldom, if ever, was found in the fields.

BROWN RAT, *Mus decumanus*. Pall.

This species (by a strange mistake called the Norway Rat, for when the name was given it was not known in Norway), is now the common rat of this country. Mr William Colquhoun says it was first introduced into the Loch Lomond district by "Gabbarts,"\* from sixty to sixty-five years ago; and in a very short time it over-ran the whole district, fields and houses alike, completely driving out its less pugnacious relation the Black Rat.

WATER VOLE, *Arvicola amphibius* (Linn.).

Both the Brown and Black varieties of this species are common on the banks of the streams and rivers of our neighbourhood, and on some of the islands of the Loch.

COMMON FIELD VOLE, *Arvicola agrestis*. De Selys.

This species, known as the Short-tailed Field Mouse, is common, although it has never increased to the same extent as in some other counties of Scotland.

\* Gabbarts: boats of from 30 to 40 tons, which, before the railway was opened to Balloch, carried coals, etc., from the Clyde, up the Leven, to various places on the banks of the Loch, taking back return cargoes of slates or timber.

RED FIELD VOLE or BANK VOLE, *Arvicola glareolus* (Schreb.).

I cannot speak of this species from personal observation, never having identified a specimen with certainty; but as I am informed by Mr E. R. Alston that the late Dr Dewar obtained it on the shores of Loch Katrine, I think it may be safely included as occurring within the district.

## RODENTIA.

## LEPORIDAE.

COMMON HARE, *Lepus europaeus*. Pall.

Very common.

MOUNTAIN HARE, *Lepus variabilis*. Pall.

Common on all the higher hills. Mr John Colquhoun states\* that when he was a boy there were no Mountain Hares in the district. The first he ever saw was on Ben Voirla in 1822. Hybrids between this species and *L. timidus* have been got in the district.

RABBIT, *Lepus cuniculus*. Linn.

Very numerous all round the loch. Fifty or sixty years ago it was quite unknown in the district, and has increased very much in numbers within recent years.

## RUMINANTIA.

## CERVIDAE.

RED DEER, *Cervus elaphus*. Linn.

An occasional straggler sometimes appears on the hills.

ROE DEER, *Capreolus caprea*. Gray.

Common in all the woods, but not so numerous as at one time. An albino was some years ago taken near Luss.

Obs.—REINDEER, *Cervus tarandus*. Linn.

Dr J. A. Smith (Proc. Soc. Ant. Scot., 1871) states that bones of this species have been found underlying boulder-clay at Croftamie, in the Endrick valley.

\* "Ferae Naturae of the British Isles," p. 28.

III.—*On Bees: the origin, treatment, and cure of Foul Brood.*

By Mr R. J. BENNETT.

About three years ago I was made acquainted with this dire calamity in the manner that it most affects a beekeeper, viz., an attack upon my own apiary, and in the space of three months I lost four strong hives. Fearing the death of my whole stock, I immediately began a correspondence on the subject with my fellow-beekeepers. A former member of this Society, now a Doctor of Medicine in England, wrote:—"Have not made its acquaintance, and don't want to"; and a Stirlingshire beekeeper said, "Give them a glass of whisky, mixed with 2 lbs. of sugar and 1 pint of water, and take my word for it, you will stimulate your bees to double work, and have stronger colonies than ever." That advice I thought at the time to be a good practical joke, and did not follow it; but in the "Journal of Horticulture" of the 15th March, I find an English apiarian recommending for spring stimulating feeding a continual administration of syrup with a dash of brandy in it.

The origin of foul brood may be said to be threefold:—

First: From fermented honey or food.

Second: From exposure of the hive to cold.

Third: From infection.

First: From fermented honey or food.—As nothing will more readily induce foul brood in a hive having unsealed honey than overheating, combs in this state should never be kept over the winter, as moisture or vapour is deposited on the comb and mixes with the unsealed honey, which thereby ferments. Fungi are then propagated, and are spread when this honey is used by the nurses for feeding the larvae, in which stage of the life of a bee the infection and destruction begins. After the cell is sealed or capped over, the bees have no means of knowing that decay and rottenness are going on within. If we take a piece of comb thus infected and withdraw the dead pupae, there appears in the bottom of the cells a small white fungoid substance, which is the germ of the disease, and in course of time turns the larvae first into a milky-like substance, and later into a dark brown glutinous jelly, which emits a very offensive smell. If you stir it with a pin at this stage, it can be drawn out in long elastic threads, almost like India-rubber.

Second: From exposure.—Frequent examination of the hive

during the spring months is apt to lower the temperature, and thus compel the bees to cluster together in order to raise the necessary warmth. As at this season they are by no means so active as in the heat of summer, it sometimes happens that the larvae perish before the warm weather sets in. This is termed chilled brood; for although the bees very often succeed in clearing out the dead larvae, yet the spores having been deposited at the bottom of the cells get scattered through the hive, cause decomposition to set in, and the foundation for future unhealthy colonies is thereby laid.

Third: From infection.—I find this by far the most frequent cause of disease, as an infected hive soon becomes an easy prey to robber bees. They in turn, while stealing the honey, take with them the seeds of infection, and thus inoculate their own hives. Many beekeepers say that foul brood is not infectious, because sometimes a natural swarm from an infected hive does not carry it with them when put into a clean hive; but it is well known that bees, when leaving, carry two or three days' consumption with them, and when a swarm is housed in a clean empty hive, by far the greatest amount of the honey they bring with them goes to the production of wax for the new combs. By the time the queen lays eggs and the larvae require to be fed, there can be no doubt that they are supplied by fresh stores brought from the fields. But as a proof of infection, it may be stated that foul brood has been known to rage for years in certain districts, and while some beekeepers used every means to get rid of it, they found that, so long as their neighbours' hives were infected, it was almost impossible. The deduction from this seems clearly to be, that strong stocks should be kept; and that the only safe cure for all infected comb is to cut out, bury, or destroy it, but on no account to allow the bees to get the honey from infected stocks; also to avoid importing any bees from a distance, as through excitement and confinement the germs of disease are sown.

Many beekeepers may take a different view of this subject from that I have stated, but if my remarks lead to investigation being thoroughly and honestly made, and turn the train of thought to an unoccupied field, it may in course of time bring forth an abundant harvest of practical knowledge.

IV.—*Miscellaneous Notes in Natural History.* By  
Mr JAMES NAPIER.

## SPIDERS.

A few years ago I found that at the corner of our veranda a garden spider, *Epëira diadema*, had spread out its net, and was posted in the centre of it earnestly watching for prey. I took a fragment of a leaf and dropped it upon the lower edge of the web, when the insect made a sudden rush to it, but when half-way stopped and fled to a dark corner out of sight. After a few minutes it approached cautiously, and having gone round the leaf several times, carefully lifted it by passing under and getting the leaf on its back, and having travelled with it to the top, pitched it over. This operation was repeated several times with the same result. I then treated it to a fly, which was killed and consumed on the spot in a few minutes. I next put an ant, to which the spider ran with great force till within an inch, when it suddenly stopped, and then made several circles round; the ant wriggled round so as to face the spider, with its mandibles open and snapping, but the spider refused to go nearer, and retired to its watch-tower. On examination, I found that the ant was tied to the web by threads thrown over it. A Bluebottle fly was next given, which the spider attacked without fear, and consumed. A wasp was then entangled in the web, on seeing which it set off to its dark corner with great speed, and nearly half-an-hour elapsed before it ventured out, and then cautiously making two or three circuits. I found that the wasp was also tied down. I supplied more flies, which were killed but not eaten. Next morning the web was clean and mended, and the spider in the centre. On examining the den, I found the wasp, ant, and flies carefully bagged and laid up, possibly for future use.

It appeared, however, that all spiders are not so cautious, for I tried another sometime afterwards with a wasp. The spider rushed at it without a pause, but evidently got a sting, for it fled with great precipitation to its den, then swung itself to the ground and disappeared, and the web stood for days without a tenant.

To show the strength of the thread of the spider's web, I may state that one morning in August a spider's thread, made visible by vapour condensed upon it, might have been seen stretching from the corner of Union Street to the corner of Jamaica Street,

thus crossing Argyll Street. The weight of the condensed dew upon this line must have been considerable.

#### DOGS.

*Fraud.*—In a public work west of Glasgow, two dogs, a Newfoundland and a Terrier, were kept. The latter was a famed ratter, and when he killed a rat, he carried it into the house to show his mistress, who ordered him out, but always followed with a large piece of oat-cake, which Tartar first ate, then taking the rat and burying it in the garden. One day he and the Newfoundland were playing together in a field, when Tartar was observed to proceed into the garden accompanied by his friend, unearthen the last rat he had buried, and carry it into the house. When the usual reward was given to him, he shared it with his companion, and then took away the rat and reburied it.

*Conspiracy.*—A dog in the village, near the works in question, was a nuisance to the inhabitants, and with it Tartar had often fought, but had always been driven off by the dog's master. One day the Newfoundland, Tartar, and another little dog were playing together, when Tartar's enemy appeared in the distance. The three at once separated. Tartar lay down on one side of the road, and the Newfoundland at the root of a tree on the other side, while the small dog ran to meet the enemy, and sportingly led him on to the place where the two others were in waiting. Whenever they came up, Tartar and the Newfoundland sprang out, the three fastened upon the one, and before aid arrived the poor dog was killed.

#### “A SHOWER OF FROGS.”

At the end of August, a few years ago, after a long drought, a copious shower fell during the night. On going out about seven next morning the road was literally swarming with young frogs; also in a neighbouring field, so numerous were they that only with great care could I walk without treading upon them. Nothing could better account for this swarm than a “shower” of them. My house and garden were surrounded by a high wall; I thought that, if the frogs had fallen from the clouds, they would be in the garden as well as outside, but upon examination, not one was there to be seen. A large pond in a clayfield at about 200 yards distance, was undoubtedly the place whence came the so-called “shower of frogs.”

APRIL 24TH, 1877.

Mr Thomas Chapman, Vice-President, in the chair.

Mr James Thomson, I.A., was elected a life member ; and Messrs. John Buchanan, Walter Burns, Scipio M. Kennedy, and Robert Smith, ordinary members.

Mr Peter Cameron submitted a report from the Committee appointed last Session to prepare Catalogues of the Fauna of the West of Scotland, and more particularly the Fauna of the Clyde Valley. The report stated that arrangements had been made with several Zoologists, who had undertaken to frame lists of species in various departments of Natural History, so that the first part might appear during this year. The Catalogues would be paged separately from the Proceedings, so that when completed they would form a separate volume. The report was approved of, and the Committee instructed to proceed with the issue of the lists.

## SPECIMENS EXHIBITED.

The Chairman exhibited specimens of several species of Cetoniae, including examples, in both sexes, of *Goliathus polyphemus*, from the west coast of Africa, and remarked that this family of lamellicorn beetles forms an extensive and brilliant group of insects. In a perfect state they frequent flowers, upon the juices of which they feed, the structure of the maxillary lobes enabling them to lap up the sweets. Some species are found on the trunks of trees, where they feed on the sap, especially of such as are wounded. Dr Savage, who has collected these large Cetonias at the Gold Coast, states that they are roasted and eaten by the natives, who find them to be fat and sweet. *G. polyphemus*, he says, feeds upon a vine climbing up very lofty trees, and full of a fluid as tasteless and limpid as water, and so plentiful that the natives, in travelling through the woods, tap it and drink the juice, when water cannot be easily found. The Rosechafer, *Cetonia aurata*, is common in the south of England on roses, and on the flowers of the privet. In the larval state they are found in rotten timber. The larvae and pupae are often found in ants' nests, where it is probable the larvae feed on the fragments of wood of which the nests are often largely formed.

Mr James Lumsden, F.Z.S., exhibited a specimen of the Spotted Crane, *Crex porzana*, which was shot at Aird's Moss, Cronberry Farm, in the parish of Auchinleck, Ayrshire, on 3d November,

1875. He stated that this species is one of our least observed migrants, and is seldom met with in Scotland. Like many other marsh birds, it is decreasing, as its haunts—the fenny and marshy lands—are being gradually drained. At one time it bred regularly in some parts of England, in considerable numbers, but now rarely, and in Scotland its nest has been taken only on one or two occasions. According to Jerdon, in his “Birds of India,” it is found over all India in the cold season, frequenting marshes, rice fields, and moist meadows, near rivers and tanks. It is also found throughout Europe, Asia, and Africa, breeding in temperate regions. Jerdon also states that it is said to make a floating nest of rushes; but this seems to be very doubtful, and is not mentioned by some of the other authorities.

Mr John M. Campbell exhibited a specimen of the Biscacha, (*Lagostomus trichodactylus*, Brookes), from South America, and made some remarks on its distribution in the Argentine Provinces, which it has overrun to a large extent, penetrating to a considerable distance southwards. It has not, however, been found in the Banda Oriental or in Paraguay, although, being a good swimmer and taking readily to the water, the Parana need not have been an obstacle to its progress. In a paper read before the Society at the December meeting, a full account was given of the habits and depredations of this rodent, which has become a thorough pest in the countries where it prevails. Mr Campbell mentioned that its skin is now imported as an article of commerce, and is taking the place of more expensive furs.

Mr D. C. Glen, F.G.S., exhibited a number of specimens from Brazil, recently brought to this country by Mr A. Smith, C.E., Glasgow. In the collection were—the carapace of an Armadillo; the bony palate of a species of Cat-fish, the mouth of which is paved, in a sort of tessellated manner, with a series of roundish-shaped crushing teeth; the legs and wings of the Horned Screamer, *Palamedea cornuta*, a bird about the size of a goose, whose wings are each armed with a pair of strong bony spurs, which it uses for defensive purposes; a Blue Crow, *Corvus azureus*, and a Red-breasted Roller, *Coracias scutata*; a specimen of one of the Lace Lizards, about four feet in length; also several other objects of interest. On these he made a few verbal remarks, concluding by presenting the Blue Crow and Red-breasted Roller to the Hunterian Museum.

Mr Peter Cameron exhibited various specimens of Tenthredinidae, new to the British Fauna, taken by Mr Joseph Chappell in the Manchester district. (1) A new species of *Dolerus*, distinguished from all the other black and red species by having the abdomen entirely red, otherwise nearly approaching *D. lateritius*, Klug; (2) *Blennocampa micans*, Klug; (3) *Lyda fulvipennis*, Zaddach, a species described in 1863, when only two specimens were known in the Berlin Museum, Mr Chappell's example being thus the third. Mr Cameron also showed *Athalia annulata*, Fab., taken in England by the Rev. T. A. Marshall. This species was erroneously inserted in our lists, but as we have now this authentic specimen, it may again be included in the British fauna.

PAPERS READ.

I.—*On Saxicava rugosa, a Bivalve Mollusc; showing an unusual mode of repair.* By Mr DAVID ROBERTSON, F.L.S., F.G.S.

It is a common occurrence to see shells which have been repaired by the animal after accidental injuries of various kinds. These repairs, it is well known, are accomplished by a calcareous secretion applied to the points of injury, whether a fracture, a bruise, or displacement of parts, which are often mended even when the fractured edges do not come into proper contact; and in such cases, the shell frequently assumes a more or less contorted appearance. This calcareous secretion is also used by the animal to cover any irritating substance which happens to get inside the valves of the shell; and when this occurs with any of the pearl-bearing molluscs, the foreign objects get covered, layer after layer, with nacreous or pearly matter, and in this way pearls are formed. This property is said to be taken advantage of by the Chinese, who place little figures of their gods within the valves of such shells, where they allow them to remain a sufficient time to be coated over with a pearly covering.

Here is an injury to the shell of a mollusc, *Saxicava rugosa*,—an injury of a different kind,—not accidental, but purposely inflicted by a carnivorous univalve mollusc, which has the power of drilling through the covering of hard shell to reach the animal within, and with much skill, if we may so call it, in selecting the most vulnerable point of attack. It will be seen by the perforations of these boring molluscs, in the numerous examples before us, that they have been done by no random aim, but so directed as to

reach the most vital part of the animal, and at a point from which escape is hopeless. It will also be noticed that the holes are never made on a thick part of the shell if a thinner part affords the same advantage. On this group of Trophons may be seen how the punctures are made in almost every case on the body whorl, and at one particular point, and with scarcely an exception they are on the ventral side, which evidently implies a vantage gained by getting to this part beneath the shell.

On looking at this valve, we find three holes pierced a little apart, near the umbo, and which are covered over on the inner side by a thin layer of calcareous matter. Each patch, it will be noticed, is just a little larger than the hole it covers, and there can be no doubt that these repairs were made by the occupant of the shell. But what I wish to draw attention to is, that although repairs of accidental injuries are common, as before mentioned, yet, with this exception, I have never seen a trace of the least attempt having been made to close up one of these bored holes ; they are always open, and it is all the more unlikely that any attempt at resistance could be made, when we consider the character of the shell borers. They appear to pierce the shell with ease, and it is not to be supposed that they have the least difficulty in making their assault without giving either time or opportunity for resistance when they have once pierced the shell.

This singular case of an apparent effort to shut out an invincible enemy cannot be easily accounted for, except by supposing some untoward accident happening to the aggressor or aggressors just at the moment they had pierced the shell and touched the prey, the damage having been repaired afterwards, in the same manner as if caused by accident.

I may further call your attention to a little sand procured from the root of a sponge, kindly sent me by Mr John Kirsop ; as also some given by Mr John Young, from the tubes of a beautiful group of annelids, also presented to the Hunterian Museum by Mr Kirsop. Both the annelids and sponge came from Australia ; the former from the shores of Kangaroo Island, and the latter from the banks of the river Cygnet, where they had been thrown up by storms and tides, together with many other beautiful specimens of various kinds which were exhibited by Mr Kirsop at our last meeting. Here are also the contents of a little mud from the Bay of Gibraltar, and those of a small parcel from off St Helena,

for which I am indebted to the kindness of Professor Young ; and those of another, from my friend Mr Dugald Bell, procured from soundings taken by Captain White off Mocha, in 22 fathoms water, on their way to India ; and the contents of another parcel, from Mr D. C. Glen, from the Brazilian coast. In all these cases the quantity of material is small, yet they all reveal the remains of abundant life, which not only represent Microzoa, but the remains of larger forms, as plates and spines of Echinoderms, otolites of fish, spicules of sponges, etc., and give unmistakable proof of the presence of such forms in these localities, and often of the particular species to which they belong. Although in these instances only a small number of species of those that inhabit a particular region may have been secured, yet we may be sure that we have a portion of the prevailing forms which at all times give character to the locality.

In most cases Foraminifera predominate over Ostracoda, and more so in the greater depths of water. But in the sample from the Brazilian coast, sent by Mr Glen, one species of an Ostracod is in great abundance, while scarcely another organism is seen. Such facts come to be of great importance, when the results from different parts of the sea bottom, at the same or different depths, can be compared ; and although small gatherings seldom fail to be of interest, and often of much scientific value, it will be understood that larger gatherings will be of more than proportionate value when they can be had.

There has at all times been no lack of voyagers bringing home novelties from distant countries, and often at great trouble to themselves. There are many who, doubtless, would have a pleasure in helping science, were it better known what particular kind of objects or material are wanted. There is generally a tendency in those collecting for others to give most attention to things that please the eye. In a scientific point of view, this is not at all times necessary, as every group of animal life is invested with a history brimful of interest, and the chances of a prize, in most cases, are greater among the obscure forms than among those that are more conspicuous. In regard to material for the microscope, beauty or pleasant appearance does not come into account. It may be the black slimy mud from the sea-shore, or margin of a lagoon, or from the bottom of the sea, attached to the grease of the sounding-lead, or brought up on the fluke of an anchor. All of these may

be at times easily procurable, and require no further preservation than to be secured in a parcel or bag, with the indispensable precaution of being accurately labelled with the locality and conditions under which they were found, whether in fresh, brackish, or salt water, and at what depth. Such gatherings seldom fail to be of great interest, and I need not say how proud I am when I happen to be the fortunate recipient.

II.—*On a remarkable Lepidopterous Gall from South America.*

By Mr PETER CAMERON.

Mr J. M. Campbell has shown me some galls which he found on a thorny plant near Watchman's Cape, Patagonia, and which merit notice. Outwardly, in form and colour, these galls are almost identical with the common oak-gall of *Cynips kollari*, but are slightly smaller, have no tubercles, but have the outer skin quite smooth, and, like our species, are formed on the leaf-buds. Internally, however, the structure is very different, there being no spongy mass as in *C. kollari*, the central cavity being very large, occupying the greater part of the gall, and the outer rim is only about a line thick, while its substance is of a firmer consistency, not spongy as in our species. But the most curious thing in connection with this gall is in the way by which the insect escapes. In the Hymenopterous galls the flies simply eat out a round hole in the side for their passage, and the substance eaten out falls away in fine dust; while the South American species takes out of one side a circular piece of the same diameter as the outer rim, this piece being thinner on the inner than on the outer side, and it remains intact, so that it can be fitted accurately into the hole again. These pieces are not all of the same shape, some being oval, others oblong, while, more or less in all, the outer edge has small indentations. It is further to be noted that the holes are not all in the same position, some being on the side, others in the apex. Internally, the surface is smooth.

Mr Campbell, unfortunately, has only pupae of the maker of these galls, and they prove to be Lepidopterous. Several moths have been reported as gall makers; but the galls which they raise are mere swellings, scarcely comparable to that just described, which is as well formed as those of any of the Cynipidae.

III.—*Notes on Clydesdale Hymenoptera.* By Mr P. CAMERON.

In the following paper I purpose detailing a number of additions to the Clydesdale Hymenoptera, and giving additional localities for species already recorded in the "Fauna and Flora of the West of Scotland," Glasgow, 1876.

TENTHREDINIDAE.

*Lophyrus virens*, Klug. Rannoch.

*Lophyrus rufus*, Kl., is possibly Scotch (Oban), as the specimens in Stephen's collection in the British Museum are *L. rufus*, and not *L. pallidus*. Mr C. W. Dale, of Glanville's Wooton, tells me that he has Scotch specimens of *L. pallidus* from the late John Curtis.

*Croesus latipes*, Vill., perhaps occurs in the district. In September, I found in Clober Wood a larva on birch, that appeared to belong to this species; it was, however, very young.

*Nematus longiserra*, Thomson. Kintail. June. Larva on fallows.

*Nematus xanthogaster*, Foerster.

In giving an account of the life history of *Nematus crassulus* (Proc. Nat. Hist. Soc. Glas., Vol. ii., p. 313), I expressed some doubt as to the identity of that insect with *N. xanthogaster*, Foer., and *N. leucostictus*, H. In that doubt I now find I was quite justified. Brischke and Zaddach have figured the larvae (Schr. Phys.-ökon. Ges. zu König. ix.; the letterpress has not yet appeared) of both species, and it is certain that they are distinct from *N. crassulus*. I am glad to be able to record *N. xanthogaster* as British, Prof. Zaddach having identified for me an insect taken at Possil Marsh as Foerster's species, it having stood previously in my collection as *N. piliserra*, Thomson, which name must now sink as a synonym. *N. leucostictus* is stated to roll down the leaves of *Salix aurita*. Possibly it is also British, as similar larvae on that plant are not uncommon in Scotland and England.

*Nematus rumicis*, Fall. Houston. August.

*Athalia glabricollis*, Thoms. Generally distributed. (See *antea*, p. 129).

*Athalia lugens*, Kl. Kilsyth; Gleniffer Braes. (Mr Morris Young).

*Emphytus tibialis*, Kl. Clober (Mr King). Cadder.

*Emphytus serotinus*, Kl. Clober. Imago in September.

*Hoplocampa pectoralis*, Thoms. Cannisburn.

*Allantus 3-cinctus*, Fab. Clober.

*Macrophya albicincta*, Schr. Rannoch; Clober. June.

*Lyda arbustorum*, Fab. Rannoch. June.

#### CYNIPIDAE.

*Dryophanta scutellaris*, Ol. Common near Tarbert, Loch Lomond.

*D. longiventris*, H. Common in the same place, and at Clober.

*Aphilothrix callidoma*, H. One gall at Clober. August.

*Cynips marginalis*, Schl. Galls agreeing with the descriptions of Von Schlechtendal and Mayr are not uncommon in many places in the West of Scotland. Like Mayr, I could find no radical distinction between these galls and the catkin galls of *Andricus 4-lineatus*; and further evidence of the identity of the two forms is found in their having the same inquilines and parasites, and their being found on the same tree, although I have observed the leaf gall on a tree which had no catkins. But it now appears, from the observations of Dr F. Rudow (*Die Pflanzen gallen Norddeutschland's und ihre Erzeuger*, p. 35 and p. 59), that the true *marginalis* is an *Aphilothrix*, and not an *Andricus*. It remains then to be proved whether the leaf galls found in this country pertain to *A. 4-lineatus* or to *Aph. marginalis*, and it is to be hoped that those interested in the subject will endeavour to elucidate this point. Appended is Rudow's description of the gall maker.

Colour black, head and thorax distinctly shining, finely punctured, slightly pubescent; scutellum slightly raised, black, smooth, covered with grey hairs. Abdomen short, quite black, strongly shining. Antennae 14-jointed, brownish at base. Legs brownish-red, femora black, knees very clear. Wings hyaline, nervures yellowish, not much thickened. Length 2 lines. Bred in August.

*Ceroptres cerri*, Mayr. Cambuslang.

*Melanips longitarsis*, H. Cadder.

*Cleditoma nigra*, Thoms. Dalry.

*Eucoela ciliaris*, Dahl. Clyde, near Newton.

*Pychotrichia urticarum* has been met with at Bishopton, and at the Clyde near Newton.

*Psilodora Boieni*, H. Bishopton.

*Psilodora maculata*, H. Bishopton.

*Allotria cursor*, H. Possil ; Clober ; Baldernock.

*Pezophycta brachyptera*, H. Dalry.

*Microstilba heterogena*, Gir. One specimen at Milngavie on 7th August.

#### VARIOUS NOTES.

In the "Fauna and Flora" I have indicated an "*Eucoela alpina*," this being a totally black species, which I got on the top of "Gyrvel," Rannoch, under a stone, near some *Tipula* larvae. It belongs to Giraud's 3d Horde, having the 4th joint of the antennae longer or thicker than the following; or, as the species are now restricted by Foerster, to that author's genus *Rhoptromeris*, which is thus defined:—Malar furrow slight, facial grooves broad but not deep; antennae—male 15-jointed, the 2d joint of funiculus more or less (sometimes strongly) thickened and elongate, always longer than 1st; female 13-jointed, with distinct 7-jointed club, scutellar cup small; 2d abdominal segment crowned with hairs at base; wings hairy, rounded at apex, and hair fringed; radial cell closed at fore margin, narrow, the 1st and 2d sections of the radius almost equal in length, the inner angle with a straight or oblique continuation.

When I first examined the above specimen, I could not identify it with any of the described species; but since then I have taken further specimens of *Rhoptromeris*, and more especially a male or two from the hills above Dalry, an examination of which has convinced me that the Rannoch insect was only a melanic variety of the male of *Eucoela parvula*, Thoms., and that *E. biscarpus* and *nodosa*, Gir., and *E. eucera*, H., are also synonyms: the last name should be adopted.

*Trichiosoma lucorum*, L. In all the manuals this species is described as having the abdomen quite black, while *vitellinae* is stated to have the same part, either at the sides or on the ventral surface, or both combined, testaceous. But when I commenced to draw up the descriptions of these insects for my monograph for the Ray Society, I soon found that the coloration of the abdomen could not be depended upon as a mark of specific distinction between *T. lucorum* and *vitellinae*, since in the former the abdomen has the sides, and occasionally the belly, testaceous. In the excellent monograph of Brischke and Zaddach, *lucorum* is stated to feed on birch; the larva is both figured and described, and

both agree perfectly with the larva of *lucorum*, so common everywhere in our birch woods ; but these authors make no mention of the imago varying in the manner I have indicated.

Van Vollenhoven has described a birch-feeding larva as that of *lateralis*, Leach, and this larva seems to be the same as that of *lucorum* ; or if it is not, then there must be two species attached to birch, with similar larvae, namely, *lateralis* and *lucorum*. But *lateralis* has always been regarded as synonymous with *vitellinae*, and that is, so far as we know, confined to willows. It was well described by De Geer (Mém. ii., 232, pl. xxxiii., f. 17–22), and there are excellent figures of the larva in Brischke and Zaddach's work, their observations and descriptions being quite in accordance with mine ; that is to say, that *vitellinae* is purely a willow-feeder. Van Vollenhoven, again, has described the true *lucorum* as a birch-feeder. We must, then, either suppose that the Dutch Hymenopterologist has described the same larva under two different names (in his plate he does not give an original figure of *lateralis*, but copies that of Curtis), or that *vitellinae* feeds both on birch and willow, and that the birch-feeder, as a larva, differs considerably from that attached to *Salix*. The latter seems to be Van Vollenhoven's own opinion, for he quotes De Geer's descriptions as referring to *vitellinae*. The matter, however, requires confirmation ; at any rate, I am certain that, in the perfect state, *lucorum* has frequently (more especially in bred specimens) the abdomen more or less coloured as in *vitellinae*, and our descriptions of it must be modified accordingly. The subject being thus a little confused, I give descriptions of the larvae of our four species of *Trichiosoma* :—

*Sorbi*, Htg.—Head small, ochreous-yellow, with two dark reddish marks on the vertex, which are frequently almost, if not quite, joined together ; mouth brownish, mandibles blackish. Body yellowish-green ; the skin beset with numerous tubercles, which are white with a yellowish tinge, and are much larger over the legs and along the dorsal vessel than over the rest of the body ; there are none on the anal segment. Legs white, with dark brown claws, abdominal legs glassy green. Spiracles elliptical, pinkish-red. The clypeus and the part immediately above it is whitish, without the ochreous colour.

When young it is whitish green, with white tubercles ; the skin deeply powdered. The head is pale ochreous-yellow.

Found during August and September, rolled up on the under surface of the leaves of *Pyrus aucuparia*.

*Vitellinae*.—Head white, with a fuscous cloud on the vertex, not touching the eye spots, which are black; the lower part of clypeus black in the centre. The body is light green, with the folds of the skin whitish; along each side of the dorsal vessel is a row of white tubercles, and another row is over the legs. The dorsal vessel is pale green. The spiracles dark reddish, and above each is one or more small red marks. Legs clear white, claws blackish. The anal segment bears no tubercles.

The above description is from some larvae taken in July at Rannoch. Brischke bred the species from two different larvae. The one was found on *Salix caprea*, in August and September. It was clear yellowish-green, with numerous white tubercles; the head shining, granular, yellowish, and black eye spots. The spiracles elliptical, reddish; the claws brown. The other larva was found in July, on *Salix viminalis* and *S. caprea*. It was smaller than the autumnal form, the ground colour was bluish-green, the dorsal line (which was free from the white warts) was of a darker green, and the whole body (except the last segment) was beset with raised, often confluent, tubercles and dots. The spiracles were reddish-brown, and over each (except the first and last) stood a small dot of the same colour, which was not present with the other larva. The claws are brown, and upon the yellow shining head is, between the eyes, a brownish spot.

*Lucorum*.—Head light brownish-yellow, the mouth part brownish, eye spots black. Across the vertex is a large dark brownish mark, occupying the greater part of the vertex, and extending down to the front of the head. The legs are white, the claws black, the clasps light glassy-green. The elliptical spiracles are dark brownish-black. The body is bright, rarely bluish, green, the skin wrinkled and beset with white tubercles over the legs and along the back, in the former part consisting of a large with a smaller one beneath it; they are absent from the anal segment. There can scarcely be said to be a dorsal stripe, but when the food canal is filled, it is noticeable as a slightly darker green line enclosed by the white dorsal tubercles.

When young the body is greyish-white, the head blackish, and obscured by a whitish exudation; the body is dusted all over with a white powder, which varies in quantity.

*Betuleti*, Kl. (*crutaegi*, Zadd.).—After the last moult, the larva of this species is bright greenish-yellow, with a darker green line running down the back. On the vertex is a large brownish-orange spot, the legs pale whitish-green, with brown claws; the spiracles are reddish. The skin is covered with minute tubercles, and sparsely covered over with a white powder.

When young it is green, but dusted over with a white powder; the head is black, obscured with a white exudation; the region of the mouth is white.

So far as is definitely known, *betuleti* is confined to the hawthorn for its food.

Taschenberg, in his *Entomologie für Garten*, describes the larvae of *Blennocampa bipunctata*, and of *Athalia rosae*; so to make my remarks (*antea*, p. 110 and p. 130) on these insects complete, I give here his observations:—

The 22-footed larva of *B. bipunctata* is whitish, yellowish on the head, except the mouth and eye spots, which are darker. It lives, boring into the pith of the rose branches, during the second half of May, June, and sometimes on to the first half of July. Towards the middle of April, or the commencement of May, the fly appears, and lays her eggs singly in the point of the young branch. The larva soon bores into the pith, whereby the leaves become withered. It eats about an inch and a half into the branch, and when it reaches maturity, bores a round hole in the side of its habitation and drops to the ground, where it pupates.

Of the larva of *A. rosae* he says that it is dark green above, at the sides and belly clearer, and the head is reddish-yellow. There are two generations in the year, the first appearing at the end of June and beginning of July, the second is found in September and October. The fly lays her eggs in the mid-rib of the rose leaves, and when the larvae emerge they proceed to devour the upper epidermis, so that the lower becomes as transparent as gauze. They spin a cocoon in the earth. The larvae are stated by J. Scheffler to feed also on *Sedum album*.

IV.—*Notes on a new method of fixing fronds of Carboniferous Polyzoa on a layer of Asphalt, to show the celluliferous face.* By Mr JOHN YOUNG, F.G.S.

Those who like myself have collected the Polyzoa of our Carboniferous limestone shales, may have often expressed regret that

the fronds of the fenestrated species should be found, in almost every instance, with the celluliferous face adherent to the stone in which they are embedded. The reason for the fronds being so persistently adherent by this face, is that the pores on the celluliferous face have often raised margins, and are more or less slightly projecting beyond the surface of the frond, giving it a rougher aspect, while the non-celluliferous face is comparatively smooth, being only faintly striated or granulated in most instances. This smoother face is consequently much less adherent to the matrix than the celluliferous face, and is therefore that which is most constantly exposed. In some of the harder limestone shales, such as those of Hairmyres, East Kilbride, and of the Beith and Dalry districts in Ayrshire, we sometimes find the fronds of the Polyzoa showing the celluliferous face, but this is owing to the circumstance that there the fronds have been fixed down by one or other face upon a layer of harder shale or limestone, and have been covered by a layer of softer shale, so that when the rock comes to be split up, the parting is in the line of the soft shale; so those specimens that chance to have their celluliferous faces next to the soft layer are now and again exposed. On the other hand, where the Polyzoa are embedded in soft shales that yield readily to the influence of the weather, like those of Dikehead, High Blantyre, or Gillfoot, Carluke, the tendency in them is for the celluliferous face to adhere to the matrix. However beautiful fronds of Polyzoa showing only the reverse face may be, they are much more beautiful, and become more valuable to palaeontologists as specimens, when the celluliferous face can be examined, for it is only by the number and form of the cells in the fenestrules that the several species belonging to the various fenestrated genera can be correctly determined.

Recently Dr Rankin of Carluke, when examining the Polyzoa of the Gillfoot shale, was led to try the experiment of fixing small portions of the fronds of Polyzoa by their non-celluliferous face to a bit of melted black sealing-wax, which adhered firmly to the frond. On the shale being placed in water, the wax brought away the bit of Polyzoa with its celluliferous face exposed, which on being cleaned, by washing with a brush in water, allowed the cells to be clearly examined. To Dr Rankin, therefore, am I indebted for the hint that first led me to try the same experiment on large fronds of Polyzoa, but using instead of the black sealing-wax, a

melted layer of common asphalt, free from sand, such as is used for street pavements. By this method, as you will see from the series of specimens exhibited, I have been successful, beyond my expectation, in transferring to the layer of melted asphalt the largest fronds of Polyzoa preserved in our shales, in all their entirety, and showing the celluliferous face in a manner which is hardly excelled in recent specimens.

The method adopted may be briefly explained as follows:— After selecting the specimens,—it being only those preserved in soft shales that can be successfully treated by the asphalt process, as those fronds embedded in hard shale or limestone cannot be lifted by this method,—let them be well dried at the fire, or in the sun's rays, to free them from moisture; and before applying the layer of asphalt, heat the specimens at the fire, this making the asphalt adhere much more firmly than when they are cold and damp. The asphalt may be melted and spread over the face of the frond by a piece of iron, or a kitchen poker, heated nearly to redness, having at the same time a bit of tough brown paper lying ready to cover the layer of asphalt while it is still warm. The paper must be pressed on the asphalt with the fingers, and spread smoothly over the surface; and in order that the frond may adhere firmly to the asphalt, see that no gum or other mucilage is allowed to touch the specimen. The layer of paper strengthens the asphalt, and forms a better surface for afterwards fixing the specimens to the tablets on which they are mounted. For large fronds of Polyzoa, it is better to use two or three alternate layers of asphalt and paper; which make a thin firm cake, not liable to break or crack across when being cleaned. Having applied the asphalt, place the shale in water, letting it lie for a time. Some shales part from the fronds of the Polyzoa in a few minutes, while others will take an hour or two, or even a day; the process may be hastened, however, by placing the shale in a saucer filled with water, and as it softens, picking it away with the point of a knife, until the face of the frond appears. Then wash the face of the frond in clean water, until the whole of the cell-pores appear quite clean, using a hard nail-brush or tooth-brush for the purpose. If the frond has been well fixed to the asphalt, it may be washed without fear of its removal. When the frond is properly cleaned, the surplus asphalt and paper can be cut away from around it by a pair

of sharp scissors; and when this is done, the specimen may be considered finished. The fronds of the Polyzoa being generally of a greyish-white colour, they contrast very favourably with the black ground of the asphalt; and the manner in which the surface of the celluliferous faces of the fronds can be examined over their whole extent, renders this method of treating them very satisfactory. The genera from our soft shales that I have had an opportunity of operating upon, are the several species of *Fenestella*, *Actinostoma*, *Synocladia*, and *Glaucanome*, and these have all turned out well. I have also used this method for exposing the outer surface of some of the *Aviculopectens*, and other shells which were adherent by their rough faces to the stone, and I find it answers very well.

Before the discovery of treating the larger fronds of the Polyzoa by the asphalt process, when we wanted to examine the celluliferous faces of the various species, we were content with the fragments of the broken up fronds from the soft weathered shales. When these fragments were collected, they were found to be often coated by a thin layer of clay. In order to remove this, I have adopted the following plan:—I pick out of the shale all the fragments to be examined; I then take a glass slide, and coat it with a layer of thin gum; next, with the forceps, lifting the fragments of the Polyzoa and placing them on the gum, with the celluliferous face uppermost. When this is finished, I allow the gum on the slide to dry slowly for a day or two, until it is quite hard; I then place the slide in a saucer filled with water, brushing the specimens gently and quickly with a tooth-brush until they are quite clean, the gum holding the specimens securely, while the washing improves the appearance of the cells. The slide may then be left in the water until the fragments are melted off, when they can be easily collected with a soft hair pencil, and dried on blotting paper, after which they are ready for mounting on slides for microscopic examination. I have found this to be a good method for cleaning fragments of Polyzoa only to be had as weathered specimens in the shales, and they form beautiful and interesting cabinet objects for microscopic investigation.

# Natural History Society of Glasgow.

SESSION 1876-77.

*President—*

Professor JOHN YOUNG, M.D., F.G.S., F.R.S.E., Glasgow University.

*Vice-Presidents—*

JAMES RAMSAY, 159 Eglinton Street.

THOMAS CHAPMAN, 56 Buchanan Street.

JAMES B. MURDOCH, Hamilton Place, Langside.

*Secretary—*

ROBERT MASON, 6 Albion Crescent, Dowanhill.

*Treasurer—*

R. J. BENNETT, 50 Gordon Street.

*Librarian—*

PETER CAMERON, 23 Exchange Square.

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D. CORSE GLEN, C.E., F.G.S.

JOHN YOUNG, F.G.S.

FRANCIS G. BINNIE.

## LIST OF MEMBERS.

### HONORARY.

1851 HUGH COLQUHOUN, M.D., Anchorage, Bothwell.

1851 WILLIAM FERGUSON, F.L.S., F.G.S., &c., of Kinmundy, Aberdeenshire.

1856 ROBERT HISLOP, Blair Lodge, Polmont.

1866 Dr. W. P. SCHIMPER, Professor of Geology, University of Strasbourg.

### CORRESPONDING.

1851 Robert Gray, F.R.S.E., 13 Inverleith Row, Edinburgh.

1852 T. B. Grierson, M.D., Thornhill, Dumfriesshire.

1861 John Shaw, Ph.D., Principal of the Gymnasium, Colesbur, South Africa.

1863 Rev. James Dewar, Arrochar.

- 1863 Rev. H. W. Crosskey, F.G.S., Birmingham.  
 1863 Edward R. Alston, F.Z.S., F.L.S., F.G.S., Arts Club, Hanover Square, London.  
 1866 Right Hon. The Earl of Haddington, Tynninghame, Prestonkirk.  
 1866 James A. Mahony, Ramelton, Donegal, Ireland.  
 1866 Robert Macdowal, Surgeon, Panama Steam Navigation Company, Panama.  
 1866 Rev. James E. Somerville, B.D., Broughty-Ferry.  
 1867 Thomas Edward, A.L.S., Banff.  
 1867 John Buchanan, of the Government Survey, Wellington, N.Z.  
 1867 Thomas Anderson, Girvan.  
 1867 George Thomson, Victoria, Africa.  
 1868 Rev. Dr. Gloag, Galashiels.  
 1869 George S. Brady, C.M.Z.S., Sunderland.  
 1869 Capt. H. W. Feilden, C.M.Z.S., Junior United Service Club, London.  
 1869 Rev. John Ferguson, New Pitsligo.  
 1870 James Hardy, Old Cambus, Berwickshire.  
 1871 Alexander Gray, Chartered Bank of India, Batavia.  
 1871 Edwin Lees, F.L.S., F.G.S., Greenhill Summit, Worcester.  
 1873 Sir George Hector Leith, Bart., Ross Priory, Dumbartonshire.  
 1875 Robert Hill, Berbice, British Guiana.  
 1876 William Hamilton, Yokohama, Japan.  
 1877 H. B. Bailey, Newton, Mass., U.S.

## ORDINARY.

Those marked \* are Life Members.

- 1872 Aitken, David, 14 Robertson Street.  
 1863 Alexander, John, Menstriebank, Dowanhill Gardens.  
 1868 Angus, William Craibe, 159 Queen Street.  
 1872 Arrol, Archibald T., Millgrove House, Alloa.
- 1862 Bain, James, F.R.S.E., 3 Park Terrace.  
 1863 Balloch, Robert, 88 Union Street.  
 1876 Barclay, Thomas, 121 West Regent Street.  
 1875 Baxter, William, 16 Gibson Street, Hillhead.  
 1876 Bayne, Andrew Malloch, 32 India Street.  
 1872 Beckett, John, 11 Windsor Terrace, West.  
 1869 Bell, John, 12 Jamaica Street.  
 1869 Bennett, Robert J., 50 Gordon Street.  
 1874 Binnie, Francis G., 83 Bath Street.  
 1872 Blackie, Alfred, Lilybank, Hillhead.  
 1868 Bott, Frank, 93 Renfield Street.  
 1863 Brodie, Robert, 16 Kew Terrace.  
 1876 Bruce, James, 26 West Nile Street.

- 1877 Buchanan, John, 230 Duke Street.  
 1873 Buchanan, Thomas D., M.D., 24 Westminster Terrace.  
 1877 Burns, Walter, 17 Garden Street.
- 1871 Cameron, Peter, 23 Exchange Square.  
 1870 Campbell, John M., Kelvingrove Museum.  
 1873 Chalmers, John, 25 St. George's Road.  
 1852 Chapman, Thomas, 56 Buchanan Street.  
 1870 Clark, Henry E., 9 Elmbank Street.  
 1863 Clark, Peter, 3 Northumberland Street, Crosshill.  
 1866 Combe, George J., 59 Cathedral Street.  
 1851 Connal, Michael, 43 Virginia Street.  
 1875 Cooke, Stephen, F.C.S., Veterinary College, Buccleuch Street.  
 1866 Coutts, James, 44 Dorset Street.  
 1874 Crosby, John, 106 North Frederick Street.
- 1865 Dairon, James, 4 Garden Street.  
 1864 Dennistoun, Alexander, Roselea, Helensburgh.  
 1871 Dickson, Donald W., Victoria Place, Maryhill.  
 1868 Dixon, James S., 19 Elmbank Crescent.  
 1866 Donaldson, Alexander, 27 Blythswood Square.  
 1868 Dougall, James D., 39 Gordon Street.  
 1869 Drew, Alexander, jun., Lower House, near Burnley, Lancashire.  
 1874 Duncan, James, 65 Hamilton Drive.
- \*1873 Fleming, James Nicol, Keile, by Campbelton.  
 1872 Fleming, John, 83 Jamaica Street.
- \*1875 Flemyng, Francis P., LL.D., F.R.G.S., Sgor Bheann, Dunoon.  
 1876 Forrest, Thomas S., Holmwood, Langside.
- 1864 Galt, Walter, 498 St. Vincent Street.  
 1858 Gardner, Robert, 38 Queen Street.  
 1872 Gibson, Walter, Glendaruel, Cove.  
 1872 Gilchrist, Archibald, 11 Sandyford Place.  
 1871 Girvan, James Graham, 186 West George Street.  
 1870 Glen, David C., C.E., F.G.S., 14 Annfield Place.  
 1876 Grahame, James, 12 St. Vincent Place.  
 1875 Grieve, Henry, 10 Willowbank Crescent.  
 1856 Grieve, John, M.D., W. L. Buchanan's, 48 Gordon Street.  
 1876 Gurney, J. A., jun., F.Z.S., Northrepps Hall, Norwich.
- 1872 Hadaway, Thomas S., 122 Wellington Street.  
 1867 Hamilton, James, 111 West Regent Street.  
 1866 Harvie-Brown, John A., F.Z.S., Dunipace House, Larbert.  
 1875 Hill, Alexander, Queen's Park.  
 1858 Hutcheson, Thomas S., 10 Great Wellington Street.

- 1877 Kennedy, Scipio M., 2 Carnarvon Street.  
 1872 Kidston, David, 233 St. Vincent Street.  
 1871 Kirsop, John, 6 Queen's Crescent.  
 1872 Knox, David N., M.A., M.B., 8 Bellgrave Terrace.  
 1858 Knox, John, 5 Park Quadrant.  
  
 1872 Leck, Henry, Woodend, Partick Hill.  
 1876 Long, Rowley Jex, 727 Duke Street.  
 1870 Lumsden, James, jun., F.Z.S., 20 Queen Street.  
 1876 Lyle, James, 39 Scott Street, Garnethill.  
 1872 Lyle, John, 7 Broompark Terrace, Dennistoun.  
  
 1876 Macdonald, Alexander, 150 Nile Street.  
 \*1876 Malloch, Charles, 7 Blythswood Square.  
 1860 Manford, John, 27 West George Street.  
 1859 Manford, Stuart, 5 Dixon Street.  
 \*1875 Marshall, James, 8 Somerset Place.  
 1876 Marshall, Peter, 6 Park Grove Terrace.  
 1874 Marshall, Richard A., 170 Hope Street.  
 1876 Marshall, Robert, 214 Kent Road.  
 1872 Martin, Donald T., 142 St. Vincent Street.  
 1863 Mason, Robert, 6 Albion Crescent, Dowanhill.  
 1858 Miller, Gavin, 10 Windsor Terrace, West.  
 1866 Millar, James, Strathclyde Print Works, Dalmarnock.  
 1876 Miller, John F., 1 Wellesley Place, Sandyford.  
 1859 Morton, James, M.D., 199 Bath Street.  
 1863 Mossman, John, 21 Elmbank Crescent.  
 1851 Murdoch, James Barclay, Hamilton Place, Langside.  
  
 1873 M'Bean, Hugh, 24 Woodside Place.  
 1876 M'Callum, James T., 66 Buchanan Street.  
 1869 M'Ewan, William, M.D., C.M., 5 Ure Place.  
 1875 M'Farlane, John H., Auchenfroe House, Dumbartonshire.  
 1868 M'Kay, John, 10 Great Hamilton Street.  
 1871 M'Kerrow, James, 461 St. Vincent Street.  
 1854 M'Kinlay, David, 6 Great Western Terrace, Western Road.  
 1872 M'Laren, John, M.D., C.M., 21 Canning Place.  
 1875 M'Lean, John A., Union Bank, Doune.  
 1863 M'Lellan, Duncan, 42 Kelvingrove Street.  
 1874 M'Lellan, David D., 42 Kelvingrove Street.  
 1863 M'Pherson, James, M.D., 115 Bath Street.  
  
 1860 Napier, Alexander, Albert Cottage, Langside Road.  
 1851 Napier, James, F.C.S., Maryfield, Bothwell.  
 1876 Nelson, Daniel M., 48 Gordon Street.  
 1876 Newlands, A. D., 7 Camden Place, Govan Road.

- 1871 Okell, Arthur, 115 St. Vincent Street.
- 1871 Park, James, 115 St. Vincent Street.
- 1872 Paterson, George E., 82 St. Vincent Street.
- 1869 Paterson, William S., 226 West George Street.
- 1876 Paton, James, F.L.S., 35 Kelvingrove Street.
- 1875 Pratt, Arthur, 225A West George Street.
- 1866 Rae, John, 106 Union Street.
- 1863 Rainy, George W., 12 St. Vincent Place.
- 1861 Ramsay, James, 159 Eglinton Street.
- 1853 Rannie, Henry Alexander, 103 St. Vincent Street.
- 1858 Reid, John Eaton, 10 Newton Terrace.
- 1875 Rennie, George, 11 Nelson Terrace, Hillhead.
- 1871 Robertson, Archibald, 33 Granville Street, Newton Terrace.
- 1852 Robertson, David, F.G.S., F.L.S., 42 Kelvingrove Street.
- 1876 Robertson, David, jun., 329 Sauchiehall Street.
- 1865 Robertson, James, 91 St. Vincent Street.
- 1876 Robertson, John, Normal Seminary, New City Road.
- 1875 Robertson, Joseph, 110 High John Street.
- 1875 Robb, John, 74 Gordon Street.
- 1859 Russell, Thomas, 14 India Street.
- 1875 Schuman, Sigismund, 7 Royal Bank Place.
- 1872 Scott, James, 6 Wilton Crescent.
- 1872 Scott, John G., Fairyknowe, Bothwell.
- 1861 Sinclair, William, City of Glasgow Bank.
- 1867 Small, Rev. Robert, Caddonfoot Manse, Galashiels.
- 1877 Smith, James, Copeland Villa, Kelvinside Gardens.
- 1873 Smith, Robert, Ayton Villa, Langside.
- 1877 Smith, Robert, 230 Duke Street.
- 1876 Somerville, Joseph, 343 St. George's Road.
- 1866 Stevenson, Robert, 40 Abbotsford Place.
- \*1864 Stewart, Alexander B., Rawcliffe Lodge, Langside.
- 1868 Stewart, James, Williamwood, Cathcart.
- 1865 Stirton, James, M.D., F.L.S., 15 Newton Street.
- 1859 Sutherland, Alexander, 97 Buchanan Street.
- 1860 Thomson, James, F.G.S., 3 Abbotsford Place.
- \*1877 Thomson, James, I.A., 88 Bath Street.
- 1869 Thomson, William, Annfield House, Dennistoun.
- 1876 Tristram, H. B., LL.D., F.R.S., C.M.Z.S., Canon of Durham.
- 1868 Turnbull, John, 50 West Regent Street.
- 1866 Walker, Theodore C., Roseneath, St. James' Road, Leicester.

- 1871 Watson, Alexander James, 10 Kew Terrace.  
 1868 Watson, James, 2 Florentine Gardens, Hillhead.  
 1874 Watson, James R., 22 West Nile Street.  
 1875 Wilson, Daniel, 85 Wellington Street.  
 1863 Wilson, W. T., 88 St. Vincent Street.  
 1863 Wingate, James, 4 Royal Exchange Buildings.  
 1863 Wingate, John B., 7 Crown Terrace, Dowanhill.  
 1863 Wünsch, Edward A., F.G.S., 88 St. Vincent Street.
- 1872 Young, Henry C., Forth Street, Port-Dundas.  
 \*1852 Young, John, F.G.S., Hunterian Museum.  
 1866 Young, John, M.D., F.G.S., F.R.S.E., Glasgow University.  
 1869 Young, Thomas Charles, M.A., 4 Great Kelvin Terrace.

## NATURAL HISTORY SOCIETY OF GLASGOW.

*Abstract Statement of Accounts—Session 1875-76.*

To Balance per last Account—		By Anderson's University, for	
Cash in Bank, £104 8 4		Rent and Attendance, - -	£3 0 0
" in hand, 0 8 9		" Printing "Proceedings," Two	
	£104 17 1	Parts, Circulars, &c., - -	99 10 9
" 110 Annual Members' Subscrip-		" Postages of Circulars, &c., -	4 18 2
tions at 5/, - - - -	27 10 0	" Magazines, Books, and Bind-	
" 16 New Members' Entry-Money		ing for Library, - - -	3 19 8
at 10/, - - - -	8 0 0	" Two Tin Boxes, - - -	1 14 0
" 1 Life Member, - - -	5 5 0	" Balance, carried down, - -	39 1 4
" 8 Members' Arrears, - -	2 0 0		
" "Proceedings" sold, - -	2 2 4		
" Interest from Bank, - -	2 9 6		
	£152 3 11		£152 3 11

To Balance—Cash in Bank at this date as per Book, - - £39 1 4

GLASGOW, 20th Sept., 1876.—Compared with Vouchers, and found correct.

(Signed) ARCHIBALD ROBERTSON.  
 JOHN MANFORD.

## ADDITIONS TO THE LIBRARY.

SESSIONS 1875-76, 1876-77.

## FROM SOCIETIES.

- Bath* Natural History and Antiquarian Field Club. Proceedings. Vol. III. Parts II. to IV. 1876-77. 8vo.
- Belfast* Naturalists' Field Club. Proceedings. 1874-75, 1875-76.
- Berwickshire* Naturalists' Club. Proceedings. Vol. VII. Part III. 1875-76. Vol. VIII. Part I. 1877. 8vo.
- Boston* (U.S.) Society of Natural History. Proceedings. Vol. XVIII. Parts I. to IV. 1877. Memoirs. Vol. II. Part IV. No. 5. 4to.
- Brighton and Sussex* Natural History Society. Annual Reports. 1874-75, 1875-76. 8vo.
- Bristol* Naturalists' Society. Proceedings. Vol. I. Part III.
- Brussels*. Société Malacologique de Belgique. Procès Verbal. January to June, 1876.
- Chester* Society of Natural Science. Annual Reports. 1875-76 and 1876-77. 8vo.
- Christiania*. J. W. Muller (Prof.) Transfusion und Plethora, eine Physiologische Studie. 1875. 8vo. From the Royal Norwegian University of Christiania.
- C. P. Caspari.—Quellen zur Geschichte des Taufsymbols und der Glaubensregel. 8vo. Ib.
- J. Lieblein.—Die Aegyptischen Denkmäler. 8vo. Ib.
- J. Collett.—Norvège Carte zoo-géographique. 4to. Ib.
- Eastbourne* Natural History Society. Papers. 1872-77. 4to.
- Edinburgh*. Transactions of the Scottish Arboricultural Society. Vol. XIII. Part II. 1877. 8vo.
- Edinburgh*. Transactions of the Edinburgh Geological Society. Vol. II. and Vol. III. Part I.
- Edinburgh* Botanical Society. Transactions. Vols. XI. and XII. 1870-76.
- Glasgow*. Proceedings of the Glasgow Philosophical Society. Vol. X. Parts I. and II. 1876-77.
- Glasgow*. British Association Guides. 3 Parts. From the Local Committee.

- Leeds* Naturalists' Club and Scientific Association. Sixth Annual Report. 1875-76.
- London*. Journal of the Royal Geographical Society. Vol. XLV., 1875. Vol. XLVI., 1876.  
 Proceedings of the Royal Geographical Society. Quarterly.  
 Ibid.—Charter and Regulations. 1877.
- London*. Journal of the Quekett Microscopical Club. Nos. 1 to 33. 1876-77. 8vo.
- London* Geologists' Association. Transactions. Vols. I.-IV.
- London* (Ontario). The Canadian Entomologist. Monthly. From the Entomological Society of the Province of Ontario.
- Lyons*. Bulletin de la Société d'Études Scientifiques de Lyon. No. 1, 1874. No. 2, 1877. 8vo.
- Manchester* Geological Society. Transactions. Vols. XIII. and XIV. Parts I.-XIII. 8vo.
- Manchester* Literary and Philosophical Society. Proceedings. 1875 and 1876.
- Manchester* Scientific Students' Association. Annual Report. 1874-75.
- Norfolk* and *Norwich* Naturalists' Society. Transactions. Vols. I. and II. Parts I.-III. 8vo.
- North Staffordshire* Naturalists' Field Club and Archaeological Society. Annual Reports. 1875-77. 8vo.
- Paris*. Bulletin de la Société Zoologique de France. Parts I. to VI., 1876; and Parts I. to III., 1877. 8vo.
- Toronto* (Ontario). Annual Report of the Entomological Society of the Province of Ontario. 1877. 4to.
- United States* Geological Survey, per F. V. Hayden. Preliminary Report of the U.S. Geological Survey of Wyoming and portions of contiguous Territories. 8vo. 1871.  
 First, Second, and Third Annual Reports of the U.S. Geological Survey of the Territories, for the years 1867, 1868, and 1869. 1 Vol. 8vo. 1873.
- Watford* Natural History Society. Transactions. Vol. I. Parts I.-V.

## BY PURCHASE.

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

LIST OF SOCIETIES, ETC., TO WHICH THE  
PROCEEDINGS ARE SENT.

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GREAT BRITAIN AND IRELAND.

Aberdeen Natural History Society.  
 Bath Natural History and Antiquarian Society.  
 Belfast Naturalists' Field Club.  
 Berwickshire Naturalists' Field Club.  
 Brighton and Sussex Natural History Society.  
 Bristol Naturalists' Society.  
 British Museum.  
 Chester Society of Natural Science.  
 Eastbourne Natural History Society.  
 Edinburgh Botanical Society.  
 Edinburgh Geological Society.  
 Entomologists' Monthly Magazine. Editors.  
 Glasgow Geological Society.  
 Glasgow Philosophical Society.  
 London Geologists' Association.  
 London Quekett Microscopical Club.  
 London Royal Geographical Society.  
 Manchester Geological Society.  
 Manchester Literary and Philosophical Society.  
 Manchester Scientific Students' Association.  
 Norfolk and Norwich Naturalists' Society.  
 North Staffordshire Naturalists' Field Club.  
 Paisley Free Library.  
 Scottish Naturalist. Editor.  
 Watford Natural History Society.

CONTINENT OF EUROPE.

Brussels.—Société Malacologique de Belgique.  
 Christiania.—Royal Norwegian University.  
 Liege.—Société Royal des Sciences.  
 Lyons.—Société d'Études Scientifiques.  
 Paris.—Société Zoologique de France.

## AMERICA.

Boston Natural History Society.

Buffalo Society of Natural Science.

Portland Natural History Society.

Saint Louis Academy of Science.

Salem.—Essex Institute.

Toronto.—Entomological Society of the Province of Ontario.

Washington.—Smithsonian Institution.

Washington.—U.S. Survey of the Territories, per Prof. Hayden.

# PROCEEDINGS

OF THE

## NATURAL HISTORY SOCIETY OF GLASGOW.

SESSION 1877-78.

THE TWENTY-EIGHTH ANNUAL GENERAL MEETING,  
ANDERSON'S UNIVERSITY BUILDINGS,  
SEPTEMBER 25TH, 1877.

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

The Treasurer submitted his Annual Financial Statement, which showed a balance in favour of the Society of £42 17s. 1d.

The Secretary read the report of the Council on the business of last session. During its progress 18 new entrants had been admitted, 3 of whom were life members. The roll now numbered 150, as against 135 reported at last annual meeting; being an increase of 15. Nine meetings were held during the session, extending from September to April, eight being ordinary monthly meetings, and one—a special meeting—in the Natural History class-room of the University, when the Society was addressed by the President, on the geological bearings of some of the results of the *Challenger* and other exploratory expeditions. The meetings were generally well attended, the interest of the proceedings having been maintained up to the close of the session. The exhibition of specimens, which tends to promote discussion, and is the means of conveying valuable information, was varied and interesting, while many of the papers read were of an important character.

The printing of the Proceedings of last session was continued during the recess, and is now on the eve of completion, so that they will be in the hands of members by next meeting. The

Society will thus be in a position not previously attained—that of having its work published up to date; and the Council trusts that the system of a yearly issue will now be maintained, as tending greatly to promote the prosperity of the Society, while rendering the printed Proceedings of more value.

The excursions arranged before the close of the session have not been very successful. The early months of the year proved very ungenial, Spring being several weeks later than usual, so that the fields consequently had few attractions for students of Natural History, while the Summer months were cold and stormy throughout. Owing to this cause, some of the excursions did not take place; and when the day fixed proved at all favourable, the attendance was small and the results disappointing.

The formation of lists of the Fauna and Flora of a district is generally considered to be one of the chief objects of a Natural History Society, and in many parts of Great Britain this design has been successfully carried out. Soon after the starting of this Society this object engaged its attention, and from time to time lists were prepared, and arrangements were made for carrying out the work; but, from one cause or another, the result has never been attained. At the close of last session a resolution was come to by the Council, that the compilation of lists of the Fauna of the Clyde valley should be taken up without further delay, the Flora of the district having been efficiently catalogued by Mr R. Hennedy and other botanists. The Council hope the matter will now be carried forward to completion, several members having engaged to give help, and some of the lists being already in a state of forwardness.

The Librarian reported that during the session the Library was taken advantage of by 17 members, who borrowed 61 volumes. The Proceedings were distributed to 24 British, 5 Continental, and 8 American Societies. In exchange there have been received 27 different publications, some of them of considerable value. The sale of the Society's Proceedings is decidedly on the increase, several sets having been disposed of during the session; the amount realised from this source being nearly sufficient to meet the outlay for books purchased and for binding.

The above reports were all approved of and adopted.

The following gentlemen were elected office-bearers for the session :—Professor John Young, M.D., F.R.S.E., etc., President;

Thomas Chapman, James Barclay Murdoch, and John Young, F.G.S., Vice-Presidents; Robert Mason, Secretary; Robert J. Bennett, Treasurer; Henry C. Young, Librarian; James Lumsden, F.Z.S., Duncan M'Lellan, George E. Paterson, David Corse Glen, C.E., F.G.S., George J. Combe, Francis G. Binnie, John A. Harvie-Brown, F.Z.S., Archibald Robertson, and David Robertson, jun., Members of Council.

Mr Robert Gray, F.R.S.E., Edinburgh, was elected an honorary member; Mr Robert Etheridge, jun., F.G.S., etc., Edinburgh, a corresponding member; and Messrs. James Bayne, jun., George Bell, jun., James Armstrong, Thomas N. Hill, Thomas M. Campbell, and Thomas M. Campbell, jun., ordinary members of the Society.

Before proceeding with the remaining business, the Chairman called the attention of the meeting to the sudden death at Oban, on 25th July last, of Mr William Keddie, Lecturer on Natural Science, and Secretary to the Philosophical Society of Glasgow. Mr Keddie was one of the original promoters of this Society, having attended the first meeting, on 9th July 1851; and for a time he continued to take a part in the proceedings, his name frequently appearing on the record as engaged in promoting the interests of the Society, and his connection with it only ceasing when his engagements as Secretary to the Philosophical Society occupied all the leisure time at his disposal; but to the end he continued to take an interest in the Society's progress, and was pleased to hear of its success.

Mr Keddie at an early period imbibed a taste for natural history pursuits, and did much, by his example and instructions, to promote among all classes the prosecution of those studies to which he was attached. He was extensively known and highly esteemed by all who had the pleasure of his acquaintance, being ever ready to communicate to others the information and knowledge which he possessed, and to assist by his advice all engaged in the same pursuits. He commended himself to his friends by his genial disposition and engaging qualities, and all who knew him will long continue to cherish his memory.

The meeting cordially sympathized with the sentiments expressed by the Chairman, and instructed the Secretary to enter a notice in accordance with them in the record, and to furnish an extract from the minutes to the relatives of the deceased, with an expression

of the sincere sympathy of the members in the bereavement which they have sustained.

#### SPECIMENS EXHIBITED.

Mr Thomas Chapman, V.P., exhibited specimens of *Papilio adamastor* and *P. agamedes* (West.), two species of rare butterflies from Cape Coast Castle, Western Africa, and stated that although these had been figured and described by Westwood as distinct species, the variation was so slight that he thought they might properly be combined in one.

Mr George E. Paterson exhibited a specimen of the Green Sandpiper, *Helodromas ochropus* (L.) He said that the Green Sandpiper has a very wide range, being found from the Arctic circle to Africa, and in Asia, as far east as China. Like most other waders it breeds in the north, and only migrates south to pass the winter in warmer countries. It is not uncommon in England, especially in the Southern counties. In Scotland it is more rare, but has occurred oftener on the east coast than on the west. This seems to be the case with many of our rarer waders; the east coast is more in the line of their spring and autumn migrations, which makes it only natural that more stragglers should turn up there than on the west. This species has now occurred three times on the Carron, in Stirlingshire. Mr Harvie-Brown procured a specimen in August 1870, and in the autumn of the following year again identified the species. This bird is sometimes confused with the very closely allied species, the Wood Sandpiper, by those who have not carefully examined the two birds. They are, however, very easily distinguished by remembering the very simple fact, that the Green Sandpiper has the shaft of the first quill feather in the wing black, while in the Wood Sandpiper it is white.

#### PAPERS READ.

I.—*On a weathered Boulder of Carboniferous Limestone Shale: its probable Geological horizon and contained Fossils.* By Mr JOHN YOUNG, F.G.S., Vice-President.

Mr Young stated, that on the recent excursion of members of the Society to the Houston clay-field near Paisley, which contains the remains of Arctic shells, he found embedded in the clay in its upper portion, under the surface soil, a boulder of limestone shale, which,

from the long percolation of water charged with carbonic acid, had been softened, so that it could be crushed with the hand. As it was apparently filled with organisms, he had selected a small portion for examination. After washing this, he was interested to find that the material contained several rare fossils characteristic of the horizon of the Campsie Craigenglen beds, in the lower Carboniferous limestone series of the valley of the Clyde, and these occurred in it in greater abundance than he had yet met with in any other locality. One of them was a Foraminifer, forming the type of a new genus, which Dr H. B. Brady has named *Archædiscus Karreri*, and which he (Mr Young) first discovered in the shales of Craigenglen and afterwards at Brockley, near Lesmahagow. It is rather rare in most localities, but in this particular boulder it may be counted by hundreds, and of a larger size and in finer preservation than previously known. Another notable fossil which the boulder contained was the plates of an American genus of Echinoderms, named *Melonites*, of which two species have been recognised in British Carboniferous strata—*M. Etheridgei* and *M. Youngii* (Keeping), the plates of the latter species having first been detected in Craigenglen, and afterwards in one or two other localities, though rare in all. In the material of the rotted boulder, however, they are abundant and well preserved. Two other characteristic Craigenglen fossils were also found in the material, viz., *Kirkbya Eichwaldiana*, an Entomostracan, and *Trochus biserratus*, a small univalve. In the very small quantity of the shale Mr Young had examined, and which represented a layer of the Carboniferous old sea bottom only a few inches in extent, he had found 26 species of fossils, all of which he knew to occur in the Craigenglen beds.

Mr Young then pointed out the value of Palæontology as a guide to the proper determination of the geological horizon of strata, and stated, that although this boulder could not be said to represent all the varied forms of life that existed over the tract of the sea bottom of which it had formed a part, yet it clearly indicated what was the general character of the organisms that there prevailed, and the horizon of strata to which it belonged, the boulder having been drifted by ice, probably, from the Campsie district, or from some other tract in the valley of the Clyde where strata of the Craigenglen series occur.

II.—*Supplementary Notes on the Birds found breeding in Sutherland.\**

By Mr JOHN A. HARVIE-BROWN, F.Z.S., Member of the British Ornithologists' Union.

Since I wrote and read my original notes on this subject in 1871, and since they were revised in 1874, and printed in the Society's Proceedings in 1875, it can hardly be expected that any very marked changes have taken place in the summer avi-fauna of the county; still it is not uninteresting to trace the gradual progress of the changes, such as they are, the increase of certain species and the decrease of others, brought about, in the one case, generally by the extension of agricultural land improvements and the planting and growth of wood in certain districts, and in the other by the influence of game-preservers or by the backwardness of the seasons of late years. Since the date of my last personal observations in the county (1869) eight years have elapsed, but during that time I have obtained much interesting information from my kind and obliging correspondents, especially Mr Thomas Mackenzie of Dornoch, Mr J. Crawford of Tongue, and from Dr James M. Joass of Golspie,† which has enabled me not altogether to lose sight of the subject, and which has helped me to form some idea of the present fauna of the north and east. The results, however, of a visit made during the past summer to many of the old localities in the west, besides giving me a personal insight into such little changes as have occurred, enable me at this time to bring the subject more fully up to date than I could otherwise have done. As change in distribution, and increase or decrease in numbers of certain species, however slight, and within however small an area—if such can be traced with a fair amount of

\* Vide Proc. Nat. Hist. Soc. of Glasgow, Vol. ii., p. 69.

† When this paper was read in September 1877, I said that I hoped to be able to add a list of the species in the Dunrobin Museum. I have now received a catalogue of the species at present represented in the collection, along with particulars of date and capture, localities, etc., of the specimens. It is, however, only intended for private use, not being as yet considered complete enough to warrant publication. We may hope, however, that before long the collection will attain more complete proportions, as becomes the representative museum of one of our most interesting counties. As it stands at present, it is far from being really incomplete, there being 181 specimens, representing 138 species of birds; and 89, out of a total of 115 species which are found breeding in the county, have their eggs represented in the collection.

accuracy—are always subjects of interest to naturalists, I offer no apology for reading to the Society the following brief notes, which it is hoped will serve in some measure as a comparison of the fauna of the present time with that of eight years ago.

Before giving a list of the species upon which I have made fresh observations, it may not be out of place generally to indicate some of the changes brought about by the influences of the seasons, land improvements, or other causes.

Thus, as I have indicated in my original paper, certain species have extended their breeding range, notably amongst which may be mentioned the following:—The Missel Thrush, Song Thrush, Starling, Chaffinch. These, and many other species, are now found, where formerly they were scarce or altogether absent. Other species again have in like manner attempted to occupy fresh stations, the Rook being the most striking example; offshoots from the Cama Loch rookery in the west, having endeavoured to establish a new colony at Loch Beannoch, in Stoir, as I ventured to predict they would in my former communication. Thanks, however, to the blackness of their character as well as habit, they were easily detected in the first instance, and shot down by the keepers, so that this, their first attempt to extend their habitations to the northward along the west of Sutherland, was promptly checked. This was in the spring of the present year (1877). When on a visit to Loch Beannoch in June, I observed a very great difference in the numbers of the Herons upon the birch-clad islands of the loch, only a few pairs being visible, where, in 1869 and years previous, I used to find from 20 to 30 pairs breeding at the same time of year. Whether the short visits made by the “black invaders” in spring can have had any influence I cannot say, but the fact of their apparent decrease is at least worth noting in this connection.

Some of the summer migrants are decidedly scarcer, such as the Common Swallow and House Martin. This change can, I think, only have been brought about by the inclemency of the springs and lateness of the summers of recent years; at least it seems difficult to account for it otherwise. The same reason will undoubtedly, in part, account for the great falling off in the numbers of the grouse, the late frosts and backward, wet springs and summers killing many young birds, and inducing tape-worm and disease, where in former years such were scarcely known.

Many birds of prey are on the decrease, such as the Buzzard, Hen Harrier, and even the bold little Merlin, while the Sparrow-Hawk, as I am informed by Mr Crawford, is holding its own, if not increasing, in the northern districts. The decrease is owing entirely to the direct intervention of man in most cases, and the increase of the latter species, to the growth and extension of woods and plantations. I am glad to say that Eagles and Peregrines still appear to hold their own in some of the wilder districts, and even to have increased in numbers. It is not perhaps difficult to find the cause in the great tracts of country devoted to deer forests, where their lives are usually respected, and where they generally find a sanctuary undisturbed by all who take a proper view of their usefulness.\*

In other species again, there appears to be little alteration in numbers, and in some cases it was interesting to me to mark how persistently some old remembered spot has been frequented by this pair of Dippers, or that pair of Ring-Ouzels or Grey Wag-tails, probably the same that frequented it eight years ago.

It is, I think, unnecessary to say more in this place concerning these changes. Under each species in the following list, such changes as I have myself noticed, or which have been reported to me upon what I consider good authority and sufficiently authentic, as well as other matters, will be found duly recorded.

Before proceeding with a list of the species of birds upon which I have made fresh observations, it may not be considered out of place to say a few words regarding the mammals. There is not sufficient new material at hand to make it worth while to treat of them separately, and indeed they can be dismissed in very few words. The Otter and Polecat are both rare now in the interior of the county, as compared with a few years back, but they are still found not uncommonly on the Stoir peninsula, near the shores. The Wild Cat is also much rarer now, if not indeed extinct, in Assynt; so also is the Marten (*Martes abietum*, Flem.). In the Reay country, however, as we are informed by Mr H. M. Wallis (Zool., 1877, p. 292), one of the keepers had 15 skins awaiting the annual visit of the furrier's traveller in 1876.

Mr Thomas Mackenzie of Dornoch Castle tells me that Fallow

\* Possibly the decrease of the Peregrine Falcon in certain districts may, however, in some degree be caused by the decrease of its favourite food—the grouse, thus forming an exception to the above rule (vide further on page 231).

Deer, for some years back, have been frequenting the woods about Dornoch in a wild state. Mr Tennant of Rosehall has formed a park for them at Rosehall, and it holds at present about 270 head.

Squirrels are becoming more abundant in the wooded parts of the east, and are rapidly extending and increasing towards the north, but have not as yet penetrated westward. That squirrels boldly swim across rivers is well known to naturalists; nevertheless, I have the statements of several people in Sutherland, that it was not until some little time after the railway bridge spanned the Kyle between Ross-shire and Sutherland, near Invershin, that the numbers of this animal appeared markedly on the increase. Squirrels are always fond of running along roads or rides in forests, and even in comparatively open country, and I think the iron road spanning the Kyle is one very probable agent in, and reason of, their increase in the east and north of Sutherland.\*

The black variety of the Water-Vole frequents the rapid burns running through the limestone district of Assynt, where this year I saw a specimen, and nearly secured it with my trout-flies, as it sat trimming its whiskers at the side of a stream. On being disturbed it dived into the water, and I shortly afterwards saw it make good its retreat into a hole in the limestone debris on the river bank.

Rabbits are perhaps a little commoner in some localities in the west where they were formerly comparatively scarce, but these are only in sheltered and wooded parts, as, for instance, around Loch Inver; or upon certain islands, such as Handa; in which latter locality, however, they were always tolerably abundant. The hard rocky nature of the ground in the interior of Assynt seems effectually to bar their progress, and, combined with the severity of the winters, to prevent their increase to any appreciable extent. Blue and Brown Hares continue to be scarce. This year I only saw a few of the former in one or two localities.

Concerning the other species of mammals mentioned in the former list (*Proc. Nat. Hist. Soc. Glas.*, Vol. ii., p. 138) I have nothing of fresh interest to relate.

I beg here to thank those who have assisted me with their

\* As stated in my former communication and elsewhere (*Scot. Nat.*, Vol. i., p. 82), the Squirrel first appeared in Sutherland in 1869.

frank and kind correspondence, as well as others who have contributed many interesting scraps of information during my visit to my old quarters in the west. It was no small pleasure to me to find that the changes there—in other matters besides distribution of birds—were few, and that these few were only what might have been expected in the ordinary course of things. I found the same hospitable roof and well-remembered faces ready to welcome me, and I at once felt assured of the continuance of the old regime.

In the following list, the numbers affixed to the names of the species indicate the pages of my former communication, and are intended to facilitate a comparison of the observations made at the different periods.

### THE GOLDEN EAGLE.

#### *AQUILA CHRYSÆTUS* (L.) 72.

The Golden Eagle is still common, and is said to be even commoner in the west than formerly. The old eyries are still occupied, and one new locality has been taken up, where young were reared this year. But Mr Crawford, Tongue, seems to consider that they have decreased in numbers in the north, and thinks that the cause must be found in the extravagant prices offered for specimens by collectors. I heard, however, that in the Reay forest, orders had lately been given to kill down the Eagles, owing to damage done, or supposed to be done, of late, to the fawns of the roe-deer. The probability is, that if damage be done in this way, the blame should lie with some one particular pair of Eagles, and not with the whole tribe. There will be, doubtless, fawn-stealing Eagles, as there are occasionally lamb-stealing Eagles, and when these are discovered, no doubt they should be destroyed, but it seems hard to punish the whole race for the misdemeanours of perhaps a single pair. Let us hope that, if such an order has been issued, it may ere long be withdrawn. The good that Eagles do in a deer forest can, I think, scarcely be counterbalanced by the evil they do; and the harm they do, *as a tribe*, to either the interests of the game-preserve or sheep-farmer, is more imaginary than real, though I do not deny that sometimes a certain pair of Eagles will do considerable damage to the latter's flocks, just as a man-eating tiger will spread terror and death in an Indian village.

## WHITE-TAILED EAGLE.

*HALIAËTUS ALBICILLA*, L. 73.

I have not much of fresh interest to give concerning this species. It does not appear to increase in numbers, nor to equal those of the Golden Eagle.

## PEREGRINE FALCON.

*FALCO PEREGRINUS*, Gmel. 74.

The Peregrine is said to be scarcely so numerous as formerly, having been shot down. The true cause, however, I believe will be found in the diminution in the numbers of the grouse, its favourite food. The grouse have not become scarce owing in any way to the abundance of the Peregrine, but the Peregrine has become scarcer because its supply of food has become scarcer.\* I found one old haunt still frequented, and from another eyrie, Mr H. E. Dresser, who was with me this year in Sutherland, procured a single young bird. This eyrie used to be frequented at intervals by the same birds which held another crag about two miles off, but which was untenanted this year. On the other hand, in certain districts the Peregrine appears to hold its own remarkably well. (See introductory remarks, page 228).

## MERLIN.

*HYPOTRIORCHIS AESALON* (Gmel.) 76.

The Merlin is certainly not nearly so common in the west as formerly, either because it has been shot down, or on account of diminution of food; but the former cause I consider in this case the more likely, as they have undoubtedly been killed to a considerable extent. Mr Crawford reports them as also scarcer in the north, along with other species of Raptors.

\* I wish sportsmen would begin to hail the Peregrine as a bird of good omen on their moors, as a herald of good sport, an indicator of a well stocked hill, a sanitary commissioner appointed by nature looking out for weakly members of the community, and removing them to where alone they can do any good. Where the grouse are, there shall the Peregrines be gathered together, but where the grouse are not, dont blame the Peregrine.

## KESTREL.

*TINNUNCULUS ALAUDARIUS (L.) 77.*

The handsome Kestrel, I am glad to say, has been spared, and is almost, if not quite, as numerous as ever.

## SPARROW HAWK.

*ACCIPITER NISUS (L.) 78.*

Has not as yet appeared in the west. Mr Crawford writes to me that Hawks of nearly every description are getting scarce in his district except the Sparrow Hawk, which is doubtless increasing owing to the plantations growing higher, and affording additional shelter to the smaller species—the favourite food of this bird.

## COMMON BUZZARD.

*BUTEO VULGARIS (Leach). 79.*

Much scarcer; many old breeding places, known to me in former years, having been untenanted for some years back. One hatch of young birds was seen not far from Inchnadamph, and another pair bred about ten miles distant. In 1869, I knew of some six nests not far removed from one another. Mr Crawford reports the same decrease in the north.

## HEN HARRIER.

*CIRCUS CYANEUS (L.) 81.*

Before not uncommon; now almost completely shot down. Three breeding places in the west have remained untenanted for several years. I did not see a single example this year. Mr Thomas Mackenzie writes me concerning this species:—"I have seen a Hen Harrier in pursuit of a Partridge, which it put into a whin-bush. The Hawk continued to swoop down until the Partridge again took to flight, and when hard pressed it again took refuge in a bush. There being snow on the ground, I easily saw where the Partridge entered the bush, and putting in my hand, I took it out uninjured, the Harrier meantime hovering about."

## THE TAWNY OWL.

*STRIX ALUCO*, L. 83.

Mr Mackenzie writes :—"The Tawny Owl breeds regularly in a hollow tree in Dunrobin Gardens, and rears at least two broods. On 6th April, 1872, there were three eggs in this nest almost hatched out." There is one egg of this species in the Dunrobin Museum.

## LONG-EARED OWL.

*ASIO OTUS* (L.)\*

Mr T. Mackenzie notes that he has received the young of this species from Tongue. The keeper called it "The Woodcock Owl," a name more generally applied to the next species. The Dunrobin Museum possesses the egg of the present species, as I am informed by Dr Joass.

## SHORT-EARED OWL.

*ASIO ACCIPITRINUS* (Pall.) 84.

In 1873, as Mr Mackenzie informs me, a nest was taken by Dr Maynard near Dornoch. This year a bird was seen on an island of Loch Awe in the west, but no eggs were found; and on the night of 13th-14th June one of this species flew past our camp by the side of a loch in Stoir. In the Museum at Dunrobin the eggs are represented, along with the parent birds shot in the east of the county.

## EUROPEAN GOATSUCKER.

*CAPRIMULGUS EUROPAEUS*, L. 85.

Mr Thomas Mackenzie has received eggs from Balblair wood, near Golspie, and has shot young birds at Migdale in July, and there are eggs in the collection at Dunrobin.

\* In my former communication is an error, which has remained unchallenged; the specific names of this and of the next species having been accidentally transposed.

## CHIMNEY SWALLOW.

*HIRUNDO RUSTICA*, L. 87.

Apparently still continuing to decrease, at least at one locality in the west. Cold, backward springs may account for this.

## HOUSE MARTIN.

*HIRUNDO URBICA*, L. 87.

Mr Mackenzie writes :—" Not a House Martin is to be seen about Dornoch, but there is a numerous colony in the quarry or pit near the railway bridge over the Golspie Burn." In the west it has, for some years back, been becoming rarer and rarer ; indeed, in 1876, only one pair was known to frequent the houses at Inchnadamph, while the rock-colony has entirely disappeared.

## SAND MARTIN.

*HIRUNDO RIPARIA*, L. 88.

It is perhaps worthy of remark, in connection with the evident decrease of some migrants in the west, that at the localities indicated in my former paper, where I had met with a few pairs of this species, I did not see a single bird this year, although I visited, or was fishing in the neighbourhood, on four different occasions. Actual decrease or disappearance, however, I do not hold as *proved* by such imperfect negative evidence.

## COMMON WREN.

*TROGLODYTES PARVULUS*, Koch. 88.

Common about the wooded slopes of the river Inver, and noticed also close to the falls on the Kirkaig river.

## SEDGE WARBLER.

*ACROCEPHALUS SCHOENOBAENUS*, L. 88.

Mr Mackenzie says not above two or three pairs are usually seen near Dornoch, where, however, he has taken the eggs. In the west I observed a pair on the islands of Loch Awe, where I have also met with them on former occasions. They are decidedly local.

## COMMON WHITETHROAT.

*SYLVIA RUF A* (Bodd.) 88.

Only one nest has been obtained at Dornoch by Mr T. Mackenzie. There are eggs in the Museum at Dunrobin.

## WILLOW WARBLER.

*PHYLLOSCOPUS TROCHILUS* (L.) 89.

Abundant in the west. It is difficult, I fancy, to judge of the increase or decrease of this species; but the latter I would deem unlikely, although Mr Crawford seems to consider that they are scarcer in his district. Possibly, as woods increase in height and acreage, and in these late cold ungenial springs, the tiny warblers may desert the more exposed situations on the hill-sides, and seek the better shelter to be found in the plantations. This year I certainly did not notice this species as common in the situations where I used to find them—on the bare hill-side, “where only a single stunted willow or alder, or birch-bush grows”; but I found them quite as abundantly as formerly in the larger birch-woods, and in the plantations along the river Inver, etc.

## GOLDEN-CRESTED REGULUS.

*REGULUS CRISTATUS*, Koch. 89.

Mr Crawford reports a decrease in the numbers of this species in the Tongue district. In many other localities, I have noticed, or fancied I have noticed, a fluctuation in the Gold-crest population, many more birds frequenting their breeding haunts in one year than in another.

*Obs.* A Wood Warbler (*Ph. sibilatrix*, Bechst.) is reported to have been heard at Kildonan in May 1876 (*auct.* Lord Clifton—“Zoologist,” 1876, p. 5122), but, as an addition to our list, should be taken with reservation, although again recorded as occurring even further to the north (Caithness—“Zoologist,” 1876, p. 5164). It certainly does not occur commonly in the inland glens of West Sutherland; indeed, as far as my experience goes, it does not occur there at all. If to be found anywhere in the west, it may be looked for in the sheltered glens near the coast, in such localities, for instance,

as the banks of the river Inver, or Kirkaig, although I have never actually met with the bird there myself.\*

### WHEATEAR.

*SAXICOLA OENANTHE* (L.) 90.

If anything, decreased in numbers, even in the limestone districts, as far as I could observe whilst on a fishing tour. Their abundance did not, as formerly, strike me as so remarkable as their apparent comparative scarcity. It is also the opinion of the natives that they have decreased in numbers.

### WHINCHAT.

*SAXICOLA RUBETRA* (L.) 90.

Apparently as common as formerly at the locality alluded to in my former communication. Occurs also, amongst other localities, at Kintradwell, in the parish of Loth, whence there are specimens in the Dunrobin Museum.

### STONECHAT.

*SAXICOLA RUBICOLA* (L.) 90.

Also again observed, commonly, at the same locality as the last—near Unapool and Kylesku. Occurs also, amongst other localities, at Loch Brora, parish of Clyne, whence there are two specimens (dated May 30, 1834) in the Dunrobin Museum.

### REDSTART.

*RUTICILLA PHOENICURUS* (L.) 90.

Mr Thomas Mackenzie writes of this species, that it is becoming commoner every year on the line of country between Dornoch and Golspie. He gets two or three nests every year. But Mr Crawford, on the other hand, considers them to be scarcer in the north than formerly. Mr E. R. Alston observed the species at Rosehall, in passing in the mail-gig, this June, and I saw one specimen in the Loch Inver plantations in the west.

\* It would well repay the trouble of minute investigation to work out the exact distribution of this species in Scotland.

## REDBREAST.

*ERYTHACUS RUBECULA* (L.) 91.

Seen also, not uncommonly, around Loch Inver, and on the wooded slopes of the river Inver.

## HEDGE ACCENTOR.

*ACCENTOR MODULARIS* (L.) 91.

A pair of these birds was seen by our party in a very bleak wild part of the country, far from wood, on the north-east side of Ben More, Assynt, in June this year. They were evidently carrying food to their young. I observed them commonly around Loch Inver.

## GREAT TIT.

*PARUS MAJOR*, L. 91.

Mr Mackenzie writes that he has never seen this species in Sutherland. I only once met with it in the west, at Loch Inver. There are, however, eggs of this bird in the collection at Dunrobin, as I am informed by Dr Joass.

## LONG-TAILED TIT.

*ACREDULA ROSEA* (Blyth). 92.

Very common about Lairg and Dornoch (*aut.* Mr Thomas Mackenzie). Mr Crawford of late years has remarked the scarcity of some of our smaller species, such as the Titmice, and especially this species, in the north.

## GREY WAGTAIL.

*MOTACILLA SULPHUREA*, Bechst. 92.

On the same burn-side where I used to find two pairs of the Grey Wagtails in 1869, I again found two pairs this year, frequenting exactly the same spots. I also observed a pair below the fall on the Kirkaig river. They do not appear to increase, but they hold to their old nesting sites with tenacity.

## DIPPER.

*CINCLUS AQUATICUS*, Bechst. 94.

Still apparently, to my eye, as abundant as formerly, though said not to be so by the natives. They are not shot down, and it would, I fancy, be difficult to assign a reason for their diminution, if such is the case. On one burn, near Inchnadamph, I was quite struck by their abundance this year, though certainly upon another, they did seem somewhat scarcer than in 1869.

## MISSEL THRUSH.

*TURDUS VISCIVORUS*, L. 94.

Mr Mackenzie, in 1875, notes this species as very common about Dornoch. Passing Rosehall, on the 21st May, 1877, in the post-gig, I saw several. I never observed them there, nor indeed in Sutherland, before. Near Loch Inver, in the west, I saw an old nest, evidently of this species. The advance of this species northward and westward has been very rapid. In the Dunrobin Museum are specimens of the eggs, with the birds, obtained as long ago as 1869; but at that time they were undoubtedly far from common.

## SONG THRUSH.

*TURDUS MUSICUS*, L. 94.

This year I observed the Song Thrush at Inchnadamph, where I have no recollection of seeing it before, and it is decidedly common now, near and around Loch Inver, and at some places on the shores of Loch Assynt. Formerly I found them common further north, at Badcall and Scowrie, and also at Loch Inver. They are now becoming more generally distributed.

## BLACKBIRD.

*TURDUS MERULA*, L. 95.

Common around Loch Inver. I cannot positively assert that it was less so nine years ago, but my impression is that it was not so plentiful then. It has not as yet reached Inchnadamph.

## SPOTTED FLYCATCHER.

*MUSCICAPA GRISOLA, L. 95.*

Nests all the way up between Dornoch and Tongue (*auct.* Mr Thomas Mackenzie).

## RAVEN.

*CORVUS CORAX, L. 96.*

Still common, though perhaps scarcely so common as eight or ten years ago. This year (1877) I saw seven Ravens, doubtless attracted by some dead sheep or lamb, circling round a low hill near Aultnagealagach, in company with about a dozen Hooded Crows.

## HOODED CROW.

*CORVUS CORNIX, L. 96.*

Have been considerably reduced in numbers in the west, according to report, though, to my eye, they were almost as plentiful as formerly.

*Obs.* Two eggs of the Carrion Crow are included in the list of the collections in the Dunrobin Museum furnished to me by Dr Joass, and also a specimen of the bird, shot near Dornoch on June 12, 1848. Concerning the eggs, however, considerable doubt must attach to them, owing to want of authentication.

## THE ROOK.

*CORVUS FRUGILEGUS, L. 97.*

In corroboration of my previous surmise, Rooks endeavoured to establish themselves at Loch Beannoch, in Stoir, but had been promptly shot down by the keeper who informed me of the fact. During my stay at Inchnadamph, a flock of Rooks several times made their appearance, doubtless from Cama Loch, and settled in the trees surrounding the manse.

*Obs.* The Chough is represented in the Dunrobin Museum by an example obtained in the county. It has no date attached, but the locality given is Dunrobin.

## COMMON STARLING.

*STURNUS VULGARIS*, L. 98.

A pair has appeared at Inchnadamph, where none were ever observed before; and they nested in the church this year, for the first time.

## CHAFFINCH.

*FRINGILLA COELEBS*, L. 99.

Has become common at Inchnadamph and Loch Inver. At the former place I only knew of one pair in 1869. Now several pairs nest round the house and in the garden, and amongst the trees along the Trailigill burn.

## GOLDFINCH.

*CARDUELIS ELEGANS*, Steph. 99.

Mr Mackenzie writes that the Goldfinch is known to breed at Dornoch, and birds are occasionally seen in his neighbourhood. There is an egg in the Dunrobin Museum.

## SISKIN.

*CARDUELIS SPINUS* (L.) 100.

Mr Mackenzie obtained a young bird from a nest on May 21, 1875, which he reared, and which made an interesting pet. Mr E. R. Alston observed several birds at Rosehall, when passing south, in June.

## COMMON LINNET.

*LINOTA CANNABINA*, L. 100.

Seen again at Inchnadamph this year.

## TWITE.

*LINOTA FLAVIROSTRIS*, L. 100.

Still frequents the same locality close to Inchnadamph. On Sunday, May 28th, I saw a party of five birds sitting on the ash tree close to the house, or perching on the top bar of a gate.

## YELLOW HAMMER.

*EMBERIZA CITRINELLA*, L. 102.

Apparently somewhat commoner around Inchnadamph than formerly.

## SKY LARK.

*ALAUDA ARVENSIS*, L. 102.

In my former communication I reported its habitat as "restricted to cultivated districts"; but this year I observed specimens upon the open moor between Oykel and Loch Clashmore, and again on the damp moor between Lochs Borrolan and Ünigill.\*

## CROSSBILL.

*LOXIA CURVIROSTRA* (L.) 102.

In a list of the species in the Dunrobin Museum there is a specimen from Kintradwell, dated 18th February, 1871.

## CUCKOO.

*CUCULUS CANORUS*, L. 103.

Heard at Inchnadamph, for the first time this year, on the 23d May. Season cold and backward. The observation was made by a native, my former gillie and collector, the day before I arrived in Sutherland. Apparently as plentiful as formerly.

## WOOD PIGEON.

*COLUMBA PALUMBUS*, L. 103.

Not uncommon now near Loch Inver, but only rarely seen at Inchnadamph.

## ROCK DOVE.

*COLUMBA LIVIA*, Temm. 104.

A pair of apparently perfectly pure-bred Rock Doves have lately frequented the house-tops at Inchnadamph Inn, where I saw them during my stay in May, June, and July. On my

\* Always distinctly pronounced *Oonigill* by natives; not *Uriigill*.

remarking on the purity of their breed, the landlord informed me that they arrived there and took up their quarters this year, associating with the Dove-cote Pigeons. On their first arrival they were shy and easily alarmed, but since then they have become much tamer.

### PHEASANT.

*PHASIANUS COLCHICUS*, L. 104.

The numbers at Loch Inver have again dwindled down, and the lessee of the shootings, I am informed, has not considered it worth while to persevere in rearing them. An old batchelor cock for a long time has wandered about; the last of his race at present in Assynt.

### PARTRIDGE.

*PERDIX CINEREA*, Lath. 105.

Not increasing at Inchnadamph; but still every year there is a nest, and sometimes two. The arable land has not been increased since 1869. A gentleman who had the shooting over the Glebe in 1876 (the Glebe extends to over 2000 acres, and is the second largest in Scotland), shot about 16 brace. The cultivated land does not exceed some 20 acres altogether.

### RED GROUSE.

*LAGOPUS SCOTICUS*, Lath. 106.

Since I was last in Sutherland (1869) Red Grouse have become very scarce in the west. On Inchnadamph shootings, during two seasons since 1869, they were very numerous, more so than formerly. 700 brace were shot one year, and I think 600 the next; but the ground was shot too hard. Tape-worm set in in 1875, and late cold springs and wet weather at hatching time, in 1876 and 1877, have brought them almost to the verge of extinction. I did not see a single bird on the 23d May, all the way between Lairg and Inchnadamph—a 32-mile drive; and during my whole stay in the west, I did not see more than 3 or 4 covies of young birds. On some shootings in the interior and east, however, good bags have been made this year.

## PTARMIGAN.

*LAGOPUS MUTUS*, Leach. 106.

Said to be less plentiful than formerly, but I had few opportunities of judging. Any times I was "up amongst the stones," I certainly neither saw nor heard a bird.

*Obs.* The Dotterell (*C. morinellus*) in the Dunrobin Museum was obtained on Ben Clibrich on 18th June, 1846.\*

## RINGED PLOVER.

*AEGIALITIS HIATICULA* (L.) 109.

Mr Mackenzie informs me that hundreds of eggs are annually laid upon the sandy links at Dornoch. In the west they have, apparently, slightly increased in numbers at the locality alluded to in my previous communication.

## LAPWING.

*VANELLUS CRISTATUS*, Meyer. 109.

Appears to me to be somewhat commoner close below Inchnadamph, where I do not remember seeing them in 1869, or years previous.

## OYSTER CATCHER.

*HAEMATOPUS OSTRALEGUS* (L.) 109.

Has only occasionally been seen inland, quite seldom enough to merit remark by the natives when they are observed.

## HERON.

*ARDEA CINEREA*, L. 110.

The numbers upon Loch Beannoch appear to me to be fewer. (See introductory remarks, page 227).

Mr T. Mackenzie writes:—"I have seen eggs hatched out 22d March, and have received fresh eggs (under-sized) in the end of

\* I cannot obtain a scrap of reliable information regarding its breeding in the county.

June. By way of accounting for this difference, an intelligent keeper gave me as his opinion, that the old or mature birds were the early breeders, and that these frequently reared two broods; and that the birds of the previous year laid in May and June, and for the first year reared only one brood."

### CURLEW.

*NUMENIUS ARQUATA* (L.) 111.

Mr Mackenzie writes:—"I have never found more than 3 eggs in some 3 or 4 nests taken by me. In one nest the eggs were just at hatching, so the number was complete."

In the west the Curlew appears to me to be somewhat more plentiful than formerly around Loch Awe.

### GREENSHANK.

*TOTANUS GLOTTIS* (Pall.) 113.

Said to be somewhat scarcer, but I hardly think so. I miss them, certainly, in one or two localities which used to hold a pair; and their loud "Twu-whu," though often heard, is not so general perhaps as formerly. About Loch Inver, and along the Inver river, they are, however, apparently even more plentiful than formerly. As I remarked before, the eggs are sometimes difficult to find, and often the old birds have to be watched to the nest, when a great deal of "Twu-whu," "twu-whu," is generally heard, repeated quickly, as if scolding. I obtained one set of eggs, for Mr Dresser. The nest was in a very exposed situation, on the top of a mound of burnt heather. The spot was pointed out to me by my old collector, who was always a good hand at finding them.

### DUNLIN.

*TRINGA ALPINA*, L. 114.

Mr Mackenzie has taken eggs annually in the east, and has found the species breeding near Lairg. They do not appear to have increased in the west at the locality before indicated.

## WOODCOCK.

*SCOLOPAX RUSTICOLA*, L. 116.

The Woodcock rears two broods in Sutherland, as Mr Mackenzie informs me. He has taken eggs and seen the young in April, and again taken eggs and seen young in August of the same year. It is generally supposed that they have considerably increased in numbers in the west, in the breeding season.

## COOT.

*FULICA ATRA*, L. 118.

Mr Crawford informs me that he shot a Bald Coot on the 7th March, 1877, and adds: "It must have come in from the sea, I think, as it was feeding in the small burn which runs through the policy here, and near to the sea." He formerly observed the species on a small lochan in the parish of Farr; but for some years they have not reappeared there.

## GREY-LAG GOOSE.

*ANSER FERUS* (Gmel.) 118.

According to all accounts, not less plentiful than formerly. This year Mr John Sutherland and the keeper got six young, and two of these have been reared successfully. They were caught on 20th May. At this locality, as before, there are still always a number of geese not breeding, but feeding in a flock of from 20 to 30, about the same number I used to find there in 1869 and the years previous. The non-breeding birds are out of all proportion to the breeding birds—some three or four pairs of the latter being about all. They have not of late years bred on Loch Assynt, where I once found a nest.

The tamed Wild Geese (referred to indirectly in my former paper, Vol. iii., page 119,) some years ago left Inchnadamph. They flew away one day, and never returned. It is supposed they were shot, as on previous occasions they had always returned; but I think the possibility exists that they took right away, induced to leave by some migrating band of their own species.

It is considered by some of the natives here that the non-

breeding birds flocking at certain localities are young birds of the previous season. The grassy knolls and pastoral country round one loch in particular, present extremely favourable feeding grounds, perhaps better than any others in Assynt.

The growth of the young birds taken this year was very rapid. They were quite small when taken; by the 16th July few remains of down were visible, while by the end of the month they were beginning to fly, and the white patches on the shoulders were quite conspicuous.

### BLACK SCOTER.

*OEDEMA NIGRA* (L.). 121.

Dr Joass of the Dunrobin Museum informs me that this species does breed, or at least did breed this year, within the boundaries of Sutherland. In this instance, the eggs were taken and both old birds shot.

Let us here entreat that such rarities be most carefully preserved, alike by proprietors and lessees of shootings. Only in very exceptional cases is there any need of shooting any Scotch species from its nest, in order to establish it as a breeding species in the country.

*Obs.* Pochard—*Fuligula ferina*, (L.)—Although eggs of a Duck in the Dunrobin Museum are supposed to belong to this species, there is want of minute and careful authentication in connection with the specimens.

### BLACK-THROATED DIVER.

*COLYMBUS ARTICUS*, L. 122.

I am glad to say that almost all the old localities still hold their pair of birds, although the eggs have been taken pretty often. Few, if any, are shot, and in many localities they are seldom or never disturbed. Even close to the public road they breed every year as formerly.

### RED-THROATED DIVER.

*COLYMBUS SEPTENTRIONALIS*, Lath. 124.

The same cannot be said of this species as of the last. Although never plentiful in the Assynt district, they are even scarcer now,

according to all reports. It is difficult to account for this, as they are, I understand, equally preserved and unmolested—at least by the keepers and those who carry guns. Possibly the situation of their nests may lay them open to more molestation from foxes and vermin than the other species.

*Obs.* Great Northern Diver (*Colymbus glacialis*, L.)—I may add I have additional evidence regarding the breeding of this species at the same inland locality where I saw them in 1868. The actual proof is, however, still wanting. A report also was circulated that they had bred at another locality, and that the eggs had been taken, but I obtained no corroborative evidence; and in this instance, written evidence or ocular proof is all that I could pay attention to.

#### LITTLE GREBE.

*PODICEPS MINOR* (Gmel.) 126.

Mr Mackenzie notes this species as common in the neighbourhood of Dornoch, and also at certain small lochs near Durness. In the Assynt district one was shot, a year or two ago, on Muloch Corrie Loch, at the base of Ben More. It was the first seen in these parts by the keeper, or by the shepherds.

#### RICHARDSON'S SKUA.

*STERCORARIUS CREPIDATUS*, Gmel. 130.

Mr Mackenzie informs me that Mr Houstoun's gamekeeper on Kintradale (Kintradwell?) got a nest with eggs.

#### GREAT BLACK-BACKED GULL.

*LARUS MARINUS*, L. 130.

Some 40 pairs of this species breed on an island on Loch Lee. Their nests are robbed twice, sometimes thrice, in a season, and 70 to 80 eggs taken each time. Yet the species shows no symptoms of diminishing. The last sets of eggs want much of the colouring matter on the shells. A far-inland locality for this species is on a loch near Oykel, where I saw one pair this year.

## COMMON TERN.

*STERNA FLUVIATILIS*, Naum. 133.

AND

## ARCTIC TERN.

*STERNA MACRURA*, Naum. 133.

My former statement, that the Arctic Tern is of more frequent occurrence in Sutherland than the Common, is queried by Mr Mackenzie; and he adds that, in his experience, the reverse is the case.

## LITTLE TERN.

*STERNA MINUTA*, L. 133.

This can now be definitely added to the list of birds breeding in Sutherland, as the collection at Dunrobin contains eggs taken in the east of the county.

III.—*A contribution to the Hymenoptera of Sutherlandshire.*

By Mr PETER CAMERON.

I have again the pleasure of bringing before the Society the results of my exploration of the Hymenoptera of the Highlands, in continuation of my two former papers, published in the last two Parts of our Proceedings. This time I proceeded further north, viz., into Sutherlandshire. Knowing from experience that a well wooded district would yield the best results, I chose Bonar Bridge, on the Dornoch Firth, as my head-quarters, not only because the country around there is better cultivated and wooded than elsewhere, but also from the facilities it afforded of making excursions northward, as well as southward into the neighbouring county of Ross. I reached the village on the 15th June, but that for the late season was rather too early; for even then insects whose normal time of appearing is May, were just beginning to put in an appearance, and the more common species, which can usually be had everywhere in abundance, were remarkably scarce. This, however, was not the fault of the country, but of the extremely bad season. It is many years since we have had such an unfavourable season for Entomology; for not only were insects scarce when one

could get out after them, but the opportunities of collecting them were very few, as scarcely a day passed without rain. In Sutherlandshire a good many of the species occurred only in the male sex (which appear about a week in advance of the females); while as for larvae, scarcely any were to be seen. Although then, as regards quantity, my journey did not yield much, yet several things were found that well repaid the visit, and indeed showed how much better I would have done if the season had been more favourable. Around Bonar Bridge the most interesting species met with was *Cyphona geminata*, Dbm., of which one specimen turned up by sweeping on the banks of the Carron; this insect is rare everywhere, and hitherto only found in the South of England. At the same place I bagged three males of *Taxonus agrorum*, Fall. (*nitida*, Kl.), an insect which I was well pleased to see, as I was doubtful of its British nativity, which was thus placed beyond question. The male differs from the female in having the neuration of the posterior wings formed as in *Perineura*, a difference which led Eversmann to describe it as a new species under the name of *Taxonus anomala*. Near Lairg I captured among the birch woods a *Nematus*, which I have no doubt is the *N. canaliculatus* of Hartig, not hitherto recorded for Britain. Near the Falls of the Shin I fortunately came across several larvae of *Nematus betulae*, Retz., this also being new to the British fauna. Of known British species the most noteworthy met with was *Fenusa melanopoda*, Cam., on Alder, a circumstance which seems to show that it was its larvae and not that of *pumila* which Zaddach and Goureau described under that name. *Nematus fallax* occurred on *Salix fusca*, thus considerably extending the northern range of this species in Scotland. *N. dorsatus*, Cam., was captured not rarely; *Athalia glabricollis* at the mouth of the Dornoch Firth; and *Nematus appendiculatus* on the banks of the Shin at Invershin, this form having only hitherto been found in Braemar in Scotland.

Towards the end of my stay I paid a visit to the interior, and stayed at Altnaharra, where my best captures were made. On the first day it poured, but the next was very fine, and an ascent was made of Ben Clibrich, the second highest mountain in the county. In ascending I found a dipterous gall (formed of thickened terminal leaves), on *Vaccinium vitis-idaea*, which had been found previously by Prof. Trail at Braemar, but the maker has never been bred. At an

elevation of about 2000 feet, what turned up but the *Blennocampa alchemillae*, which I described before the Society last session, and published in Part II. of the Proceedings. It was found among *Alchemilla alpina*. At the same place I found several interesting *Oxyura*, which I have not yet succeeded in naming, and they are probably undescribed. When the top was gained, I sat down to enjoy the glorious view. I had not been seated five minutes, when lo! a Saw-fly landed on my trousers. He was instantly pounced upon and safely bottled, when he soon paid the debt of nature. An hour and a half was spent searching for more, but not one was discovered. On coming home this specimen was found to be undescribed, although closely allied to *Nematus hyperboreus*, Thoms. I purpose calling it *Clibrichellus*. During the search for this insect several interesting ichneumons were found. Afterwards a descent was made to a loch in a corry at the foot of the mountain, but nothing of importance was discovered there. Botanically, Ben Clibrich is very poor; scarcely a plant of any rarity was found, and even the common alpine saxifrages, etc., were conspicuous by their absence, or very sparingly represented. After the bootless journey to the loch, some time was spent beating the birch and alder bushes along the banks of the Clibrich burn (very much to the astonishment of some natives who happened to be passing at the time), and here another new and very distinct species of *Nematus* was found. This last discovery is of some interest, as it is the second new species of the *luteus* group that has been found in Scotland. In the "Entomologists' Monthly Magazine" for August, 1877, I have described it under the name of *N. antennatus*. An attack was then made on the birches on the banks of Loch Navar, but this turned out to be no easy matter, for all the trees were infested with thousands of a Geometer larva. It literally swarmed on them, especially on the old and scraggy trees, so much so that after only two or three taps of the beating stick I had hundreds not only in my umbrella, but all over my clothes, and as when cast off they hang by a thread, the subsequent process of clearing them, and making myself, to say nothing of the umbrella, fit to enter a hotel, was a work of some trouble. Many of the birches had been completely stripped of their leaves by these wretches, and the whole plantation had quite a withered and forlorn appearance. However, the wood yielded some interesting ichneumons, as also *Hoplocampa crataegi*. Desist-

ing from beating, the sweeping net was used, and it produced among others *Nematus rumicis*. Next day an assault was made on the beautiful and singularly shaped Ben Laoghal, but the rain coming on, it proved fruitless. Altogether, I think that this district, as well as the northern coast, would yield, under favourable circumstances, many new and interesting Hymenoptera, and I shall look forward with pleasure to revisiting it.

Of Cynipidae no new species were met with among the gall makers. The white woolly gall of *Andricus ramuli* was a conspicuous object on the oak everywhere. *A. amenti* was also noticed, and *Trigonaspis megaptera* was abundant. At Bonar an addition to our fauna was found in *Hexacola hexatoma*, H., a parasitic form. *Pezophycta brachytera* was the only other noteworthy capture among the parasitics. *Aculeata* were extremely rare, as I don't think I saw a dozen species altogether.

After these introductory remarks, I will now proceed to enumerate *seriatim* all the species found among the Tenthredinidae, Cynipidae, and Aculeata, leaving the other families to be treated in a subsequent paper.

#### TENTHREDINIDAE.

*Tenthredo livida*, *T. velox*, Altnaharra; *T. dispar*, *T. rufiventris*, rare; *T. balteata*, *T. mesometa*, *T. scalaris*, *T. punctulata*, *T. olivacea*, *T. viridis*, L. (*picta*, Kl.), Lairg.

*Perineura nassata*, Lin., *sec.* Th.; *P. brevispina*, Th.; *P. sordida*, Kl., *sec.* Th.

*Allantus nothus*.

*Athalia glabricollis*, Th., Dornoch; *A. rosae*.

*Macrophyta albicincta*.

*Pachyprotasis antennata*, *P. rapae*.

*Dolerus vestigialis*, *D. gibbosus*, *D. aeneus*, *D. pratensis*, L.

*Emphytus serotinus*, larva common on oaks; *E. rufo-cinctus*, Bonar Bridge.

*Taxonus glabratus*, *T. agrorum*, Fall., Strath-Carron.

*Strongylogaster cingulatus*.

*Poecilosoma pulveratum*, *P. submuticum*, *P. excisum*.

*Phyllotoma nemorata*, Lairg.

*Fenusa melanopoda*, Cam., on alder.

*Selandria serva*, *S. morio*.

*Blennocampa bipunctata*, Bonar Bridge; *B. albipes*, *B. luteiventris*,

*B. cinereipes*, *B. pusilla*, *B. alchemillae*, Cam., Ben Clibrich (*vide supra*).

*Hoplocampa crataegi*, Altnaharra, on hawthorn.

*Hemichroa rufa*.

*Dineura degeeri*.

*Camponiscus luridiventris*.

*Cladius padi*.

*Nematus appendiculatus*, var. with black femora, Bonar Bridge ; *N. ruficornis*, *N. clibrichellus*, Cam. ; *N. obductus*, *N. capreae*, *N. canaliculatus*, Htg., Falls of the Shin, on birch ; *N. punctulatus*, Dbm., Altnaharra ; *N. rumicis*, Altnaharra ; *N. fallax*, Strath-Carron on *Salix fusca* ; *N. bilineatus*, *N. luteus*, *N. antennatus*, Cam., foot of Ben Clibrich ; *N. dorsatus*, *N. abdominalis*, *N. ribesii*, common in gardens, Golspie, etc. ; *N. myosotidis*, *N. miliaris*, *N. crassulus* ; ? *N. pedunculi*, Htg. ; *N. herbaceae*, Cam., Ben Laoghal.

*Cryptocampus saliceti*, Fall.

*Hylotoma ustulata*.

*Cyphona geminata*, Strath-Carron.

*Abia sericea*.

*Trichiosoma lucorum*.

*Cimbex sylvarum*.

#### CYNIPIDAE.

*Aphilothrix albopunctata*.

*Andricus curator*, *A. 4-lineatus*, *A. amenti*, Invershin ; *A. ramuli*, abundant, easily noticed from the train going from Invershin to Lairg.

*Dryoterus terminale*.

*Neuroterus leucularis*.

*Spathogaster baccharum*, *S. tricolor*.

*Trigonapsis megaptera*, abundant.

*Allotria minuta*.

*Pezophycta brachyptera*.

*Sarothrus canaliculatus*.

*Kleditoma albipennis* ; *K. geniculata* ; *K. nigra*.

*Hexacola hexatoma*, Htg.

*Rhoptrameris encerus*, Htg.

*Aegilips nitidulus*.

#### ACULEATA.

*Bombus lapponicus* ; *B. vestigialis* ; *B. schrimshiranus* ; *B. lucorum* ; *B. lapidarius*.

*Andrena furcata*; *A. combinata*; *A. parvula*; *A. nana*. (In swarms nesting at Creich close to the sea).

*Halictus albipes*; *H. subfasciatus*; *H. nitidusculus*; *H. minutus*.

*Nomada ruficornis*.

*Vespa germanica*; *V. norvegica*.

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OCTOBER 30TH, 1877.

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

Mr John J. Dalgleish, Edinburgh, was elected a life member; and Messrs. Robert Morton, Samuel M'Culloch Morrison, James White, and William Ferguson, ordinary members.

SPECIMENS EXHIBITED.

The President exhibited drawings and specimens of three new species of Carboniferous Polyzoa, one of them being a new species of *Synocladia*, from the limestone shales at High Blantyre, the other two being species of *Glaucanome*, from the Gillfoot shales at Carluke. One of the forms of *Glaucanome* belonged to a sub-genus, *Diplopora*, which had been established by Dr Young and Mr John Young, F.G.S., for the reception of certain forms of *Glaucanome*, which have a second small pore below each cell aperture, a feature which they were the first to notice in connection with Carboniferous Polyzoa. Dr Young pointed out the probable use of this second small pore, as allowing of the passage of processes in connection with the Polyzoa, and also the affinity of this group with the Brachiopoda, a subject which was of interest, and to which he hoped more fully to direct the attention of the Society on a future evening.

Mr John Young, F.G.S., exhibited the test or shell of a large flexible Sea Urchin, of an apparently undescribed species, and which formed part of the large and valuable collection of natural history objects recently presented to the Hunterian Museum by Dr Allen Thomson. Mr Young stated that it was only of recent years that sea urchins with flexible tests were known to be living in our recent seas. During the cruise of H.M.S. *Porcupine* in the North Atlantic in 1869, two specimens of flexible Echini, belonging to different genera, were obtained, and were described

by Professor Sir Wyville Thomson, in the "Depths of the Sea," under the names of *Calveria hystrix* and *Phormosoma placenta*. The specimen from Dr Thomson's collection was probably obtained at an earlier date than the *Porcupine's* cruise, and appears to belong to a different genus from the above. Its locality is not known, and from its appearance it seems to have been lying past for many years, having lost its spines and dental apparatus, though otherwise the test is quite perfect. In its depressed form and flexible test it presents a strong contrast to the rigid shelled species of *Echinus* found on our coast, but in other respects clearly belonging to the same family group of the Echinodermata. The specimen measured  $18\frac{3}{4}$  inches in circumference by  $2\frac{1}{4}$  inches in height. The test is thin and flexible in all its parts, but its upper surface is much more elastic than the lower. As in other members of the same group, the test is composed of five double rows of ambulacral and interambulacral plates, all of which bear perforated tubercles, to which the spines were attached. The plates, so far as yet examined, appear to be arranged in an over-lapping series, as in *Calveria* and *Phormosoma*, but it is in the character of its interambulacral plates on the upper surface of the test that Dr Thomson's specimen is seen to differ from the above genera. These plates are divided into three areas, the middle space being flat, and free of tubercles. This peculiar character commences at the periphery of the test, where the middle area of the plate is seen to widen in each successive row, by the reduction or loss of the side tubercles towards the summit, where the genital disc is placed. At this point the primary tubercles disappear, leaving a wide flat space in each of the ambulacral rows, which, being of a spongy, membranous texture, gives great flexibility to those plates. The interambulacral plates on the lower surface of the test have no intermediate flat spaces, the tubercles being continuous across. The ambulacral plates are perforated each by three pairs of pores, two pairs on the lower edge of the plates, and one pair on the upper edge, intermediate in position between the other two; they are likewise continuous in their rows, from the mouth to the summit of the test. Mr Young stated that he had already pointed out in the Transactions of the Society that *Archaeocidaris Urvii*, one of the oldest of our fossil sea urchins, found in the limestone strata of the Glasgow district, had also a flexible test

formed of overlapping plates. This evening he exhibited plates of another species of the same genus, from the Ayrshire Carboniferous limestone, in which the overlapping character of the plates was very clearly seen.

Mr G. E. Paterson exhibited a dated series of specimens of the Black Guillemot, *Uria grylle*, showing the various changes of plumage from December to June, on which he made some remarks. He stated that he would endeavour to bring forward at a future meeting a series showing the variations from the plumage of the breeding season down to that of winter.

Mr James Coutts showed a collection of mounted specimens of small organisms, which had been in his possession for some years, and which he had obtained from the limestone strata at Dockra, Waterland, and other localities. In the collection were numerous specimens of sponge spicules similar to those obtained at Cunningham-Bedland, which were exhibited before the Society in October last, when it was stated that the remains of silicious sponges had not before been noted as being found in the Carboniferous strata of the West of Scotland. Mr Coutts' remarks on the specimens were supplemented by the President.

Mr James Lumsden, F.Z.S., exhibited a pair of Merlins, *Falco aesalon* (male and female), shot in July last, from the nest *in a tree*, on the banks of Loch Lomond. Mr Lumsden remarked that he exhibited these birds in order that the somewhat unusual position of the nest might be recorded. The Merlin in this country is usually found to nest on the ground or in rocks. What rendered the present case of greater interest, was the fact that the ground all round the situation of the tree was just of such a character as is usually chosen by the Merlin to nest in; showing that the tree could not have been fixed on for want of another suitable place. The nest occupied appeared to be a deserted one of *Corvus corone* or *Corvus cornix*. Although rare in this country, tree nests of the Merlin are not uncommon in Lapland.

#### PAPERS READ.

I.—*Note on the recent occurrence of the Hoopoe (*Upupa epops*) in Arran.* By Mr JAMES LUMSDEN, F.Z.S.

On the 23d of May, 1877, a Hoopoe, *Upupa epops*, was shot at Dougrie, in Arran. It had been observed for several days frequenting a sand-bank where some starlings had their nests, or

running about among the rushes in a marshy field close by. The bird appeared strong on the wing, and was very wild. The gamekeeper who shot it (a man of unusual intelligence), assured me that he thought it had a nest about the sand-bank; but this statement must be taken with considerable reservation. As no nest was found, and no other Hoopoe seen in the district, it is very improbable. The sex of the bird was unfortunately not noted. Specimens of the Hoopoe have at various times been recorded from Scotland, but the usual time of their occurrence has been autumn. In England it has been known to breed, but very rarely. The species is common all over the south of Europe, and specimens have been obtained as far north as Spitzbergen. In Africa and India it is met with as a winter visitor, and in China it is found all the year round.

Records like the above may appear to some to be of but small value, and, from the sameness of their character, of little interest, but so much attention is now being paid to the migration of birds, and so much light has of late been thrown on the directions taken by them in their periodical migrations, that every scrap of information about rare visitants is of the utmost importance, and the fuller the notes on the occurrence of rare species the better. The date of the first observation, the state of the weather and direction of wind, the condition of the bird—whether strong and in good condition, or weak and thin—are all facts to which the greatest attention should be paid.

II.—*Apiarian Notes for 1877.* By MR ROBERT J. BENNETT.

In his paper, Mr Bennett gave a detailed statement of his observations on, and treatment of, his apiary in Argyllshire during the present year. In January and February, notwithstanding the heavy rains which prevailed, the temperature was mild, and the bees were stimulated to activity when they should have been in a torpid state, which caused great destruction to the workers, and depopulated many hives. March, which is always a trying month to the beekeeper, was this year attended with considerable difficulty, and during its continuance, as well as in April, liberal and stimulating feeding had to be adopted to keep the stocks in existence. May opened well, and gave hopes that the season was yet to be a good one, but the cold east winds, which set in early,

and continued to the end of the month, dispersed all these hopes. June, which is the great swarming month, began with fine weather, and again excited the hopes of beekeepers that the season was to be a productive one; but as July came in, the days were dull, cold, and rainy, and many of the stocks would have suffered had they not been fed, a procedure contrary to all former experience. August, which it was trusted would redeem the disasters of the past months, and enable the bees to make up for lost time, proved no better than July, and honey shows, both here and in England, were abandoned, the usual supply of food having miserably failed, and honey being consequently almost absent. In September, the usual Scottish honey harvest month, half of the bees in the country were in a starving condition; and instead of the usual cry,—What are we to do with our honey? it was, How are we to preserve our bees? During this month and October, artificial feeding had again to be resorted to, and the result was that 1877 proved to be the most disastrous season for beekeepers since 1862.

At the close of his paper, Mr Bennett presented to the library of the Society a beautifully written letter he had received from Miss Clementina Stirling Graham of Duntrune, the last representative of the Grahams of Claverhouse, written in bed, shortly before her death, in her ninety-sixth year. Miss Graham was probably the oldest beekeeper known, having taken an interest in the culture of honey for three quarters of a century; and this document, amongst the last of her correspondence, he thought well worthy of preservation.

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NOVEMBER 27TH, 1877.

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

Messrs. David Riddell, Robert Marshall, David Marshall, and Alexander Buchanan Dick Cleland, were elected ordinary members. Mr Gavin Miller was elected a life member, and in addition to paying the life composition, he stated his willingness to give a donation of five guineas to the funds of the Society. It was resolved to record a vote of thanks to Mr Miller for his liberality.

## SPECIMENS EXHIBITED.

Mr F. G. Binnie exhibited some additions to the Trichoptera of the Clyde Valley, stating that for the collection he was indebted to Mr R. J. Morton of Carluke, who had sent them to him to be named. The specimens were all taken in that district during the past season. The collection comprised over thirty species, and illustrated very clearly what has yet to be done in the investigation of this group, for on looking it over he found at least five species which did not find a place in his list of Trichoptera in the British Association Guide. Two of these belong to the family Limnophilidae, two to the Sericostomatidae, and the fifth to the Rhyacophilidae. The species are as follows:—

*Limnophilus griseus*, L. This species he had obtained from the Scotch firs at Rannoch, and in the Braemar district. M'Lachlan states that it particularly affects uncultivated districts with fir forests.

*Halesus auricollis*, Pict. This species has been added to the British list since the publication of the "Trichoptera Britannica"; and so far, it is known only from Scotland and the north of England. M'Lachlan found it in countless myriads by the river Wharf at Bolton Abbey, Yorkshire. The only specimen in the present collection is a female.

*Sericostoma personatum*, Spence. This species is remarkable for the extraordinary development of the maxillary palpi of the male, which form a mask over the face, whence its trivial name. It is the only species found in our islands, occurring in England, Scotland, and Ireland.

*Goera pilosa*, Fab. This is the first example Mr Binnie had seen from the Clyde district; but he had captured it during the present season at Aberlady. It is the *flavipes* of Curtis.

*Rhyacophila obliterata*, M'L. Its ally *dorsalis*, may be considered one of the commonest and most generally distributed species of the group in our district, occurring by every burn and rapid stream. The present species is distinguished in the male by the short broad lobe of the upper margin of the last abdominal segment, and the character of the terminal joint of the inferior appendices. The only localities given for it by M'Lachlan in his "Trichoptera Britannica" are North Wales, North Devon, Staffordshire, and Scarborough, being common in the first-named district along all the mountain torrents at considerable elevations.

The Chairman showed a specimen of one of the crowned pigeons, *Goura albertissi*, recently presented to the Hunterian Museum, along with skins of birds and other animals, brought home last year from Port Moresby, New Guinea, by the Rev. W. Y. Turner, M.D. This fine pigeon, one of the largest of its class, belongs to a recently-described species, discovered by the traveller D'Alberti in New Guinea. It measures nearly 30 inches in length, being about the size of a small turkey. The colours vary on different parts of the bird from a slate-coloured blue to a rich chestnut purple, the wings being barred with white. The crest that adorns the head measures eight inches in length, and is composed of thinly barbed feathers of a silky texture and of a greyish blue colour. This handsome bird approaches closely in its character to the *Goura coronata* found in the same island, but differs from it in the form of its crest, and in the disposition of the colours over its body.

## PAPERS READ.

I.—*List of the Birds which have been observed in the district of Ardnamurchan, Argyllshire.* By Mr JOHN J. DALGLEISH, M.B.O.U.

The following notes are the result of observations made at intervals during the last twenty-one years; and although perhaps it may be necessary to add to the list from time to time, still it may be taken as a nearly complete one of the birds of the district.

Before, however, proceeding to give the list in detail, it may be interesting to describe the physical features of the district.

The peninsula of Ardnamurchan, while interesting as being the most westerly portion of the mainland of Great Britain, forms otherwise a remarkably well-defined district for ornithological observations, being bounded on the north and west by the open Atlantic, and on the south partly by the Sound of Mull and partly by Loch Sunart—one of the most beautiful of our western fiords; the eastern or landward boundary being very short, and formed partly by the river Sheil and loch of the same name, which separate it from Inverness-shire, and partly by the public road leading from the latter at Ardshealach—a distance of only a mile and a half—to Salen on Loch Sunart.

The extreme length of the district is about twenty-five miles, and the average breadth about six miles. It consists of a range

of comparatively low hills, having their longer slopes to the north, with glens running from the central ridge in both directions. The two principal heights are Ben Hiant, opposite the north end of the Sound of Mull, and Ben Laga, lying more to the east; the former being, according to the Ordnance Survey, 1728 feet, and the latter 1678 feet, above sea level.

The geological formation of the eastern half of the district is gneiss, while the western end is composed of trap rocks. A band of limestone runs across from Swordle in the north to Mingary on the southern shore, which seems to be part of a continuous band or vein which passes down the west coast of Scotland, through Skye, Eigg, Morven, and Lismore, appearing at intervals, and again disappearing below the superincumbent rocks.

The shores are generally rocky, sometimes rising to fine cliffs, as near the Point of Ardnamurchan, and consequently they are not favourable for wading birds; there are, however, one or two more favoured localities, which are frequented by a few. One of these spots is the mouth of the river Sheil, where there is a small spit of sand, uncovered at low water; another is the Bay of Kentra, which is about a mile and a half square, and is entirely uncovered at low water. This large area of foreshore abounds in various varieties of shell-fish and minute crustaceans, and consequently is resorted to by a goodly number of ducks and waders, to whose habits it is well suited. Both of these localities are upon the northern shore. The only other is the Bay of Kilchoan, and rocks lying between it and the old castle of Mingary on the southern shore, opposite the Island of Mull; but the extent of suitable shore is in this case much more limited than at Kentra. Besides these there are a few smaller inlets and sandy bays, in which occasionally a stray wader may be found.

The few isolated rocks off the coast, belonging to Ardnamurchan, which are frequented by birds, are in Loch Moidart, between Kentra Bay and the mouth of the Sheil, and in Loch Sunart.

There are numerous fresh-water lochs scattered through the district, although none are of any great size, except Loch Sheil, which, however, only touches it for about a mile.

As in most parts of the Western Highlands, the extent of cultivated ground is very small, and confined to a few spots, mostly on the sea-coast.

As a rule, the district is bare of wood, especially towards the

western part. There are, however, about 600 acres of fir woods, lying along the shores of Loch Sunart, between Salen and Glenborrodale, chiefly of larch of different ages, being all, however, with the exception of a few acres along the roadside north of Salen, planted during the last twenty years. These have all replaced natural coppice woods, and this change may yet, as the trees grow up, exercise a considerable influence on the distribution of the local fauna. There are still a few patches of greater or less extent of coppice woods—of oak, alder, birch, ash, and hazel—at other points, although mostly confined, as above mentioned, to the eastern and more sheltered end of the district.

## LIST.

1. *Haliaëtus albicilla* (L.) White-tailed Eagle. A regular visitant to the district; probably from the adjacent island of Rum, where it breeds.
2. *Buteo vulgaris*, Leach. Common Buzzard. Formerly common, and breeding in the district, but now rarely met with. Last nest found in 1868.
3. *Falco peregrinus*, Tunstall. Peregrine Falcon. Two or three pairs frequent the district, and often succeed in rearing their young.
4. *Falco aesalon*, Tunstall. Merlin. Becoming very scarce, although one or two pairs are to be found.
5. *Falco tinnunculus*, L. Kestrel. Common.
6. *Accipiter nisus* (L.) Sparrow Hawk. By no means rare, but not so common as the preceding.
7. *Circus cyaneus* (L.) Hen Harrier. Like the Buzzard, was formerly common, but is now nearly extinct; no nests have been seen for eight or nine years. Still breeds in Morven.
8. *Strix stridula*, L. Tawny Owl. Appears to be common, if one can judge by the ear, its hooting being often heard in the night.
9. *Aluco flammeus* (L.) Barn Owl. A pair occasionally frequent the ruins of Mingary Castle, and from information which I have received, I have no doubt that it also haunts certain rocky places.
10. *Caprimulgus europaeus*, L. Nightjar. Plentiful in the summer, when it is interesting to watch them hawking for moths, among the haycocks, on a fine evening.

11. *Cypselus apus* (L.) Swift. About a dozen pairs frequent Mingary Castle, in holes, in whose ruins they breed.
12. *Hirundo rustica*, L. Swallow. Plentiful. Both this species and the following have increased in numbers very much since the erection of a number of farm-houses and other buildings in the district, with projecting roofs, under the eaves of which they build their nests.
13. *Chelidon urbica* (L.) House Martin. Not so common as the preceding, the remarks on which, however, apply to this species also.
14. *Certhia familiaris*, L. Creeper. Pretty common in the wooded district.
15. *Troglodytes parvulus*, Koch. Wren. Common.
16. *Calamodyta naevia* (Bodd.) Grasshopper Warbler. This species I believe to be more common than appears, owing to its very retiring habits. I found a nest at Glenborro-dale in 1868.
17. *Sylvia rufa* (Bodd.) Whitethroat. Common.
18. *Phyllopneuste trochilus* (L.) Willow Warbler. Common.
19. *Regulus cristatus*, Koch. Golden-crested Wren. Common in the wooded district.
20. *Ruticilla phoenicurus* (L.) Redstart. More common than I have observed in lowland districts, and building their nests frequently in the breastworks of the public roads, regardless of the noise made by passing vehicles overhead.
21. *Erythacus rubecula* (L.) Robin. Common.
22. *Saxicola aenanthe* (L.) Wheatear. Common, but very local in its distribution.
23. *Pratincola rubetra* (L.) Whinchat. Sparingly distributed.
24. *Pratincola rubicola* (L.) Stonechat. Not very common.
25. *Accentor modularis* (L.) Hedge Accentor. Common.
26. *Parus major*, L. Great Titmouse. }  
 27. *Parus caeruleus*, L. Blue Titmouse. } Common in the  
 28. *Parus ater*, L. Cole Titmouse. } wooded parts.
29. *Acredula rosea*, Blyth.\* Long-tailed Titmouse. Occasionally common; at other times none are to be seen.

\* Though following generally the nomenclature of Mr Wharton's "List of British Birds," Van Voorst, 1877, I have in this instance departed from it, as *Acredula caudata* (L.) is generally understood to be the White-headed Continental form originally discovered by Linnaeus.

30. *Motacilla lugubris*, Temm. Pied Wagtail. A few pairs scattered over the district.
31. *Motacilla sulphurea*, Bechst. Grey Wagtail. More rare than the preceding.
32. *Motacilla reyi* (Bonap.) Ray's Wagtail. An occasional visitor.
33. *Anthus obscurus* (Lath.) Rock Pipit. Common all along the coast. I have more than once seen one of this species come on board the Highland steamers, and pick up crumbs or other morsels of food, close to passengers and others, without showing the least fear.
34. *Anthus pratensis* (L.) Meadow Pipit. Very common.
35. *Anthus trivialis* (L.) Tree Pipit. One seen by me in 1876, and doubtless not very rare.
36. *Turdus viscivorus*, L. Missel Thrush. Common.
37. *Turdus pilaris*, L. Fieldfare. Common in winter and spring. A white specimen was observed all the winter of 1876-77.
38. *Turdus musicus*, L. Thrush. Common.
39. *Turdus iliacus*, L. Redwing. A few in winter.
40. *Turdus merula*, L. Blackbird. Common.
41. *Turdus torquatus*, L. Ring ouzel. A few pairs on the hills.
42. *Cinclus aquaticus*, Bechst. Dipper. Very local and not common, feeds occasionally on the sea-shore, at the mouth of streams.
43. *Muscicapa grisola*, L. Spotted Flycatcher. Common in wooded parts.
44. *Pica rustica* (Scop.) Magpie. A pair frequented the manse orchard in the western part of the district, for 4 or 5 years after 1856, having probably crossed from Mull, the nearest trees in any other direction being 12 miles off; they bred for a season or two, their young being destroyed regularly by gamekeepers, who ultimately killed the old birds also.
45. *Corvus corax*, L. Raven. Not so common as formerly, but still far from rare; more common in spring and autumn.
46. *Corvus cornix*, L. Hooded Crow. Too common.
47. *Corvus frugilegus*, L. Rook. There is no rookery in the district, but detachments from Mull, Morven, and Sunart, are regular visitants. Occasionally these take up their evening quarters for weeks together on the trees of the manse garden.

48. *Sturnus vulgaris*, L. Starling. Plentiful, especially about the ruins of Mingary castle.
49. *Fringilla coelebs*, L. Chaffinch. Common.
50. *Passer domesticus*, L. House Sparrow. Not very common, and distribution very local.
51. *Ligurinus chloris* (L.) Greenfinch. Not uncommon.
52. *Pyrrhula europaea*, Vieill. Bullfinch. Common along Loch Sunart side, in the larch woods.
53. *Linota cannabina* (L.) Linnet. Found sparingly.
54. *Linota flavirostris* (L.) Twite. Not very common.
55. *Emberiza miliaria*, L. Common Bunting. Not common, and very local.
56. *Emberiza citrinella*, L. Yellow Bunting. Common.
57. *Emberiza schoeniola*, L. Reed Bunting. Not rare, but local.
58. *Plectrophanes nivalis* (L.) Snow Bunting. Not seen by myself, but I believe to be a winter visitant.
59. *Alauda arvensis*, L. Skylark. Found in suitable localities.
60. *Cuculus canorus*, L. Cuckoo. As in other parts of the West Highlands, very numerous.
61. *Columba livia*, L. Rockdove. Breeds numerous in the ruins of Mingary Castle, and in caves on the north coast.
62. *Columba palumbus*, L. Ringdove. Not common.
63. *Phasianus colchicus*, L. Pheasant. Was introduced by the late proprietor.
64. *Perdix cinerea*, Charleton. Common Partridge. Generally distributed near cultivated ground.
65. *Tetrao tetrix*, L. Black Grouse. Numerous in suitable localities.
66. *Tetrao mutus*, Leach. Ptarmigan. A covey frequented Ben Laga for some months, during a severe winter about ten years ago, but left on the return of spring, for the higher hills adjoining, and none have since been seen within the limits of the district.
67. *Tetrao scoticus* (Lath.) Red Grouse. Generally distributed. There have no symptoms of disease ever been observed here.
68. *Vanellus cristatus*, Meyer. Lapwing. A few pairs breed. Very local.
69. *Charadrius pluvialis*, L. Golden Plover. A few pairs breed on the hill tops.

70. *Ægialites hiaticula* (L.) Ringed Plover. Each of the few sandy beaches on the coast is enlivened with a pair or more of these interesting birds.
71. *Haematopus ostralegus*, L. Oyster-Catcher. Common, and not decreasing, notwithstanding the robbing of their nests.
72. *Streptilas interpres*, L. Turnstone. Two or three pairs observed more than once on Slignach, a small low rock or island in Loch Sunart, nearly opposite Tobermory, in May, 1876, and as late as the 27th of that month.
73. *Ardea cinerea*, L. Heron. Common. Full particulars of this species, and its breeding, will be found in Mr Gray's "Birds of the West of Scotland," which is quoted in Dresser's "Birds of Europe," with additional notes.
74. *Numenius arguata* (L.) Curlew. The only breeding place of this bird is near the mouth of the Sheil; in autumn and winter, however, it is common all along the shores.
75. *Numenius phaeopus* (L.) Whimbrel. I observed one on the shore of Loch Sunart in May, 1876.
76. *Totanus glottis* (Pall.) Greenshank. I have heard this species at night, corroborated by Mr Harvie-Brown, who was with me, but I have not seen it.
77. *Totanus calidris* (L.) Redshank. Common, but not breeding.
78. *Actitis hypoleucos*, L. Common Sandpiper. Very common.
79. *Tringa maritima*, Brünn. Purple Sandpiper. A specimen shot by Mr Harvie-Brown, November, 1877; doubtless not uncommon in winter.
80. *Tringa alpina*, L. Dunlin. A few frequent Kilchoan Bay in winter, but they do not breed in the district.
81. *Tringa subarctica*. (Göld.) Curlew Sandpiper. One seen by Mr Harvie-Brown, in November, 1877, at Kentra Bay.
82. *Gallinago gallinaria*, O. F. Müller. Common Snipe. Common in suitable localities.
83. *Gallinago gallinula* (L.) Jack Snipe. Common in suitable localities.
84. *Scolopax rusticola*, L. Woodcock. Very common in severe weather in winter; an increasing number breed. I have observed, more than once, the interesting process of the old bird carrying her young here.

85. *Crex pratensis*, Bechst. Landrail. A few pairs are to be found in summer.
86. *Anser cinereus*, Meyer. Greylag Goose. I have seen small flocks of this goose flying over, but have not heard of their alighting.
87. *Cygnus musicus*, Bechst. Hooper. A pair, which I conclude were of this species, frequented a hill loch for two months every spring for some years, until a late tenant of shootings killed one of them, in 1871 or 1872, since which occasion none were again seen until the spring of 1877, when a flock of five alighted for a short time at Swordle, on the north coast.
88. *Mareca penelope* (L.) Wigeon. A regular winter visitant.
89. *Anas boschas*, L. Mallard. Common, but not plentiful; breeds.
90. *Querquedula crecca* (L.) Teal. A few pairs found; also breeds.
91. *Clangula glaucion* (L.) Golden-eyed Duck. A few pairs in winter occasionally on a hill loch.
92. *Mergus merganser*, L. Goosander. A winter visitant, in small numbers.
93. *Mergus serrator*, L. Red-breasted Meganser. Pretty common; breeds.
94. *Colymbus glacialis*, L. Great-northern Diver. Not uncommon in winter round the coast.
95. *Colymbus arcticus*, L. Black-throated Diver. I once observed one of this species, or *C. Septentrionalis*, on a hill loch in summer, but frequent and careful subsequent searches have failed to discover any trace of its breeding, or even of the bird itself.
96. *Podiceps cristatus* (L.) Great-crested Grebe. I have observed either this, or the red-necked Grebe, on Loch Moidart in winter, but was unable to identify it.
97. *Podiceps minor* (Gm.) Little Grebe. Found on Loch Sunart in winter; breeds on a hill loch.
98. *Alca torda*, L. Razorbill.
99. *Alca troile* (L.) Guillemot.
100. *Uria troile*, var. *rhyrvia*, Brünn. Ringed Guillemot. The three last species are always found on Loch Sunart in varying numbers, even at the breeding season, at which period, of course, they are less numerous.

101. *Fratercula arctica* (L.) Puffin. I have observed this bird at the Point of Ardnamurchan; breeds in the isle of Rum.
102. *Uria grylle* (L.) Black Guillemot. Seen occasionally all round the coast; but does not breed nearer than the isle of Rum, or Roshven, on the Inverness-shire coast.
103. *Puffinus anglorum*, Temm. Manx Shearwater. I have observed this bird off the lighthouse.
104. *Stercorarius*, *sp.*? A bird which, from the description given by my informant, must have been a Skua, was observed three years ago by my late gamekeeper in Loch Sunart, in the act of chasing some gulls.
105. *Larus canus*, L. Common Gull. A colony breed on an island in a hill loch.
106. *Larus marinus*, L. Great black-backed Gull. A few pairs occasionally breed in detached pairs; there is a considerable breeding colony in the adjacent district of Moidart.
107. *Larus fuscus*, L. Lesser Black-backed Gull. Common on the shores; breeding on an island in Loch Sunart, belonging to the adjacent estate of that name.
108. *Larus argentatus*, Gm. Herring Gull. Frequents the shores.
109. *Chroicocephalus ridibundus* (L.) Black-headed Gull. A few seen occasionally about Kentra Bay.
110. *Rissa tridactyla* (L.) Kittiwake. Seen on the coast occasionally; probably visitors from the adjacent colonies at Rum or Tyree.
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|---|--|
| 111. <i>Sterna fluviatilis</i> , Naum. Common Tern. | } Both species visit<br>Loch Sunart, but<br>in sadly diminished numbers. |
| 112. <i>Sterna</i> ———, Naum. Arctic Tern.          |  |
113. *Sula bassana* (L.) Gannet. Frequently seen in summer, off the coast.
114. *Phalacrocorax carbo* (L.) Cormorant. Plentiful on the coast, coming up Loch Sunart in winter.
115. *Phalacrocorax cristatus* (Fab.) Green Cormorant. Also plentiful, but confined more to the open waters near the lighthouse.

II.—*Notes on the Fern Islands, and some of the Birds which are found there.* By Mr J. H. GURNEY, jun.

The Fern\* islands, off the coast of Northumberland, belong to Mrs Thorpe of Durham, and there is no property in the three kingdoms, public or private, better worth a visit. Here are no tremendous precipices, as at Flamborough, but the number of species of birds is much greater. The gay ornament of the islands is the Eider Duck, which breeds in large numbers, and there are also three or four exquisitely graceful species of Terns, which are annual visitors; but what chance either the race of Eiders or the Terns have of lasting, if the present state of things goes on, I cannot tell, for summer after summer the birds are shamefully misused, and their eggs poached, and this in spite of a paid keeper who resides on the islands. Rascals have been known to land from steamers, and steal everything they could lay their hands on; and worse than that happened on one occasion. A party of them having collected all the young Sandwich Terns, etc., that they could find, piled them together, and heaped a number of "peats" over them, and then, with a refinement of cruelty scarcely to be surpassed, they set fire to the peats, and consumed the pile—the whole pile—living and dead! It was a deed worthy of the Druids, who burnt men in wicker-baskets at Stonehenge! But the birds will not stand such treatment. They will find out that if they are not protected in this country, they are in Norway. They are beginning to quit the Fern islands. A few more seasons may see them gone, not from there only, but from every other place where the law of England is set at nought, and an indefensible and senseless persecution is carried on for the gratification of the few who can find a pleasure in shooting down the birds of our rocky headlands, at the expense of the many,—not naturalists alone, but lovers of scenery, of the wild rocks and of the deep ocean,—who derive their greatest pleasure, each summer visit, from those places.

There are two villages from which to visit the Fern islands, and no order is required if it is not intended to take eggs; but if that be the object of the visit, I believe an application to the Rev. Charles Thorpe, Durham, will obtain permission for any naturalist to take a limited number. There is the dirty redolent fishing-

\* Sometimes written *Ferne*, and sometimes *Farne*.

village of North Sunderland, with plenty of boats, and there is the charming clean village of Bamborough, with only one boat, which belongs to a man named Dixon. There is no decent inn at the former, but at the latter there is a comfortable house, kept by Mrs Henry.

For those who are not so exclusively ornithological that they cannot bear to look at anything which has not wings, there is the grand old castle, and the tomb of Grace Darling, at Bamborough, in the churchyard, where all should pause to pay a tribute of respect to the noble daring which made her, in a boisterous sea, impel her father to launch the boat which was to succour the crew of the ill-fated *Forfarshire*. Wordsworth has immortalized her in thrilling lines, which are not too long for any one interested in the Fern islands to read, though they are too long to quote in an ornithological paper. But Grace Darling has an immortality conferred upon her by her own heroism which is greater than any poetry can give her.

Books say that no castle in England has had so definite a connection as the hoary old castle of Bamborough, with History before the Conquest. Its aged walls, which frown down upon us, have stood where they now stand—impervious to war, and time, and weather—since very early times. Kings and rulers, belted knights, and learned men, have passed beneath its massive portals, and Willughby, whose name must awaken emotion in the heart of every naturalist, visited Bamborough, though in what year is not known, except that it was at the time when Sir William Forster was living at the castle. (*Vide* the account of the Eider Duck, "Willughby's Ornithology," p. 362). We can picture this eager searcher after truths in natural history at the old castle. Perhaps the hand of death was already on him, but it is more pleasant to think of him as not knowing that in a few more years his lease of life would be run out; to think of him pondering on the great ornithological work—great now, how much greater then—which he was going to give to the world, and which, how little men can tell of the future, he was never destined to see published.

Perhaps it was evening, and tired with the day's journey, he has mounted the castle battlements. The crimson rays of the setting sun are shedding an unparalleled splendour across the waters. With their rich coppery glare, they tinge each wavelet

as it breaks upon the shore. A gleam falls upon the grey, ivy-mantled walls, and lights up the figure of the man as he is standing there. It gives an Eider drake, which chances to be in-shore, the appearance of quicksilver; it throws a halo of roseate round a party of gulls which are busy over yon stranded garbage. Like molten silver is a large seal which, human-like, pops its head above the water. It bathes the distant cluster where he is to go on the morrow. It is a matchless scene, and with wistful eyes he gazes upon it, as his eager mind takes in the rich harvest of ornithological booty and knowledge is in store for him. The morrow comes, and he does not go; for strange as it may appear, Willughby never went on to the islands. He knew a good deal about the treasures which were there, as his list proves ("Ornithology," p. 19); but *he never went on to the islands*. His information was obtained at second-hand, either from Sir William Forster or some of his people; and Willughby returned home with the very moderate satisfaction of leaving his work half done. In the account of the Eider Duck, we find him unable any longer to speak from what he had seen alive, obliged to say, "I saw only the Cases of the Cock and Hen [Eider Duck] stuft, hanging up in Sir *William Foster's* Hall at *Bambergh* in *Northumberland*." ("Ornithology," *l.c.*) And again, as regards the Black Guillemot breeding there, he leaves us no certain facts, but only the vague data which was to be gathered from oral information. Whether it was that time pressed, or the sea was rough, or the men harvesting, it is much to be regretted that this accomplished author left his work half done; and yet, if we consider all the facts, English and foreign, which Ray has handed down to us as the result of the short span of his pupil's life, we can only marvel, not that Willughby did not effect more, but that he did so much.

But it is time to leave speculations about the past, and turn to our present knowledge of the islands. Since Willughby's time many distinguished naturalists have visited Bamberough Castle, and some have gone on to the islands, and some have turned back. None of those who have seen the beautiful birds there have, I will dare to say, returned disappointed; and to any who read this paper there will come back, as there does to me, a vivid recollection of a happy, a successful, and an instructive day.

CORMORANT, *Phalacrocorax carbo* (L.)

The nearest island to the mainland is the home of the Cormorants. Their old island\* was further away, and near the Gulls, but these predaceous neighbours stole their eggs, and drove them all away. The boatman told me that, as soon as the old Cormorants were put up, the Gulls would be down on the eggs, and he has known a complete clearance of them to be made by these robbers in a few minutes, and in spite of his presence. Where we put the Cormorants off on my last visit, there was one Gull who was evidently on the look-out, and in an instant was sailing above the nests. Though our boat was within a few strokes of the rock, I gave up all hope, and the men were certain, if there was an egg, the Gull would have it first; but for once they were wrong, for, as it happened, there were two eggs, and we bagged them both under the very nose of the robber-Gull. It was decidedly early, April 5th, but Cormorants are the first fowl to lay. Nothing else had come to the rocks so early. The next to begin are the Gulls, probably. Guillemots, Eider Ducks, and Terns, are very late breeders. It needs not the nose of a pointer to discover the whereabouts of a Cormorant's nest. I have come across some of the worst odours that the nose of man can conceive in my rambles, but never, in England or Africa, did I smell anything so foetid as a Cormorant's nest. Well might Milton call them the representatives of the fiend of darkness, though he drew the simile from their gaunt black forms. I do not know how long incubation lasts, but it must be a long time, for Mr E. Smith, who was at the same place nearly two months after me, does not mention that any of the eggs were hatched. (Zool., ss. 49, 34). The nests were only six inches high on my visit, and built for the most part of seaweed; but in one I found a piece of rope, and in others large pieces of wood, apparently fragments of wreckage. Cormorants have, like so many other birds, the power of throwing up the indigestible parts of their food in pellets. Two, which we picked up on landing, were friable, and of a very pink colour. They were composed of crabs. My boatman said their eggs would never

\* Alluded to by Hewitson ("Eggs of British Birds," ii., p. 471).

boil hard like any other bird's eggs,\* but always remain a jelly, and that the old lighthouse-keeper, Darling, used to aver that they were the richest eggs laid on the rocks. I would rather he eat them than I.

In 1875 I was told two white nestlings were seen; for a wonder, they grew up, and got away without being shot.

PUFFIN, *Fratercula arctica* (L.)

The Puffin is getting up its numbers, according to the boatmen. At certain times of the year they may be seen dotted all round about the islands, on which they breed very freely. They sometimes go by the name of "Tommy Noddies,"† but the fishermen in the neighbourhood of the islands use local names but little. In reply to my questions, they said that they came about the 5th of April, and left about the 5th of September. Perhaps this hardly puts the date of their coming early enough. In 1876 I was in the vicinity of the islands on the 5th of April, and saw about a score of single birds, and a flock of ten. On the other hand, Selby, who was as well acquainted with the Fern islands as any naturalist could be, speaks of them as coming "about the middle of April" (Brit. Orn., ii., p. 440); but I imagine that he is alluding here to the mass, and not to the forerunners of the army. The young of the preceding year are sometimes met with as late as the April following their birth, for on the 26th of that month, 1866, I shot a young one between the islands and the mainland. I suspect it was diseased. Its legs were very white, and it weighed only 11 oz., having but little flesh on its bones. This would account for its never having developed into an adult Puffin. The occurrence of young Puffins on the English coasts in the early spring is frequent enough to have attracted a good deal of attention. They have been commonly termed "Winter Puffins," and several ornithologists have been led to suspect that they were a distinct species. Some interesting articles will be found on the subject in the "Zoologist." Several have passed under my hands, and I have examined them internally and externally, at different times, without ever finding any reason to

\* This I believe to be quite the case; at least on an occasion when I tried in Sutherland, I utterly failed to boil two or three eggs of the Cormorant to the same consistency as those of a Plover, which I tried at the same time.—J. A. H.-BROWN.

† In Scotland, "Tammy Nories."—J. A. H.-B.

think that they were anything more than common English Puffins, which, from having been hatched late, or perhaps from disease, had not attained their growth when the next breeding season came round.

I wish to make some remarks on the Puffin's osteology. I have before me ten Puffins' breastbones, nine of which were from birds killed near these islands. I find they differ from the breastbones of Guillemots and Razorbills, in having two posterior emarginations,—one being an indentation, the other a hole. In this, as in many other respects, they resemble the breastbone of the Black Guillemot, which sometimes, but not always, has two emarginations. It is generally believed that the holes ossify with age, and that in a very old bird they are closed up. There is, however, much variation, as I have skinned a Puffin in which one emargination (the hole), on the left side, was completely changed to bone, and on the other side it was nearly so. Much may be learned as to the affinity of birds to one another by an examination of their osteology.

#### GUILLEMOT, *Alca troile*, L.

The Guillemots live on some rocks called the Pinnacles, and I have seen such a stream of them go swarming off those aforesaid rocks, that I can only liken it to a busy ant-hill, or bees on a sunny day in summer time. I really think that, for their size, there are more Guillemots on the Pinnacles than on any similar rock anywhere, and I do not forget the multitudes at Flamborough and Ailsa Craig, and other places which I have only read of. If the whole Guillemot population were numbered, the Fern islands would fall very far below most places; but compare the Pinnacles with a similar area anywhere else, and I think they will stand first. They are not very high, and the eggs are easily taken. The egg-gatherer, who lives on one of the islands, employs a ladder for the purpose. Either he or one of the boatmen informed me that blood was sometimes seen upon the rocks, which I thought showed that, as in human beings, so in birds, when the density of the population exceeds the area, fights ensue.

#### RAZORBILL, *Alca torda*, L.

I have twice obtained the Razorbill at the islands, but it is far from common. On my last visit I did not see one.

GANNET, *Sula bassana* (L.)

There are generally a few Gannets to be seen, as one would naturally expect. They are not easy to be shot; but there is a fatal way to catch them—by tying a herring to a board. I do not know how long ago it was that a Gannet was found washed up ashore with a gurnet wedged into its mouth so hard that it had killed it—a punishment for its gluttony. I believe that it is not an uncommon death among Gannets, though a highly curious one. Mr Gray mentions having found several dead at Ailsa Craig from this cause. (Birds of Scot., p. 462).

EIDER DUCK, *Somateria mollissima* (L.)

The two great attractions of the islands are the Eider Ducks and the Sandwich Terns. The former are much the earliest to arrive; indeed, I was assured that a pair or two in female plumage were to be seen all the year round. By the 5th of April they seem to have all paired, though not to have got up on to the rocks. At that season you may see an equal proportion of ducks and drakes; but go there in the beginning of August, and perhaps you will not see a single bird in the masculine attire. Some writers think that the full colouring of the drake is not assumed until the fourth moult, and that once got, it is shed no more. My opinion is that it gets it the second year, and that it annually moults again into the female attire; and I ground this opinion on a example in the Zoological Gardens, and on others which I have shot myself, or seen in Leadenhall market. The value of this bird, in an economic point of view, is very small, compared to what it is on some of the Norwegian groups of islands, where, as is well known, the down is collected in large quantities, and is highly valued for making quilts, etc. At the Fern islands only a small quantity of it is annually collected. A certain number of eggs are also gathered for eating, and sold in Bamborough.

KING DUCK, *Somateria spectabilis* (L.)

An adult male occurred at the Fern islands on the 14th of November, 1873, as recorded by Mr Hancock (Birds of Northumb. and D<sup>m</sup>, p. 158). From enquiries made on the spot, I believe it had remained about there many weeks. When first observed, it was partly in female plumage. Various persons saw it, and occasionally it was seen walking about on the island where the Eiders

nest. Of course there can be no longer any doubt as to the propriety of admitting this fine species into the British list. The females of the Eider Duck and King Duck are very hard to keep apart; but the female Eider never gets so red or rufous as the female King Duck often does, though some King Ducks—known to be so—are quite as brown as any female Eiders.

VELVET SCOTER, *Oidemia fusca* (L.)

Of Ducks I have, on my different visits, seen various species—Merganser, Sheld Duck, Wild Duck, Teal, Golden-Eye, Long-tailed Duck, Scoter, and Velvet Scoter. Dixon, the boatman, told me that a few Velvet Scoters might be seen all the year round. In August, 1864, I shot a splendid old drake, with my second barrel, after missing him with the first; and the same day I remember being nearly within shot of a Long-tailed Duck. I dare say such opportunities may be of every-day occurrence to Scotch naturalists, but to us Southerners they are rare.\*

COMMON GULL, *Larus canus*, L.

Of all the funny things which have happened at the Fern islands, the following is one of the most curious. It was told to me as true by one old seaman, and corroborated by another. These "old salts" were pursuing their calling one fine day when their attention was drawn to a prodigious commotion among the Gull community, which were clamouring over the fate of one of their kin, which was fast held by one wing by an angler or devil-fish. The whole affair was incontinently hauled on board, when the Gull was discovered to be dead. Strange story as this was, it was not altogether novel, as I have heard of Great Northern Divers more than once having fallen victims in this same way. The chapter of accidents to which birds are subject is much larger than we think. †

\* Scarcely of every-day occurrence as regards the latter birds. They usually keep far out from land, on the east coast of Scotland. In Shetland they are perhaps most commonly procured.—J. A. H.-B.

† I once saw a struggle between a Swan and a large Pike which had seized the bird's foot. The commotion was great, but the bird succeeded in flapping along the surface, and half lifted the Pike out of the water before it loosed its hold. This was on a mill-dam belonging to the Carron Co. in Stirlingshire.—J. A. H.-B.

COMMON TERN, *Sterna fluviatilis*, Naumann.

In July, 1865, I shot three.

ARCTIC TERN, *Sterna macrura*, Naumann.

The Arctic Tern is very late in coming. According to the boatmen, it does not arrive until May 12th, and leaves about September 18th. I think, however, that I have seen them before May. I shall never forget the spectacle of a vast drove, resting upon a spit of sand, at Holy Island. This island is not one of the Ferns: it is a few miles farther north, and a separate day must be given up for it. It was the first time I had seen any Terns not upon the wing. This very large flock quite whitened the surface they were resting upon, and when they all flew up, the effect was beautiful. I dare not venture to make even a guess at their numbers.

SANDWICH TERN, *Sterna cantiaca*, Gm.

Selby says the time of their arrival is about the middle of May (Brit. Orn., ii., p. 466), but I saw plenty on the 26th of April. No one can forget them who has once seen their exquisite forms. They are very tame, and it is a great shame to shoot them.

ROSEATE TERN, *Sterna dougalli*, Montagu.

The Roseate Tern *may* exist at the Fern islands still in small numbers, but it is a moribund species as far as English stations are concerned. One—possibly the last—was shot at the islands a few years ago, and has found a place in the Dyke Road Museum at Brighton. I saw it when I was there a short time ago. I have also seen another, which in all probability had been a native of the Fern islands, in Mr Newby's collection at Stockton. It was shot a good many years ago, at the mouth of the Tees. I have also examined a nestling and some adult birds, at the late Mr Selby's, which were obtained by that naturalist himself on the islands. Selby's remark, that in his time the Roseate Tern increased, is curious (Zool. Journ., ii., p. 462). His house was an easy drive from the islands, and he availed himself of their vicinity to study their avi-fauna well, as is very evident from the references to them in his work. This makes his testimony of all the more value. It is observations by men upon the spot which are always so valuable. In the case of the Roseate Tern, it seems

that they came and flourished, and sprang up for a time, and then died out. We have no one who can tell us why. We can only hope that, with protection, they may again come to the fore; but then that protection must be given more fully than it is now.

OYSTER-CATCHER, *Haematopus ostralegus*, L.

I find that these birds clean the limpets out completely, excepting a small portion of the ligament which attaches the creature to its shell. The boatmen told me they could tackle a limpet as big as a crown-piece; those which I examined, which had been cleaned out by them, were about the size of a shilling. There was only one broken. In general they get out the contents without any need of breaking the shell. It was for some time a mystery to me how their blunt bills were inserted between the shell and the rock, until I read in the "Birds of Scotland," (p. 270), that they only detach those which are already raised a little.

PURPLE SANDPIPER, *Tringa striata*, L.

This favourite Sandpiper of mine is far commoner at the Fern islands and the opposite shore, than at any other place I ever was at. I have seen, I may say, as many as a hundred in one flock, and they were so tame that they passed and repassed within shot of me several times. I have one which was shot at the islands by Selby, in the year 1831.\*

TURNSTONE, *Streptilas interpres*, L.

Another common and ornamental bird of the islands is the Turnstone. On one of my visits I killed three at a shot. It would be easy to kill four times that number, as they fly across the narrow channels which divide some of the islands. It was on the 27th of April, and one of them by that time was in beautiful summer plumage. I have seen them on the coast of Durham as late as the 6th of July. Sandpipers killed in May are, as a rule, finer in plumage than any killed at their breeding places in June and July.

It is scarcely necessary for me to say that the above makes no pretence to being a complete list of the species which inhabit

\* In the Outer Hebrides Captain Feilden and I shot two Purple Sandpipers, on 27th May, 1870, and saw others.—J. A. H.-B.

the Fern islands or pass by them at certain seasons of the year. I have only enumerated those birds about which I found in my notes matter that seemed to me worth recording in the Society's Proceedings.

III.—*On Injured Specimens of Rissoa striata.* By Mr  
DAVID ROBERTSON, F.L.S., F.G.S.

These injured specimens of *Rissoa striata* that I bring before you were met with in post-tertiary clay taken from an excavation for Paisley Gas Tank. The larger one has been injured about the time of the growth of the fifth whorl, and the body whorl that succeeds takes a bend and swells to an abnormal extent. The most interesting point is that this abnormal whorl is devoid of striation. The process of striation seems to have ceased at the time of the injury, from which we are led to believe that when the animal is in possession of all its faculties it is furnished with a special appliance for the formation of these striae, and when that appliance is destroyed, the striae consequently cease to be formed. Nevertheless, the growth of the shell goes on; but in the case before us it has, from the point of injury, grown out of proportion to the first formed whorls. Now, the question arises, whether the loss of this faculty of striating is the cause of the increase of growth of the shell?

Another shell of the same species from the same locality tends to strengthen this view. It has sustained a similar injury, but to all appearance of less extent, and at an earlier stage of growth. It is also curved at the point of injury in the same manner as the other, and from that point the striations are greatly weakened, although not altogether wanting, and the whorls succeeding the injury have also grown out of proportion. This animal, not having sustained so much injury as the first example, has been still able to continue the striations, although in a weak degree, and you will observe that the striae almost disappear as they approach the outer lip, which we may consider as proving that after the injury the power of striating has rather been declining than recovering.

The great difficulty in this case is the want of a sufficient number of examples to prove satisfactorily that the destruction of the one organ affects the function of the other. In a palaeontological point of view it should be remembered that such cases

may at times fall into our hands, and there can be little doubt that even with recent forms individuals may have frequently been raised to the rank of species, which were nothing more than functionally imperfect animals. This must be all the more likely to happen with fossils where the diagnosis has often to be made from a crushed individual, or a fragmentary portion of a shell. If a body whorl was met with in some of our Carboniferous shales which, under similar circumstances to one of these shells before us, was devoid of its characteristic striae, and enlarged beyond its normal size, it is almost certain that it would be referred to a different species, or described as new.

A discussion followed the reading of this paper regarding the functions of the mantle in molluscs, in which the Chairman, Mr D. C. Glen, F.G.S., and others took part.

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DECEMBER 18TH, 1877.

Mr James Barclay Murdoch, Vice-President, in the chair. Messrs. William Horn, Edinburgh, Robert Bennett Browne, and John M. Martin, were elected ordinary members.

SPECIMENS EXHIBITED.

Mr David Robertson, jun., exhibited a pair of Black-throated Divers, *Colymbus arcticus*, Linn., got on a small islet in Loch Awe in May, 1876. Mr Robertson remarked that these birds were in full summer plumage, a condition in which they are seldom found, especially so far south as Loch Awe. The species frequents principally the lakes of Norway and Sweden, and Hudson's Bay, North America; and in Scotland is chiefly found in the north, where it breeds in the lochs of Ross and Sutherland, and in the Hebrides. In 1850 it was obtained in several parts of England, but so far as is known, in all cases the specimens were in winter plumage. In Ireland it is very rare, having only occurred two or three times. Mr Harvie-Brown, who has often met with this bird in the northern counties of Scotland, made some remarks on the specimens.

Mr Arthur Pratt exhibited a fine series of the heads and stems of various species of Crinoids, from the limestone strata at Inveriel, near Kirkcaldy, and other districts in Fifeshire, amongst

which he had found the two following species, *Hydreionocrinus Scoticus*, De Kon., and *Poteriocrinus nuciformis*, M'Coy; and in illustration of his remarks he had prepared enlarged drawings of the different parts, and full sized restorations of four of the many genera comprising this family of Echinoderms. Mr Pratt said the Crinoidea first appeared in the time of the upper Cambrian rocks, and they have continued up to recent times. They flourished in greatest abundance during the Carboniferous period, covering tracts of sea-bottom many miles in extent, and forming strata hundreds of feet in thickness. The drawings of restored forms represented *Cyathocrinus*, which commenced life in the upper Silurian, and continued through the Carboniferous period; *Woodocrinus*, which came into existence and perished in Carboniferous times; *Apiocrinus*, which is found only in the Oolite, having begun and ended in that formation; and *Pentacrinus*, a Liasic form, which, along with several other recently discovered genera, is still living on the West Indian and Atlantic sea bottoms. Altogether, between 70 and 80 genera, and upwards of 300 species, are catalogued, two-thirds of which are found in Palaeozoic rocks. In the Beith district large tracts of strata many feet in thickness are composed of little else than the remains of Crinoids, but very few heads have been discovered there, only an isolated one turning up now and then on the weathered surfaces. At Trearne quarry the stems are large and robust, the limestone being one of the finest known for building or fluxing purposes. Mr Pratt then described the way in which the bodies of Crinoids are built up, and stated that in the collection he exhibited there were eight different species of heads, and double that number of stems, all differently sculptured on the external surfaces. He had found in an old working near Cupar, about 20 miles from Kirkcaldy, several of these heads and the remains of an Echinoderm, *Archaeocidaris Urvii*, a species which has a wide range in the limestone strata of Scotland, having been first described from the Lanarkshire coalfield.

Mr John Young, F.G.S., and Mr James Thomson, F.G.S., made some remarks on the collection, the former expressing a hope that Mr Pratt, who had already done good work in illustrating this group of fossils, would continue to prosecute what he had so well begun.

The Secretary exhibited a collection of plants from Disco Island, forwarded by Captain H. W. Feilden, C.M.Z.S., naturalist to the

late Arctic Expedition, and a corresponding member of the Society. Disco is an island about sixty miles in length, lying to the west of Mid Greenland, on the 70th parallel of north latitude. The centre of the island is covered with a sheet of ice like the opposite coast, but the belt of cleared land of varying width lying all round its margin has been pretty well explored. The rocks are chiefly trappean, of later age, overlying the primary and metamorphic strata. On the east there are considerable tracts of tertiary strata, which have yielded, along with those of the opposite shores, a large number of fossil plants of Miocene age. Coal has been found in many places in the shape of a lignite giving off little heat, but burning well when mixed with a more bituminous variety. Graphite is also found in some abundance. The collection of plants is of considerable interest, containing, as it does, a good number of species common in our own neighbourhood, such as *Alchemilla vulgaris*, *Equisetum arvense*, *Veronica hederifolia*, etc.; while the grasses are represented by *Poa pratensis*, *Aira flexuosa*, *Festuca ovina*, and *Alepocurus pratensis*. Plants, whose habitats are the moors and mosses, are also present, examples occurring of *Eriophorum*, *Botrychium*, *Carex*, and *Juncus*; and as indicating more upland stations there are specimens of *Antennaria dioica*, *Gnaphalium sylvaticum*, *Lycopodium Selago*, etc. Two species of willow occur, one of which seems to be *Salix pentandra*, which often becomes a tree of considerable size, and not of a shrubby character like many of our willows. Sub-alpine species occur, such as *Cerastium alpinum*, a plant found on Goatfell, and *Sibbaldia procumbens*, which grows plentifully on the top of Benlomond. A large number are duplicates of our true Alpine plants found on the lofty Highland mountains, such as *Azalia procumbens*, *Thalictrum alpinum*, *Epilobium alpinum*, *Toffieldia palustris*, *Woodsia Ilvensis*, and *Veronica alpina*. There are specimens also of other boreal plants not found in this country but common in Norway, as *Pedicularis lapponica*, *Andromeda tetragonum*, and many others well known on the Dovre fjeld. The collection was made by Captain Feilden on the outward voyage of the Alert and Discovery, on 13th July, 1876, and consists of upwards of seventy species. As this represents the result of only one day's botanising, we may consider that a complete list of the plants of the island would show that Disco can give a good representation of the flora of northern countries.

## PAPER READ.

"*The Avi-fauna of the Ural*," translated from the Russian\* of Leonida Sabaniëff, by Mr F. C. CRAEMERS, and communicated by Mr JOHN A. HARVIE-BROWN, F.Z.S., M.B.O.U.

The following translation from the Russian was prepared for the private use of Mr H. E. Dresser, for quotation in his work on the "Birds of Europe"; and for Mr Henry Seebohm. To these gentlemen the members of the Society are indebted for liberally placing the MS. at their disposal. As it is the only full and connected account we have of the birds of the district, it cannot fail to have considerable interest to students of Geographical Distribution.—J. A. H.-B.

*Gyps fulvus*, (Gm.) Is a breeding species as far as the Kaslinsky Ural, and migrates sometimes as far north as 59° N. lat.—Pavdinskaya Dacha. Russian, *Bolshoy belogolovey bertuk*.

*Falco subbuteo*, L. Common everywhere, but is particularly numerous in the birch woods on the western slopes of the Ekaterinburg Ural. Bashkire, *Belogorlek*; Meschersky, *Igalbai*; Zirián, *Kania-varish*.

*Falco peregrinus*, Tunstall. Inhabits only the mountains and their valleys. Russ., *Socol*; Bashk., *Etelge*; (Pallas calls the female by that name, but the male *Shoukar*. Voyages, T.S., fol. 25).

*Falco lanarius*, L.† I found this species in the Ural as well as in the steppes, but it is not so numerous as the preceding species. In the Kamishloff and Shadrinsk districts, only this species occurs. Bashk., *Losson*.

*Falco gyrfalco*, L. Is not so common as the two preceding species, being most numerous on the western slopes of the Ural mountains, about Uffa and Chusova, and in the northern parts of the Perm Ural. Russ., *Kretchet*, *Beley Socol*; Bashk. and Zirián, *Pelk-varish*.

*Falco aesalon*, Tunstall. Is rarer than *F. subbuteo*, and I never observed it north of 57° N. lat.‡

\* "Preavaritelnoi Oscherk Faunoi Posvosnoschnoech Slednyago OOrala," by Leonida Sabaniëff (Bull. Mosc. xlii., 1870, pp. 185-197).

† I believe this to be *Falco sacer*, not *F. lanarius*.—H. E. D.

‡ It is very difficult to decide the question of how far north and south the range of this species extends. It is not common in Central Russia, although it occasionally breeds in the Governments of Jaroslav and Moscow. Teplouhoff found it about 57½° N. lat. Mejakoff (Bull. Mosc., 1856, No. iv., p. 627),

*Falco vespertinus*, L. Is very common in the birch woods and groves in the south-eastern parts of the Ekaterinburg and Shadrinsk districts, and does not appear to occur here north of the first-named town. Bashk., *Si*.

The Ural Expedition did not find it on the western declivity higher than 58° N. lat. ("Das nordliche Ural," etc. Supplement, p. 61). Teplouhoff informs me that this species is abundant in 58° N. lat., and probably breeds there. According to Mejakoff it is not scarce in the south-west of the Government of Vologda, and Lilljeborg ('Naumannia,' Band II., Theil ii.) states that he observed it in large woods on the Dwina, and that it is very plentiful about Kargopol.\*

*Falco tinnunculus*, L. Is found throughout the Perm Government as high as 59° or 60° N. lat. To the southwards it increases in numbers, and becomes numerous in the birch woods of the Black-earth tract. Russ., *Triasuchka*; Bashk., *Kingunak*; Zirián, *Teuseau-varish*.

*Obs.* *Falco cenchris*, Naum., is probably to be met with in the Shadrinsk steppes and about Cheliabiansk, and Eversmann's opinion that it does not occur in the northern parts of Orenburg, is very much to be doubted. (Eversm. Nat. Hist. of the Orenburg Province, T.S., p. 65). Middendorff met with it on the Boganida. (Sibirische Reise, Band II., Theil ii., p. 28).

*Pandion haliaëtus*, (L.) Occurs throughout the Province, but usually keeps about the lakes, which abound with fish in the Ekaterinburg and Shadrinsk districts; in the latter place breeding in almost woodless localities. Russ., *Scopa*; Bashk., *Kalmergau*; Zirián, *Chare-varish*.

*Pernis apivorus*, (L.) Occurs up to 58° N. lat. (Tagill), but is rare, although it breeds there.

*Obs.* It is a breeding species in the Jaroslav and Moscow Governments, and therefore it is rather surprising that it does not occur about Kasan. (Eversm., *op. cit.* 46, and Bogdanoff—Birds and Animals of the Volga, p. 42). According to Erman (Reise,

affirms that it is not rare in the south-west parts of the Government of Vologda. According to Middendorff (Beitrag zur Kenntniss der Russ. Reiches, Part VIII., p. 201) it is not rare in Lapland. (Seeböhm and I found it as far north as 65° 26' N. lat., at Ust Zylma.—J. A. H.-B.)

\* (Alston and I found them numerous at Kargopol, in June, 1872, sitting on the telegraph wires along the road.—J. A. H.-B.)

p. 30) it inhabits Shadrinsk; and Nordmann states (Bull. Mosc., 1860, No. 1, p. 6) that it is not rare in Finland. Lilljeborg (*l.c.*) found it at Ladienopole and on the northern Dwina.

*Buteo vulgaris*, Leach. Very common in the Western Ural as far as 59° N. lat. In the birch woods of the eastern slopes of the Ekaterinburg Ural it is scarce, and does not occur about Shadrinsk. Russ., *Dikey Jastreb*; Bashk., *Sar*.

*Buteo lagopus*, (Gm.) Most likely it breeds on the steppes of Shadrinsk, and from that occasionally visits the south-eastern parts of the Ekaterinburg district. Russ., *Bolshay-misheloff*.

*Obs.* Further north it again appears in the Ural mountains; Hoffmann, Brandt (*l.c.*)\*

*Aquila pennata*, Gm. From the Severtsk Ural, 59° N. lat., its range extends through Kaslinskaya and Keshtemskaya Dacha to the birch woods of the western slopes of the Ural. In none of the above localities is it common. Russ., *Teternik*.

*Aquila clanga*, (Pall.) Common everywhere as far north as 58° N. lat. Then, however, it becomes scarce, and does not occur further north than Bogoslaffsk. It is also common in the birch woods of the western slope of the Ekaterinburg Ural, but is scarce further east. Russ., *Podorlik*; Bashk., *Karagush*; Zirián, *Koudosmer-varish*.

*Aquila nobilis*, Pall.† Is common on all the wooded parts of the Perm Ural, and perhaps it occurs even at Bogoslaffsk. Russ., *Berkut*; Bashk., *Burkut*.

*Aquila chrysaëtus*, (L.) This species appears to inhabit the south and south-eastern parts of the Perm Ural, but I cannot make this statement with certainty, as I rely only on the sportsmen, who call it either red, brown, or long-tailed. In Uffa they name *Aquila Bonellii* (?), the smaller bird with a long tail. According to N. A. Severtzoff, *Aquila pennata* occurs also in the Tver Province.

*Aquila imperialis*, Bechst. Inhabits the southern parts of Perm, with the exception of the steppes, in which latter it occurs only in spring and autumn. It does not occur far beyond Ekaterinburg, where it occasionally breeds, according to Martin.

*Haliaëtus albicilla*, (L.) Has a wide distribution, and occurs

\* (Seebohm and I found it as far north as 66° 13' N. lat., on the Petchora.—J. A. H.-B.)

† (For remarks on this form, see "Annals and Mag. Nat. Hist.," 1877, p. 201.—J. A. H.-B.)

throughout the Government of Perm, except in the woodless localities. Russ., *Belochvost* (everywhere *Orel*); Bashk., *Kusagan*, *Sulgash* (?); Zirián, *Varesh*.

*Obs.* According to Pallas (*Zoog. Rosso. Asiat.*, vol. i., p. 341), *Solgosh* is *Aquila chrysaëtus*.

*Milvus regalis*, Briss. I can positively state that I have seen several Red Kites amongst hundreds of *Milvus ater*, flying towards some dead animals in the Kaslinsky Ural.

*Milvus ater*, (Gm.) Is common throughout the Government of Perm. Russ., *Korshen*; in some parts *Tseptiatnic*; Bashk., *Tiulugan*; Zirián, *Tsipan-varesh*.

*Milvus glaucopus*, Eversm. This is most likely only a variety of the preceding species. I met with it in the Kaslinsky Ural, where it is commoner than *Milvus regalis*, but not so common as *Milvus ater*.

*Astur palumbarius*, (L.) Occurs throughout Perm wherever woods are to be found. Russ., *Jastreb*; Bashk. and Mestshersk, *Karsaga*; Zirián, *Tupiur*.

*Astur nisus*, (L.) Occurs throughout Perm, but is not so numerous as the preceding species. Russ., *Jastrebok*; Bashk., *Kuger*; Zirián, *Chungun*.

*Circus cyaneus*, (L.) Everywhere, but more abundant in open places. Russ., *Mishelovka*; Bashk., *Bieliala*; Zirián, *Vesiasche ?-varesh*.

*Circus cineraceus*, (Montagu). Not known how far north it ranges, but it certainly occurs about Ekaterinburg. In the Ural it is found usually in plains close to rivers. Very common in the Perm steppes.

*Obs.* Eversmann (*op. cit.*, p. 8) says that it does not occur in Kasan Province, but according to Bogdanoff it has been obtained there (*op. cit.*, p. 51). Eversmann does not mention *C. pallidus*, but Bogdanoff found the latter in the Belasheff district.

*Circus pallidus*, Sykes. I think I saw this species in the Bashkir district, at the boundary of the Shadrinsk and Ekaterinburg districts.

*Circus aeruginosus*, (L.) Is very common on the lakes of the eastern slope of the Ural, but is very scarce about Ekaterinburg. Teplouhoff, however, found it plentifully on the river Obva (Perm Government), about  $57\frac{1}{2}^{\circ}$  N. lat. Russ., *Kameshnick*; Bashk., *Kameshkara*.

*Obs.* Pallas (*op. cit.*, p. 356) is mistaken in calling it in Bashkir *Bak targe*, as this name belongs to *Nyctale*. According to a Zirián from Ijma, *Circus aeruginosus* occurs on the Volga, and is called there *Outka-varesh*.\*

*Ulula barbata*, Pall. I never saw this bird here, but according to Martin it was found by him about 30 versts from the Poleff works. According to Mejakoff (*l.c.*) it breeds in the Vologda Government, and according to Nordmann (*l.c.*) it occurs in the southern parts of Finland.

*Ulula uralensis*, (Pall.) Is very common in all the fir woods throughout the Perm Government, and does not appear to breed in any other forests. In Perm it is called *Baba*; in Ekaterinburg, *Maley filui*; Bashk., *Tall-uku*; Zirián, *Rud-pelui*.

*Ulula aluco*, (L.) Is not so common as *U. uralensis*, and is rather rarer on the eastern declivity than in Central Russia. It does not, I think, occur in the northern parts of the Perm Government. Zirián, *Serapelui*.

*AEgolius otus*, (L.) Is extremely abundant on the eastern slope of the Ural mountains, and probably ranges as far north as 59° N. lat. Russ., *Sech*.

*AEgolius brachyotus*, (Forster). Is met with in the more open plains, consequently mostly in the southern parts of the Government of Perm. I never saw it north of 58° N. lat. (Tagill), although Middendorff found it much further north on the Boganida (Sib. Reise, B. 2, Th. 2, p. 130), and at Udskey Ostrog, and Nordmann (*l.c.*) traced it as far as the White Sea.

*Nyctale tengmalmi*, (Gmel.) Has not been found further north than the Pavdinskay Dacha, 59° N. lat. Thence southwards it becomes more common, but is nowhere so numerous as *AEgolius otus*. Russ., *Sechik*; Bashk., *Bukturge*; Meschersk, *Baigosh*; Zirián, *Vorobay-varesh*.

*Surnia passerina*, (L.)† Is found, but is scarcer than the preceding species, and its limits of distribution are not known exactly.

*Surnia funerea*, Auct. Is very common, but has not been traced very far north. It appears to be most numerous on the eastern slope of the Ekaterinburg Ural.

*Surnia nyctea*, (L.) Throughout the Perm Government, being

\* (*Outka-varish*, i.e., "Duck-Hawk."—J. A. H.-B.)

† (This species appears to be rare everywhere in Northern Russia, judging from the paucity of records. (Annals, 1877, p. 187.)—J. A. H.-B.)

commonest in the north. It breeds in the plains of Shadrinsk. Russ., *Beloy filui*; Bashk., *Ak-uku*; Zirián, *Edshea pelui*.

Eversmann (*l.c.*) says that it breeds in the Orenburg Province, but according to Bogdanoff (*l.c.*) it occurs there only in winter, but I incline to the former opinion, and do not consider that it is impossible that *S. nyctea* is to be seen on the southern steppes, *Lagopus albus* and *Buteo lagopus*, its usual companions, being found there. According to some sportsmen, *Strix flammea* is found in the southern parts of the Perm Ural, but I have never observed it. Most likely *Surnia noctua* does not occur here, although Bogdanoff traced it as far as the district of Sizransk.

*Bubo maximus*, Fleming. This owl is found in the Perm Government, but is commoner further south, and is still more numerous in the birch woods on the slopes of the Ural mountains, but it does not occur on the plains of Shadrinsk. Russ., *Filui*; Bashk., *Uku* or *Clotke-uku*; Zirián, *Pelui*. The variety *B. sibiricus* is often met with, but Eversmann does not mention it at all.

*Ephialtes scops*, (L.) On both the western and eastern slopes it is distributed nearly as high as 57° N. lat., but occurs only in coniferous forests, and not in birch woods. The Bashkirs call the male *Siop*, and the female *Gak*. It has never been found in the Governments of Kasan or Simbirsk. It is very remarkable that it does not occur in the northern parts of the Kasan Province.

*Cypselus apus*, (L.) This species occurs only in the Ural mountains, and goes along the eastern slope as far as Bogoslaflsk, but does not inhabit the plains of Shadrinsk. Russ., *Strish*; Bashk., *Carcagase*; Zirián, on the Ishma, *Vorchekish*.

*Cypselus alpinus*, Scop. Occasionally it is met with in Kashtin, Uffa, and Uraim districts, and sometimes even in the Kaslinsky Ural, and probably also it inhabits the Zlatoustovska Dacha. Russ., *Belobruchey strish*.

*Caprimulgus europeus*, (L.) Is to be met with everywhere, and has been observed at Verhoturie, but does not occur, however, in the woodless plains. Russ., *Churila*; Bashk., *Sabalak*.

*Cuculus canorus*, L. Is common in all the forests and groves. Russ., *Kukushka*; Bashk., *Kakuk*; Zirián, *Kek*. A species of Cuckoo is met with sometimes in the fir woods of the south-east, and sometimes also on the south-west slopes of the mountains, which distinguishes itself by its rough and harsh voice, and is

called by the sportsmen *Fir-cuckoo*. It did not, however, come under my observation.

*Jynx torquilla*, L. Is very common, particularly about the birch woods of the Ekaterinburg district, and has been found by us in the Pavdinsky Dacha.

*Picus canus*, Gm. Has not been found on the eastern declivity north of Ekaterinburg. On the western slope it is rather common, but does not breed in the birch woods of the eastern slope. Russ., *Selenoy-diatel*; Bashk., *Yaschel-tumurtka*; Zirián, *Sez-sez*.

*Obs.* *Picus viridis* has never been found by me, but it most likely occurs on the south-west parts of the Perm Government, although Bogdanoff (*l.c.*) states, in opposition to Eversmann's opinion (*op. cit.*, p. 100), that it is of rare occurrence in the Kasan Government.

*Picus martius*, L. Throughout Perm, except in the woodless parts. It is also common in the birch woods of the Province of Ekaterinburg. Russ., *Shelna*; Bashk., *Kara tumurtka*; Zirián, *Ker*.

*Picus leuconotus*, Bechst. Its distribution is similar to that of *P. martius*, but it is more numerous, especially in the birch woods.

*Picus major*, L. Is met with everywhere, and is more abundant than the White-backed Woodpecker (*P. leuconotus*) in the Ural mountains. In the birch woods, however, it is remarkably scarce.

*Picus medius*, L. We only obtained one specimen of this species, which was got at the Pavdinsky works.

*Obs.* Bogdanoff did not meet with it along the Volga, but I saw it in the Government of Jaroslav. Mejakoff records it from the Government of Vologda (*op. cit.*, p. 629). Nordmann does not include it in his "Birds of Finland." Lilljeborg (*op. cit.*, p. 107) has found *Picus minor* in the Archangel Government, near  $63\frac{1}{2}^{\circ}$  N. lat.

*Picus minor*, L. Is not so common as *P. major* and *P. leuconotus*, and apparently does not go so far north.\* Mesch., *Kesel-alla-tukurtina*. All coloured woodpeckers are usually called in Bashk., *Sabar-tumurtka*; Mesch., *Sera-tukurtina*; Zirián, *Sera-sez*.

*Picus tridactylus*, L. Is not very numerous, but is widely distributed.

\* (Seebohm and I met with it (*Picus minor*) beyond the Arctic circle, up to  $67^{\circ} 15'$  N. lat. on the Petchora.—J. A. H.-B.)

*Alcedo ispida*, L. Is not scarce in the south-east parts of the Perm Ural, along the tributaries of the Uffa, in the Ukrainsky and Poleffsky Dacha. On the eastern declivity it is occasionally seen in the Kaslinsky Ural, but I do not think it breeds there.

*Obs.* Bogdanoff (*l.c.*) met with it about Kasan.

*Upupa epops*, L. The distribution of this species is very curious. I obtained one specimen from Pavda, where it is not supposed to appear every year. When they do, they make their appearance in the Esety valley, in the Shadrinsk. (I think I have noticed them east of Ekaterinburg, at the Beresoffsky works). According to Falk, ("Travels," viii., p. 328) they occur in the Province of Esety. In Pavda it is called *Polevsky-petushak*. Eversmann traces it to the Kasan district (*l.c.*), and Bogdanoff to Christopol. According to Nordmann (Bull. Mosc., 1860, No. 1, p. 13), it is not uncommon in Central Finland. Mejakoff does not mention it in his catalogue (*l.c.*) of the southern parts of the Government of Vologda, but I found it in the Government of Jaroslav (Bull. Mosc., 1869). Falk, ("Travels," viii., p. 336) says that it inhabits the Esety Province. Georgi (*v. Middendorff's "Isepiptesen Russlands,"* p. 21) has watched it on the eastern slopes, near  $56\frac{1}{2}^{\circ}$  N. lat.

*Coracias garrula*, L. I have never seen this species in the Perm Government, but according to sportsmen, it is met with at the boundary of the Ekaterinburg and Shadrinsk districts. Teplouhoff met with it about Iliensk (Perm Government), in  $58\frac{1}{2}^{\circ}$  N. lat., in June and July, and A. Pastuhoff has seen several of them near Solikamsk, in  $59\frac{1}{2}^{\circ}$  N. lat.

*Obs.* According to Mejakoff (*op. cit.*, p. 629) it occasionally migrates to the Griesovetsk district. Bogdanoff (*l.c.*) traced it to Christopol. According to my own observations, it sometimes occurs in the Governments of Jaroslav and Moscow, and probably breeds on the western parts of the latter, being very common about Smolensk, in the Viazemsky district. According to Lilljeborg (*l.c.*), it is met with—as also is *Coccothraustes vulgaris*—now and then near Ladoga and Ladienapole.

*Alauda arvensis*, L. Is distributed throughout the localities where there are ploughed fields, and goes from thence northwards as far as Verhoturie. It is not so common here, however, as in Central and Southern Russia. Russ., *Shavoronock*; on the eastern declivity called mostly "*Stolbik*"; Mesch., *Sabau-*

*turgai*; Bashk., *Bos-turgai*; Zirián, on the Ijma, where they have only lately appeared, *Savoranka* (bad Russ.).

*Alda arborea*, L. I did not come across it, but it certainly occurs on the western slopes.

*Obs.* According to Eversmann (*l.c.*), it breeds in the Governments of Kasan and Viatka. Mejakoff states (*l.c.*) that it is rare in Vologda Government, and Nordmann (*l.c.*) informs us that it is to be met with in some parts of Finland.

*Alda brachydactyla*, Leisl. Seen only once at the boundary of the Ekaterinburg and Shadrinsk districts, although it occasionally breeds there. Further south eastwards it becomes commoner. This is contrary to Eversmann's opinion (*l.c.*), who supposes that it is not met with beyond the Ural.

*Alda alpestris*, L. In the valleys of the eastern slope of the Ural mountains it is numerous during migration, and it breeds also in the Perm Government, but not numerously. According to Eversmann (*l.c.*), it does not occur beyond 53° N. lat. However, Bogdanoff (*l.c.*) observed it near Kasan during migration, and I saw it in the Moscow and Jaroslav Provinces.

*Alda alpestris* belongs probably to the number of birds like *Surnia nyctea*, *Lagopus albus*, and others, building only on the eastern slope of the Ural mountains, in the southern and northern steppes.

*Alda calandra (sibirica?)*, Gm. It is not certain which of these two species does occasionally breed at the boundary of the Ekaterinburg and Shadrinsk districts. I never met with it here, but traced it early in spring, 1869 (7th March), near to Sunder, which does not agree with Eversmann's statement (*op. cit.*, p. 273).

I once had in my hands a specimen of *Alda calandra* which was killed early in spring near Moscow. The stuffed bird is now in the Jaroslav Museum.

*Alda tatarica* has also been found by Middendorff in February in the Barabin steppes (Reise, B. ii., Th. 2, p. 133). According to Martin, it inhabits the district of Shadrinsk.

*Plectrophanes nivalis*, (L). In autumn and early in spring it passes the open plains in thousands, and some native sportsmen say that some remain to breed on the eastern slopes near certain lakes. I can, however, only state that on the 6th May, 1869, I killed a female near Lake Karaguz, in summer plumage, which was

probably nesting there. The migration lasts till the early part of April. Russ., *Sne-shurka*; Bashk., *Ak-yak*; Zirián, *Budsheukai*.

*Plectrophanes lapponicus*, (L). Passes during the vernal and autumn migration in great numbers, principally on the eastern slope of the Ural. It probably breeds here, as I obtained several specimens in May.

*Emberiza aureola*, Pall. Is very common throughout the Government of Perm.

*Emberiza hortulana*, L. This bird, which slightly differs from west European specimens, is very abundant in the thinly-wooded western parts of the districts of Ekaterinburg, Shadrinsk, and Cheliabiansk. It is not found in the Ural, and the northern limit of its distribution coalesces with that of Black-earth ( $56\frac{1}{2}^{\circ}$  N. lat., and west,  $57^{\circ}$  N. lat.), and is probably met with in some parts of the Krasnoufim and Osin districts.

*Obs.* According to Eversmann, *E. aureola* occurs in the southern parts of the Ural (*op. cit.*, p. 280). Hoffmann has found it near  $62^{\circ}$  N. lat. (*op. cit.*, p. 63). Bogdanoff traced it along the Volga to near  $53^{\circ}$  N. lat., but he is not right in saying that the Volga is its western boundary, as I have also observed it in Tamboff, Nijni-gorod, Riazan, Moscow, Jaroslav, and Smolensk.

It is strange that Eversmann says that *E. hortulana* is commoner in the Ural than in the Governments of Kasan and Simbirsk. It is still more curious that Nordmann affirms it to be common in Karelen,\* and rare in South Finland. (Eversm., *op. cit.*, p. 281, Nordmann, *op. cit.*, p. 14). According to Lilljeborg, *E. aureola* is met with from Kargopol to Archangel.

*Emberiza citrinella*, L. Common everywhere. Mesch., *Sara-turgai*.

*Emberiza schoeniclus*, L. Common everywhere, especially on the lakes and rivers of the eastern slopes.

*Emberiza pyrrhuloides*, Pall. Ekaterinburg (Eversmann, *op. cit.*, p. 288). This large variety of the preceding species occurs only on the rivers Ural and Volga.

*Emberiza rustica*, Pall. On the eastern slope, as far as Ekaterinburg, it is very rare. Further north, however, and on the western slope of the Ural, it is very common. According to

\* (I find no record whatever of *E. hortulana* in north of Russia proper—north of  $58^{\circ}$  N. lat.—J. A. H.-B.)

Teplouhoff, it breeds along the river Obva in the Perm Government, on the left bank of the River Kama.

*Obs.* According to Bogdanoff (*l.c.*), it migrates as far as Kasan. Mejakoff (*l.c.*) does not mention it, nor did I find it in the Government of Jaroslav. According to Nordmann (*l.c.*), it inhabits Lapland, and reaches Kuopio. Eversmann (*l.c.*) says that it does occur in the Orenburg district, but it is probably met with now and then in the Zlatoustoff Ural, and in the northern districts of Ufim.

*Emberiza pusilla*, Pall. It never came under my observation, but probably it is met with throughout the northern parts of the Perm Government. Hoffmann found it from  $61\frac{1}{2}^{\circ}$  N. lat. in the Cherdin district (*op. cit.*, p. 63); Eversman (*l.c.*) found it on the eastern mountain slopes; Middendorff came across it at Stanovoi and Boganida (Reise, *l.c.*) According to Nordmann (*op. cit.*, p. 15), it is common on the northern Dwina, and Lilljeborg reports it as very numerous about Archangel.\*

*Emberiza pithyornis*, Pall. Neither was this species seen by me, but it is found in the fir woods east of the Ural mountains (Government of Orenburg). Pallas observed it near Cheliabai, and Lepechin and Martin near Ekaterinburg (Eversm., *op. cit.*, p. 286; Pallas, "Voyages," iv., p. 21; Lepechin, "Travels," vol. ii.) During migration, Bogdanoff observed it near Kasan (*op. cit.*, p. 104).

*Passer montanus*, (L.) The Tree Sparrow is met with throughout the Province, except in the most northern parts.† Russ., *Lesnoy-vorobey*; Bashk., *Turgai*.

*Passer domesticus*, (L.) Has about the same distribution as the preceding, and has been traced as far as Bogoslaßsk. According to Hoffmann (*op. cit.*, p. 64), it is found everywhere near inhabited places as high as  $66^{\circ}$  N. lat.‡

*Pyrhula rubicilla*, Pall. According to Falk ("Travels," viii.,

\* (It was met with by Seebohm and myself as far north as Alexievka on the Petchora, in  $68^{\circ}$  N. lat.—J. A. H.-B.)

† (The curious scattered distribution of this species is here again noted. Sabanäeff *excepts* the northern parts (of Perm), but Seebohm and I found it common at Kuya,  $67^{\circ} 45'$  N. lat., and present even at Stanavoya-Lachta, about  $68^{\circ}$  N. lat. See also Annals and Mag. Nat. Hist., 1877, p. 204. The same sporadic distribution of this species is noticeable in other countries, as Scotland, Faroe, etc.—J. A. H.-B.)

‡ (And as far as  $68^{\circ}$  N. lat., on the Petchora.—J. A. H.-B.)

p. 396), it is met with in the district of Issetsk (Perm Government).

It is met with in almost all the coniferous woods of Perm, but they only visit the Black-earth plains and the birch woods during migration. It keeps exclusively in fir and pine forests on the eastern slope at other seasons. They are rare at Kaslinsky and Keschem Dacha. Russ., *Shulan* or *Podorojnick*; Bashk., *Sandugai* or *Kezel-tushtuet*; Zirián, *Sheu-kai*.

*Pyrrhula enucleator*, (L.) On the south-east slopes it is not frequent during migration. However, according to statements by sportsmen, it builds in the southern parts of the Perm Ural (Kaslinsky and Uffa Ural).

*Pyrrhula rosea*, Pall. According to Eversmann (*l.c.*), it visits the eastern parts of the Ural mountains, and migrates as far as Kasan, and therefore it might also occur here, although it has never been seen by me.

*Pyrrhula erythrina*, Pall. Occurs throughout the Government of Perm, and is common everywhere. Russ., *Cheremoshink*.

*Fringilla spinus*, L. The distribution of this species corresponds with that of the preceding. Zirián, *Tog-teu-kai*.

*Fringilla carduelis*, L. Inhabits the birch woods of the eastern slope of the Ekaterinburg Ural, and occurs as far north as Bogosloffsk.

*Fringilla linaria*, L. Is very common during migration, but breeds only in the north of the Province. Bashk., *Kukoniash-bustargai*; Mesch., *Bzet*.

*Fringilla borealis*, Vieill. Is not uncommon during migration, but goes further north.

*Fringilla cannabina*, L. Is commoner on the western declivity, but I cannot with certainty state whether it breeds there or not (*i.e.*, in the Shadrinsk district). It most likely does not occur in the northern parts of the Perm Government, but on the right bank of the river Kama, Teplouhoff found it numerous about  $58\frac{1}{2}^{\circ}$  N. lat. According to Falk (*op. cit.*, vol. iii., p. 400), it occurs on the Ob, and Eversmann states that it is common in the northern parts of Orenburg, which will also refer to the Ufim Province.

*Fringilla chloris*, L. On the eastern slope it is rare, and probably does not breed there. In the mountains themselves, however, and on the western slope, it is commoner, and most

likely goes further north than the preceding species. Russ., *Selenouskha*; in Perm, *Sever*.

*Fringilla petronia*, L. Martin found it only upon a single occasion in the Kaslinsky Ural, but I never met with it there. In the Catalogue of the Birds of the Government of Vologda, Mejakoff (*op. cit.*, p. 632) mentions it as breeding there.

*Fringilla coelebs*, L. Inhabits all the wooded parts of the Government of Perm, although it is not so common there as in Central Russia.

*Fringilla montifringilla*, L. Occurs all along the Ural and in the fir woods of the Government of Perm, and is as numerous there as the preceding species. In all the above localities, as also in the northern parts of the province of Orenburg and Ufim, it is found breeding. Russ., *Ziablik*; in Ekaterinburg, *Coakari*.

*Coccothraustes vulgaris*, (Pall). It does not range very far north, but is also rare in the south of Perm, at least on the eastern slope. Here it was observed by Martin near Issetsk, but according to some reports it is not uncommon in the western parts of the Government. According to Falk, (*op. cit.*, p. 396), it occurs in Issetsk Government, and Middendorff met with it near Irkutsk (Sib. Reise, Band ii., Th. 2, p. 154), and Nordmann met with it occasionally in Finland (*l.c.*)\*

*Loxia curvirostra*, (L.) Its distribution is similar to that of the Bullfinch, but is rare even during migration in the pine woods of the Kaslinsky and Keshtemsky Ural. In the forests on the western slope and north of Ekaterinburg it is not scarce. Zirián, *Ur-kay*.

Most likely also *Loxia bifasciata*, which I observed about Moscow and Jaroslav, will be found here. According to Nordmann, it builds in Finland, and Lilljeborg states it is very common about Archangel (*l.c.*)

*Ægithalus pendulinus*, L. Is very common in the southern parts of the Ekaterinburg and Shadrinsk districts. On the western slope it is rather rare, but occurs occasionally as far as  $56\frac{1}{2}^{\circ}$  N. lat. Russ., *Rennes*; Bashk., *Kurulday*.

Although Bogdanoff never came across it in the Government of Kasan, still I think that Eversmann (*op. cit.*, p. 147) is right in stating that it occurs as far as the mouth of the Kama.

\* (Also once shot at Archangel. *Vide Annals*, 1877, p. 11.—J. A. H.-B.)

*Parus caudatus*, L. Is tolerably common throughout the Perm Government, except in the woodless parts.

*Parus cyaneus*, Pall. Is very common throughout Perm, especially on the banks of rivers and lakes. Its northern boundary was not defined by me. Bashk. and Mesch., *Temirternak*: all Tits are called "*Maigas*." Russ.—in some parts—*Slepushky*; Zirián, *Sirchik*.

Eversmann mentions (*l.c.*) *P. cyaneus* as visiting the Volga and Kama, but Bogdanoff (*l.c.*) did not find it there in summer. I can, however, positively state that it breeds near Moscow and in the Government of Jaroslav.

*Parus major*, L. Is common everywhere. Mesch., *Josheb-maigas*; in Perm, *Kusveschnik*.

*Parus caeruleus*, L. In contradistinction to *Parus cyaneus*, this species belongs only to Western Europe, but on the Eastern slope it has been observed in spring.

*Parus cristatus*, L. Most likely it occurs only on the western slope, and has only once been seen on the eastern declivity.

*Parus cristatus* and *Parus caeruleus* are rather rare on the upper Volga, but they are rather common in the Governments of Moscow and Jaroslav.

*Parus ater*, L. Occurs in the fir woods of the Perm Government, where it is not uncommon. It seldom breeds, however, in the pine forests, and on the western slope it is scarce, and occurs only during migration in the birch woods.

*Parus sibiricus*, Gm. This species is included in the present list on Martin's authority, who observed it on the eastern slope of the Ekaterinburg Ural, about 56° N. lat. Hoffmann (*l.c.*) met with it at 62° N. lat., and according to Nordmann, it breeds in Lapland (*l.c.*)

*Parus palustris*, L. Common everywhere.

*Sitta uralensis*, Licht. Inhabits all the coniferous forests of the Government of Perm, but cannot be called common in the Kaslinsky and Keshtemsky forests.

*Bombicilla garrula* (L.) On the south-eastern slope of the Perm Ural it is not very numerous during migration, but in the Pavdinsky Dacha it certainly breeds. On the 26th May, 1868, I met with an example in a wood between the Viatka and Perm Governments, which evidently tried to mislead my dog from its nest. Russ., *Sweeristel*.

*Garrulus infaustus*, (L.) Is common in all the fir and pine forests of the Perm Government. In the latter, however, it does not breed, but often builds in birch woods. Russ., *Kuksha*.

*Garrulus glandarius*, (L.) Its distribution is very wide, and it is rather commoner than the next species, being very abundant in the oak forests of the Government of Uffa, and in the pine forests of Keshtemsky and the Kaslinsky Ural. Russ., *Sozka, bobrovaza-sorochka*; Bashk., *Umran-soiskan*; Zirián, *Kenia*.

*Nucifraga caryocatactes*, (L.) Is extremely numerous in the northern parts of the Perm Government, but south of 57° N. lat. it soon becomes rare. It is more common on the western slope than on the eastern. Russ., *Kedrovka*; in Kaslinsky, where it is very little known, *Botrovaya-sorochka*.

According to Lehman ("Travels"), it occurs in the forests of Orenburg, but this has probably reference only to the Ural, and I hardly think it breeds as far as the river Sackmara.

*Corvus monedula*, L. Does not go far north, and is not numerous about the Pavdinsky Dacha, and does not even remain there to winter.\* In the south, and particularly in the Bashkir birch woods, it is very abundant, and breeds there in hollow trees, and only occasionally in stone buildings. Russ., *Galka*; Bashk., *Saulka*; Zirián, *Chauken*.

*Corvus dauricus*, Pall. I observed it in the Pavdinsky and Kaslinsky Ural (56° N. lat.), and Hoffmann (*op. cit.*, p. 65) found it at Cherdin.

*Corvus corone*, Lath. I only once noticed it in the Pavdinsky Dacha, but it certainly occurs throughout the Government of Perm. Teplouhoff shot it twice in the Perm Ural, near the village Iliensk.

Eversmann says that it occasionally occurs in the Province of Kasan (*op. cit.*, p. 163). Lehman found it in Orenburg (*op. cit.*, p. 316). According to Nordmann, it is scarce in Finland (*op. cit.*, p. 22). Lilljeborg found it at Ladienopole. I ("Materials for the Fauna of the Jaroslav Government") met with it about Jaroslav. Falk (*op. cit.*, vol. iii., p. 335) found it in Issetsk Province.

*Corvus cornix*, L. Is very common everywhere, especially in the cultivated districts, but in the Ural it is rather rare. Russ., *Verona*; Bashk., *Karga*.

\* (But in the West it even winters as far north as Mezén.—J. A. H.-B.)

*Corvus corax*, L. Is rather common in the Ural mountains, but is rare on the eastern slope in the birch woods. Hoffmann met with it at the sources of the Petchora, in the most northern parts of the Perm Government, 62° N. lat. (*op. cit.*, p. 66). Russ., *Veron*; Bashk. and Mesch., *Kuzgun*; Zirián, *Kirnish*.

*Corvus frugilegus*, L. Does not occur very far north, and on the western slope not beyond 59° N. lat.; on the eastern slope, not beyond 57° N. lat. It does not inhabit the mountains, but is commonest in the birch woods of the Ekaterinburg and Shadrinsk districts, where it lives in large colonies. Russ., *Gratch*; Bashk., *Kara-karga*.

According to the statement of a native it occurs at Ijma (64° N. lat.), and is called there *Sedra*. Lilljeborg (*l.c.*) and Hoffmann (*l.c.*) states that it visits even Archangel and breeds there.\*

*Fregilus graculus* (L.) It inhabits all the Ural range, beginning at Tagill. About the Ekaterinburg and Uffa Ural it is not scarce, and is known to the Russian sportsmen and the beekeepers under the name of *Chernay-diatel* or *Bortevshika*. Bashk., *Bal-tumurkta*. Neither Eversmann nor Hoffmann mention this species.

*Sturnus vulgaris*, L. Is extremely common in the southern parts of the Government of Perm in the Ural mountains, as also on the slopes north of 57° N. lat. On the eastern slope it becomes rare, and does not appear to occur north of the Pavdinsky Dacha. Russ., *Skvoretz*; Bashk. and Mesch., *Segersik*. It does not occur at Ijma, and according to Middendorff ("Isepiptesen", p. 39), occurs on the Kama up to 60½° N. lat.

*Troglodytes parvulus*, Koch. Is rather rare in the Kaslinsky Ural, but becomes rather commoner on the western slopes of the Ural mountains. Russ., *Kropevenik*.

Neither Bogdanoff nor Eversmann mentions it. It is common in the Governments of Moscow and Jaroslav. It occurs in Ijma, where it is called *Pista*, and according to Middendorff (*Reise in Lapland*, p. 234), it is probably found in Lapland.

*Certhia familiaris*, L. We met with it as far as Pavda, but it evidently does not breed in the south-eastern slope of the Ural,

\* (Seebohm and I obtained a specimen at Ust Zylma, on the Petchora, 65° 26' N. lat. I consider it doubtful that it breeds at Archangel.—J. A. H.-B.)

but is common in the fir woods of the western declivity of the Ekaterinburg Ural.

*Cinclus aquaticus*, Briss. Occurs throughout the Ural, occasionally also breeding on the shores of lakes on the boundary of the Ekaterinburg and Shadrinsk districts. Common on the south-western slope. Russ., *Vodianay-vorobey*; Bashk., *Kara-turgai*; Zirián, *Vasez*.

Hoffmann met with it in 62° N. lat. (*l.c.*) I must also state here that it winters with us, though Bogdanoff doubts it (*l.c.*)

*Anthus aquaticus*, Bechst. I often met with it in July and August in the Pavdinsky Dacha, and several times observed it during migration in the southern parts of the Ekaterinburg Province, and in the Shadrinsk district. It probably breeds in the Keshtemsky and Kaslinsky Ural.

Hoffmann met with it between 61° and 63 $\frac{3}{4}$ ° N. lat. (*op. cit.*, p. 66). According to Eversmann, it occurs in the southern Ural and the hilly woods of the Khirgis steppes (*op. cit.*, p. 260).

*Anthus pratensis*, (L.) Occurs everywhere, but is most numerous during migration.

*Anthus cervinus*, Pall. This species or variety of the preceding is tolerably common on the marshy plains of the Ekaterinburg and Shadrinsk districts. Eversmann says (*op. cit.*, p. 261) that this bird is commoner than the preceding species in the Orenburg Government; but this is certainly wrong, at least as regards migrating birds, which latter is also Bogdanoff's opinion (*op. cit.*, p. 98).

*Anthus arboreus*, Bechst. Is extremely abundant throughout the Province where woods or groves exist. Hoffmann found it in the most northern parts of the Government of Perm, 62° N. lat. (*op. cit.*, p. 66).

*Anthus campestris*, (Lin.) This species did not come under my own observation, and is mentioned here only on Falk's authority, which may be wrong (*op. cit.*, p. 391). It occurs, according to Nordmann, in Central Finland (*op. cit.*, p. 24).

*Motacilla alba*, L. Is very common everywhere. Russ., *Sinitchka*; Mesch., *Taltius*; Bashk., *Kukmursik*.

*Motacilla boarula*, (Penn.) It is extremely strange that it is commoner in the north than in the south. It is very common in the Pavdinsky Dacha, and according to Teplouhoff it breeds on the left bank of the Kama, 58 $\frac{1}{2}$ ° N. lat. South of Ekaterinburg it

becomes rarer. Neither Eversmann nor Bogdanoff mention this species. It occurs about Moscow.

*Motacilla citreola*, Pall. In Ekaterinburg district it occurs up to  $56\frac{1}{2}^{\circ}$  N. lat. It does not occur in the Ural, but further south and east it becomes common. According to Lepechin, it occurs at Tumen (Petesh., vol. ii., p. 384), and Bogdanoff (*l.c.*) says it is common in Kasan Province, and therefore I think it goes even further west. In the Shadrinsk district *M. campestris*, Pall., is probably to be found.

*Motacilla flava*, L. Occurs everywhere, and has been met with as far as Bogoslaffsk.

*Oriolus galbula*, L. Does not go very far north, at least on the eastern slopes, and I do not believe beyond  $58^{\circ}$  N. lat. It is common in the birch woods south of Ekaterinburg. Bashk., *Harigush*. According to Middendorff ("Isepiptesen," p. 44), it occurs on the Kama to  $61\frac{1}{2}^{\circ}$  N. lat.

*Turdus iliacus*, L. Is scarcer than the other common thrushes, but breeds throughout the Perm Government, except in the Black-earth forests.

*Turdus musicus*, L. Is very common, and its distribution is similar to that of the preceding species. Bashk. (like all thrushes), *Barkaldak*.

*Turdus atrigularis*, Natt. I found it very numerous in the Pavdinsky Dacha, but according to statements of some sportsmen, it occurs also further south, in the Kaslinsky Ural. According to Eversmann, it visits the Government of Orenburg, from the southern Altai (*op. cit.*, p. 185). Hoffmann came across it between  $62^{\circ}$  and  $65^{\circ}$  N. lat. (*op. cit.*, p. 67). *Turdus merula* certainly does not occur in the Ural, and this is confirmed also by Eversmann (*op. cit.*, p. 185), but occasionally it visits the south-west parts of the Province. According to Bogdanoff, it is very common in the south of Kasan and Simbirsk (*op. cit.*, p. 87).

*Turdus torquatus*, L. Occurs only in the Ural mountains, and there only rarely. Martin obtained a specimen once at the Issetsk Dacha,  $56\frac{1}{2}^{\circ}$  N. lat. Some native sportsmen inform me that it is occasionally seen near mountain brooks in the Kaslinsky Ural. They call it *Kuznechick*.

According to Nordmann (*l.c.*), it breeds in the north of Lapland and Finland. In the same localities the natives say that *Turdus saxatilis* is found, but this is doubtful.

*Turdus pilaris*, L. Is common everywhere, even in the Bashkir birch woods, but not so numerous as, for instance, in the Jaroslav Government.

*Turdus viscivorus*, L. Is very common in the conifer woods, but does not breed in the birch groves. In Perm, *Vershenez-drosd*, *Vershennick*.

*Accentor montanellus*, Pall. Only once, at the Pavdinsky Dacha.

*Accentor modularis*, (L.) Is tolerably common throughout the Government of Perm, and appears to breed in the south-east parts of the Ural.

*Salicaria fluviatilis*, Meyer. I found it only in the Kaslinsky Ural, and it does not appear to go far north. In the Moscow district it is rarer than any of the other *Salicariae*.

*Salicaria turdoides*, Meyer. Is extremely abundant in the reeds of the lakes of the Ekaterinburg and Shadrinsk districts, occasionally also breeding on the lakes of the Ural mountains. It occurs as far north as  $65\frac{1}{4}^{\circ}$  N. lat., on the eastern slope.

*Salicaria arundinacea*, (Briss.) On the rivulets and lakes of the Ekaterinburg Ural it is not uncommon, but it does not occur far north, probably not beyond  $57\frac{1}{2}^{\circ}$  N. lat.

*Salicaria palustris*, Bechst. Is commoner than the two preceding species, and has been obtained at the Pavdinsky Dacha. Breeds in the bushes on the plains, where *S. arundinacea* does not occur.

*Salicaria locustella*, (Penn.) Is even commoner than *S. palustris*, and occurs as far north as Pavda, and inhabits mostly the birch groves near rivers and lakes.

*Salicaria turdoides* has been traced by Bogdanoff only as far north as Sarepta (*op. cit.*, p. 81). I have found it in the Governments of Jamkoff and Jaroslav. It is very strange that Nordmann mentions only one species of *Salicaria*—*phragmitis*—as occurring in Finland; also Lilljeborg (*op. cit.*, p. 95). *Sal. palustris*, var. *magnirostris* (Lillj.), occurs as far as Cholmogory.

*Salicaria phragmitis*, (Bechst.) Is extremely numerous as far as Bogoslaflsk, but principally in the reeds of lakes in the Ekaterinburg and Shadrinsk districts.

*Regulus cristatus*, Koch. The distribution of this species is similar to that of *Parus ater*, *Pyrrhula rubicilla*, etc., but it is still rarer in the south-east slopes of the Perm Ural and the pine forests of the Kaslinsky and Keshtemsky districts. In the latter it does not breed at all, but is common further south.

*Regulus proregulus*, Pall. I met with this species from Orenburg Province as far as Bogoslaffsk, and even in the birch woods of the eastern slopes.

*Ficedula hypoleis*, (Bechst.) Is distributed through the Government as far as Bogoslaffsk, and is commoner in the Ural than in the Bashkir woods.

*Ficedula rufa*, (Lath.) Its distribution is similar to that of the preceding species, and it also appears to be commoner on the western slope than on the eastern. According to Nordmann (*op. cit.*, p. 27), *Ficedula hypoleis* becomes commoner in Finland every year. Lilljeborg (*op. cit.*, p. 95) met with it about as far north as Cholmogory. It is strange that Mejakoff should call it a rare and late visitor (*op. cit.*, p. 630).

*Ficedula trochilus*, (L.) Is very common everywhere, although not so numerous as in Central Russia.

*Sylvia curruca*, Lath. We met with it in all the localities visited by us.

*Sylvia atricapilla*, (L.) In the Ural and in the conifer woods it is commoner than in the birch woods of the Bashkir country. We did not observe it north of Ekaterinburg. According to Nordmann, the present species (and *Sylvia nisoria*) occasionally visit the southern parts of Finland; and Lilljeborg says that *S. hortensis*, *cinerea*, and *curruca* occur near Archangel (*op. cit.*)

*Sylvia cinerea*, Briss. Its range extends probably as far north as Bogoslaffsk. Teplouhoff found it at the river Obva, in  $58\frac{1}{2}^{\circ}$  N. lat. It is commoner than *S. curruca*, but not so numerous as that bird is in Central Russia.

*Sylvia hortensis*, Bechst. It has been observed as high as  $59^{\circ}$  N. lat., and is tolerably common.

*Sylvia cyanura*, Pall. We came across this species in the thickest forests of Tagila and the Pavdinsky Dacha, and found it there rather common, so that it probably goes further south in the Ural, and even visits the western slope.

*Sylvia nisoria*, Bechst. I did not see it myself, but Martin observed it at the Keshtemsky works, and it is very likely that it goes north as far as  $57^{\circ}$  N. lat.; but as these birds inhabit the thick bushes, and lead a very retired life, they are not easily detected.

*Lusciola philomela*, (Bechst.) Scarce on the south-east slope of the Ural, but occurs also in the mountains themselves. Occasionally it appears in the neighbourhood of Ekaterinburg, and

lately it has been seen in the Tagil Dacha, where it never was seen before. It is common in the western slope up to 59° N. lat. (Teplouhoff). Mejakoff found it in the southern parts of the Vologda Province. Lilljeborg traced it as far as Wuitegra, and it is strange that Eversmann should have found it common throughout Perm. The latter observation can only have reference to the south-west parts of that Government.

*Lusciola caligata*, (Licht.) Inhabits all the Ural, and especially its northern parts. We did not observe it on the banks of rivers.

*Lusciola calliope*, Pall. I did not observe it, but Martin obtained 3 or 4 specimens in the Polevsky Dacha. He states, however, that it is very rare. Further east, however, viz., at the boundary of Tobolsk Government, it is tolerably common.

*Lusciola suecica*, (L.) (var. *caeruleculä*). Is very common everywhere. Mesch., *Shakardak turgai*.

*Lusciola rubecula*, (L.) Is rather common on the western slope, but has occurred also at the Pavdinsky Dacha. It is rare in the forests of the Ekaterinburg Ural, but in the Bashkir birch woods it does not occur even during migration.

*Lusciola phoenicura*, (L.) Occurs in all the localities explored by us as far as Bogoslawfsk, and is commonest on the western slope. Some, however, remain to breed in the groves of the Shadrinsk district.

*Saxicola rubetra*, (L.) Is common throughout the Province.

*Saxicola oenanthe*, (L.) Inhabits also the whole Government of Perm, but is not so common as the preceding species. Mesch., *Taltuis*.

*Saxicola rubicola*, (L.) Throughout the Government of Perm; and I met with it from Bogoslawfsk to the boundary of the Orenburg Government. It is also tolerably common in the Bashkir country, but not so abundant as *S. rubetra*.

*Lanius excubitor*, L. Inhabits all the localities visited by us, and breeds in them, but is not very numerous anywhere.

*Lanius collurio*, L. Does not go north beyond 58° N. lat. Southwards from that place, however, it becomes common, especially in the Shadrinsk district, although not so abundant as in Central Russia.

*Muscicapa grisola*, L. Has not been observed very far north, and breeds exclusively in pine forests, and does not inhabit the birch woods of the Bashkir country. Lilljeborg met with it at

Archangel (*op. cit.*), and Schrader (Middendorff—Reise in Lapland: Appx. by Von Baer) in Central Russia.

*Muscicapa atricapilla*, L. Its range extends at least to 57° N. lat. on the eastern slope, and it occurs also in the birch woods of the Bashkir country. In Central Russia it is commoner than in the Province of Perm.

*Hirundo urbica*, L., and *Hirundo rustica*, L. Both these species have been observed as far as Bogoslawfsk, the second being the more abundant one. Bashk. and Mesch., *Karleygas*; Zirián, *Checkish*.

*Hirundo riparia*, L. Occurs in certain localities up to 58° N. lat., and goes even further north on the Kama. It is scarce in the south-eastern slope of the Ural, because of the want of suitable localities. It breeds in the Kaslinsky and Keshtemsky Ural.

*Columba palumbus*, L. Inhabits all the woods of the Perm Government, but is most numerous in the southern parts. Russ., *Lesnay-golub*; in Kaslinsk, *Mekitan*; Bashk., *Ala-dugu*; Zirián, *Vir-golub*.

*Columba livia* (var. *domestica*), Briss. Very common in all the inhabited places and the manufacturing localities of the Perm Government, especially in the southern parts.

*Columba oenas*, L. Is also very numerous up to 56½° N. lat. in the eastern slope, but as yet has not occurred at Ekaterinburg. Russ., *Dekey-golub*; Bashk., *Kugarsin*; Mesch., *Karkugarseney*.

*Columba turtur*, L. Is very scarce on the eastern slope, but has been found breeding in the Keshtemsky and Kaslinsky Ural. In the south-east parts, however, it is abundant. Russ., *Krasnay-golub*; Bashk., *Jabersin*.

Lepechin found *C. palumbus* at the boundary between the Verhoturie and Turinsk districts. Occasionally also it occurs at Archangel (Lilljeborg, *op. cit.*, p. 107). Probably also *C. livia* breeds on the south-west slope of the Perm Ural, as Eversmann states that they breed abundantly in the rocks of Belaya and Uffa. According to Bogdanoff, *C. oenas* is common in the Government of Kasan. It breeds in the southern parts of the Moscow Government, but I do not think it occurs in the Olonetz Government. Eversmann says (*op. cit.*, p. 325) that *C. turtur* is very common in the Government of Perm. Mejakoff (*op. cit.*, p. 632) found it as far as 60° N. lat. According to Nordmann (*op. cit.*, p. 31), it does not occur in Finland, but occasionally it visits the south of Lapland.

*Lagopus albus*, Gm. In the northern parts of the Government of Perm it is very common, according to Hoffmann, and occurs as far north as 70° N. lat. It is very abundant in the plains of the Shadrinsk and Ekaterinburg districts, but is scarce in the Central Ural. Russ., *Kouropatka*; Bashk. and Mesch., *Aguna*; Zirián, *Baydek*.

*Lagopus alpinus*, Nills. I met with it in the Pavdinsky Ural, where it is tolerably common. Southwards it occurs only locally, and it occurs in the Kaslinsky and Uffa Ural, though only occasionally. Hoffmann met with it in 61°–62° N. lat. According to Nordmann, it is common in Lapland (*op. cit.*)

*Tetrao urogallus*, L. Inhabits all the conifer forests of the Government of Perm, especially its northern parts. Russ., male, *Gluhar*, female, *Kopolutcha*; Bashk., male, *Suer*, female, *Bos-suer*; Zirián, female, *Kou-dosmer*, male, *Chuckchey*.

*Tetrao urogalloides*, Midd. (*T. medius*). Occurs throughout the Perm Government in the same localities as *T. urogallus*, but is much scarcer. I observed it oftenest in the Kaslinsky Ural. Taking this as a hybrid, it is easily explained, as a great number of the male *T. urogallus* are killed in spring, and therefore there exists a great predominance of females. Russ., *Maley-gluhar* or *Dlenney-gluhar*; Zirián in Ijma, *Koytoutik*. A native of Ijma assured me that in every hundred *T. urogallus* that are killed there they find up to five small specimens. According to Mejakoff, *T. medius* occurs in the south-east parts of the Government of Vologda (*op. cit.*, p. 632).

*Tetrao tetrrix*, L. Inhabits the whole Province, and is very numerous in the birch woods of the south-east slope of the Ural. Russ., male, *Teterev*; Cosach, or Poliash, female, *Riabushka*; Bashk., *Zou*; Zirián, male, *Tar*, female, *Ken-tar*.

*Tetrao bonasia*, L. Its distribution is similar to that of *T. urogallus*. Russ., *Borovay-raibchick* or *Raibchick*; Zirián, *Sela*.

*Sterna cinerea*, Briss. Occurs in the cultivated districts of the southern parts of the Ural slopes, but does not occur in the mountains themselves. Lately it has several times occurred at Tagila. According to Teplouhoff, it occasionally breeds on the Obva (58½° N. lat.) It is commonest in the Kamishloff, Shadrinsk, and the western parts of the Krasnouffa and Ossinsk districts. Russ., *Polevay*, *Polskay*, or *Ovuniay-raibchick*, *Golenashka*; in Tagila, *Slobodskay-riaback*; Bashk., *Bejir*; in Perm, *Kouropatka*.

*Ortygion coturnix*, (L.) It is common in the cultivated southern parts of the Province of Perm, but their range extends further northwards every year. I found it in the vicinity of Verhoturie, and according to the statement of an Ijma peasant, it occurs about Ijma (64° N. lat.); but this is rather doubtful. Russ., *Perepel*; in the Kama it is called *Podpalushka*; Bashk. and Mesch., *Budena*; Tartar, *Pitpildick*; Zirián, *Kvaitpalick*.

*Glareola melanoptera*, Nordm. Occurs during migration, up to 56½° N. lat., on the eastern slope, and apparently breeds in the Shadrinsk district.

*Otis tarda*, L. Breeds throughout the Shadrinsk district (up to 56° N. lat.), and further west, in Tobolsk Government (probably up to 57° N. lat.) Sometimes, also, it breeds in the south-east parts of the Ekaterinburg district. The Kaslinsky sportsmen who visit the Bashkir country call it *Bolshoy-kouropatka*. The Bashkirs call it *Dudack*.

*Crex pratensis*, Bechst. Inhabits the whole Province, but is not very common in the Ural. Russ., *Korostel*; Bashk., *Tartay*; Zirián, *Eyulesh*.

*Ortygometra porzana*, (L.) Occurs only in the southern parts of the Government of Perm. It does not inhabit the eastern parts. Westwards from the Ural, Teplouhoff met with it in 58½° N. lat.

*Rallus aquaticus*, Briss. Is evidently a more northern bird than the preceding species. Russ., *Paharek svistanok*.

*Fulica atra*, L. Occurs almost all over the Province, but is rare in the Ural. On the lakes of the Ekaterinburg and Shadrinsk districts (from 56½° N. lat. to 57° N. lat.) it is very common. Russ., *Lesaya-chernaya-gagara*, *Lesushka*; Bashk., *Kushkalak* or *Urlan*.

*Grus cinerea*, Bechst. Is distributed throughout the Province, and is not scarce in the marshes of the south-east Ural. Russ., *Luraol*; Bashk. and Mesch., *Turna*; Zirián, *Turey*.

*Vanellus cristatus*, L. Does not go far north, but it apparently breeds in the Pavdinsky Dacha, although it is not known from Ijma (64° N. lat.) In the southern district it is very common. Russ., *Pegalka*; in Perm it is called *Vshivitza*; Bashk., *Zircant*; Mesch., *Pivec*.

*Vanellus gregarius*, Pall. On the eastern slope it goes as far north as 56½° N. lat., and it breeds in the Shadrinsk district.

*Squatarola helvetica*, Briss. Has been observed everywhere in

the Province, but I never saw its nest here. Eversmann says that it is occasionally met with near Ekaterinburg in summer (*op. cit.*, p. 374), and some sportsmen assure me that it breeds in the Pavdinsky Dacha and the Kaslinsky Ural. In Pavda it is called *Kakashnie*; in Perm district, *Bolotuaya-seevka*.

*Charadrius pluvialis*, L. As far as I know, it breeds in the Pavdinsky Dacha, but according to some sportsmen, it occurs also in the Kaslinsky Ural. During migration, however, it is scarce. Russ., *Sevtsey*; in Pavda, *Vergantsey*; Zirián, *Kachiss*.

*Eudromias morinellus*, (L.) Occurs at Ekaterinburg during migration, as also further south, and probably breeds at the Pavdinsky Dacha. Russ. in Pavda, *Kokoshinkej*; at Ekaterinburg, *Petushock*.

*Aegialites curonicus*, Beseke. Is distributed everywhere, but is numerous only on the Kama, and on the larger rivers and lakes of the south-east slope. In the Ural mountains it is scarce. Russ., *Zuck-pesochnick*; Mesch., *Sausan*; Zirián, *Istan*; in Pavda it is called *Biello-sheyka*.

*Aegialites hiaticula*, (L.) I met with it only during the vernal migration, in the Ekaterinburg district.

*Haematopus ostralegus*, L. Is very common on the Kama. They were also observed at Pavda, and in the vicinity of Ekaterinburg, and, according to some sportsmen, they breed in the Kaslinsky Ural (where they occasionally have *spots on the head*: Naum., pl. 184). Russ., *Bolshay-petuschock*; Zirián at Ijma, *Tevda*.

*Recurvirostra avocetta*, L. According to some sportsmen, it breeds in the Kaslinsky Ural, in the marshes.

*Hypsibates himantopus*, (L.) I did not observe this species anywhere, but Falk mentions it as occurring in the Government of Issetsk (*op. cit.*)

*Totanus glottis*, (L.) Occurs in the whole of the Perm Government, but in the steppes only during migration. Russ., *Borovay-kulick*, *Borovay-evdoshka*, *Semenucha*.

*Totanus stagnatilis*, Bechst. Occurs also everywhere, but is commonest in the marshes east of the Ural. In Pavda it is called *Biellobrushka*.

*Totanus fuscus*, Briss. Was observed at Pavda, as well as in the southern parts of the Ekaterinburg Government, being, however, scarcer than any other Sandpipers, and only rarely breeding. In Pavda it is called *Polevskay-petuschock*.

*Totanus calidris*, (L.) Very common on the eastern slope, as far

as  $56\frac{1}{2}^{\circ}$  N. lat., and breeds as far as Pavda. Teplouhoff found it also breeding under  $58\frac{1}{2}^{\circ}$  N. lat. In Ekaterinburg it is called *Zuck*; in Pavda, *Polenskaya semenucha*.

*Totanus glareola*, (L.) Is tolerably common in spring on the south-east slope, and is very numerous during migration. In Pavda it breeds, and is the commonest species of the genus. In Pavda it is called *Seray-kulick*.

*Totanus ochropus*, (L.) From Pavda southwards throughout the Ural, but not so common there as in Central Russia. In the birch woods of the Ekaterinburg and Shadrinsk districts it does not breed, and appears there only during migration. Russ., *Lesnay-kulick*. In Ekaterinburg it is called *Biellohvostick*; in Pavda, *Kechenska*. According to Bogdanoff, *Totanus fuscus* breeds in Boganida. *Totanus calidris*, at all events, does not belong to the fauna of the Black-earth steppes. Mejakoff says that it breeds in Vologda (*op. cit.*) According to Nordmann (*op. cit.*), it is not rare in Finland and Lapland. Eversmann and Bogdanoff state that *Totanus glareola* breeds in the south of Kasan, Simbirsk, Saratoff, and Orenburg, and therefore Aksakoff's opinion that it is round about Uffa only during migration is incorrect.

*Actitis hypoleuca*, (L.) Is commoner than the preceding species, and breeds on the rivers of the eastern slope. In Pavda it is called *Piskun*.

*Phalaropus cinereus*, Briss. Breeds throughout the Government of Perm, but is common only during migration. Teplouhoff also found it in summer at  $58\frac{1}{2}^{\circ}$  N. lat. Russ., *Plavenechick*.

*Limosa cinerea*, Guld. Inhabits the whole Perm Province, and breeds at Pavda and on the western slope of the Ural. Teplouhoff found it breeding at Shinsk. Russ. in Pavda, *Sivojelesaya-semenucha*.

*Limosa aegocephala*, (L.) Does not occur on the eastern slope below Ekaterinburg (perhaps sometimes during migration), but on the western slopes it breeds up to  $58\frac{1}{2}^{\circ}$  N. lat.

It is very common in the south-east plains of the Government of Perm up to  $56\frac{1}{2}^{\circ}$  N. lat., and breeds perhaps in the Kaminshlovsk district up to  $57^{\circ}$  N. lat. Russ., *Evdoshka*; Bashk., *Kiseget*.

*Limosa rufa*, Briss. During migration it came several times under my observation in the district of Ekaterinburg. It may even breed in the northern portions of the Province of Perm.

*Machetes pugnax*, L. It is very common in the marshes of the

south-eastern slopes ; has not been remarked by us north of 57°, but on the western slope Teplouhoff found it building near 58½° N. lat. Probably it breeds throughout the Government of Perm, Petoushok, near Ekaterinburg, and in the districts of Perm. Russ., *Turutan*; Bashk., *Setermen*. Meshakoff has seen it only during migration (*op. cit.*, p. 633). However, in the Government of Jaroslav it is very common in the summer, and Nordmann found it everywhere (*op. cit.*, p. 40), Bogdanoff (*op. cit.*, p. 135).

*Tringa canutus*, L. Has been remarked by me in the Pavdinsky Dacha, where it also breeds, and during migration in the districts of Ekaterinburg. In Pavda it is called *Kerkun*.

*Tringa subarquata*, Guld. I have not remarked it, although it is met with in the south-eastern parts of the Ekaterinburg districts. Teplouhoff found it on the Obva on 1st of July, so that very possibly it breeds there. Eversmann traces it to Central Volga, Kama, and Government of Orenburg (*op. cit.*, p. 432), which Bogdanoff doubts (*op. cit.*, p. 136). According to Nordmann it is rare in Finland (*op. cit.*, p. 409).

*Tringa alpina*, L. I think it breeds throughout the Government of Perm, because I found it during the summer in the districts of Ekaterinburg. According to Teplouhoff it breeds on the Obva River.

*Tringa minuta*, Leisl. Positively breeds in the Pavdinsky Dacha, in the neighbourhood of Ekaterinburg, and I think in the southern parts of the district of Ekaterinburg also. Teplouhoff has also met with it during the summer in the neighbourhood of the Thiensk village, the Pavda Zueck. Bogdanoff is against Eversmann's opinion, who says that they do not breed in the Government of Kazan (*op. cit.*, p. 136); however, they breed in the Government of Jaroslav, and even in Moscow Government.

*Tringa temminckii*, Leisl. Is met with more seldom, and only during migration. In Pavda it is called *Mujineck*, *i.e.*, the male of the preceding species.

*Scolopax gallinula*, L. I have never seen it on the eastern slope in the summer. According to Hoffmann, it builds in the northern limits of the Government of Perm at the efflux of the Petchora. In Tagila, according to Beckmann, it has never been met with ; its spring migration is very insignificant. I traced it in the south-eastern parts of the Ekaterinburg district. See Hoffman (*op. cit.*, p. 70). According to Eversmann, it is very common (during

migration) in the Ural mountains and the adjacent woods; in the Government of Kazan, and the north parts of the Orenburg Government (*op. cit.*, p. 449). Aksakoff—in the Government of Ufim (Sportsmen's extracts, p. 74), and Bogdanoff—in the Government of Kazan (*op. cit.*, p. 140), have never met with it in the summer. In the Government of Jaroslav it nests sometimes (in the north-eastern part). According to Meshakoff, it breeds in the Government of Vologda (*op. cit.*, p. 633); according to Nordmann in Central Finland (*op. cit.*, p. 41).

*Scolopax major*, L. Is common throughout the Government of Perm.

*Scolopax gallinago*, L. Is much more numerous than the last. Russ., *Barashik*; Bashk., *Gankaza-haraljin*.

*Scolopax rusticola*, L. Is also met with in great numbers, but very seldom breeds in the birch-woods of Bashkiria and in Tagila. Russ., *Shabashka*; in the district of Ekaterinburg, *Pahar* (meaning *ploughman*, because it flies there and back all the time); at the Polevsky works, *Hurkun* (by the voice); Bashk., *Flur-pasek*.

*Numenius phaeopus*, L. Is met with as high as 60° N. lat. (as far as Pavda); it is very common in the Black-earth plain of Bashkiria; also breeds on the high elevated flat surfaces in the Ural (Kaslinsky, Mazepetroosk, Beloe steppes, White steppes). *Kulick*, in the Perm district; *Ferul*, in Pavda; also Bashk., *Kinilda*.

*Numenius arquata*, L. On the eastern slope it does not go further to the north than 57° N. lat., and it is rare near Ekaterinburg; it is very common in the steppes of the Shadrinsk district.

*Ardea cinerea*, L. It is not met with north of Ekaterinburg (on the east side). In the end of the summer and all the autumn it is very common on the lakes of the Black-earth plain, but here it does not build at all, or very seldom. It must be supposed that it breeds somewhere in the Ural (most likely in the Mazepetroosk or Polevsky, *i.e.*, on the western slope) in great colonies. In the Kaslinsky and Keshtemsky Ural it breeds but seldom (according to sportsmen's information). Russ., *Zaplia chepura*; Bashk., *Selian*, or *Kuck-selian*.

*Ardea alba*, L. According to the information of the Bashkirians and the Russian sportsmen, it breeds in the reeds of the lakes in the district of Shadrinsk. Bashk., *Ack-turna* (white crane), *Belaja-zaplia*. Is very likely the *Grus ancogoramus*, Pall.

According to Eversmann, it breeds in the southern steppes of Kirkiz (*op. cit.*, p. 464). Very likely in the southern boundary of our fauna *Ardea minuta* is also to be found, which, according to Eversmann, is met with in the slopes of the southern Ural mountains (*op. cit.*, p. 469), and Bogdanoff (*op. cit.*, p. 142) traced it as far as the district of Spask, Government of Kazan. According to my observation, it breeds in the Government of Moscow, and probably in that of Jaroslav also.

*Ardea stellaris*, L. It is very common in the reeds on the lakes of Bashkiria, and sometimes builds on the lakes of the Kaslinsky and Keshtemsky Ural. It is not met with north of 57° N. lat. Russ., *Wepp*; Bashk., *Kul-buga* (water-bull); Metch., *Su-ukze*.

*Ciconia nigra*, L. Positively builds in the Polevsky and Mazepe-troosk Ural; sometimes it is met with on eastern slopes, and it is seen every year in the districts of Ekaterinburg. Falk (*Beitrage*, vol. iii, p. 365) found it on the Kama. Meshakoff has seen it now and then in the Government of Vologda, and A. Nordmann in Finland.

*Platalea leucorodia*, L. Builds on the boundaries of the Shadrinsk and Cheliabiansk districts, and sometimes migrates to Sesertsk works (as high as 56½° N. lat.); according to Eversmann, only as high as 53° N. lat. (*op. cit.*, p. 487). According to Bogdanoff (*op. cit.*, p. 143), in the spring it migrates as far as Sezran.

*Cygnus musicus*, Bechst. Builds almost all through the Government, but on the lakes (in the steppes) is seen during migration only. It is very numerous on the lakes of the Sesertsk Ural (not far from the Sosnovo village). Russ., *Lebed*; Bashk., *Akkosh*; Zirián, *Sed-nerance*.

*Cygnus olor*, Gmel. According to sportsmen it sometimes builds in the Kaslinsky Ural, and in the Polevsky Ural it is commoner than the *Cygnus musicus*. Zirián, *gerd-nerance* (red-beaked).

*Cygnus minor*, Pall. It is not exactly known whether it builds in the south-eastern Ural (Kaslinsky Ural), but nearer to the boundary of the Tobolsk Government it must be frequent enough (in the districts of Irbitisk and Verhoturie). On the lakes of the Black-earth plain I followed it only during migration.

*Anser cygnoides*, L. (?) It is sometimes seen in the south-eastern Ural during the autumn migration, but it has never been remarked by me.

*Anser hyperboreus*, Pall. According to Pallas (*Voyages*, Vol.

iv., p. 21) it is met with while on migration near Cheliuba. According to sportsmen it is also seen in the Kaslinsky Ural during migration.

*Anser albifrons*, Perm. On the lakes of the south-eastern slope it is very numerous during migration. In the Ural, north of Ekaterinburg, its migration is insignificant, and it flies the same as the others from the mouth of the Ob, through the districts. On the eastern part of the Government of Perm they go along the Kama, and on the Ekaterinburg and Shadrinsk districts. Russ., *Sredinja*, *Kazarka belolobaja* (white forehead), also *Lesushka* and *Pleshivka*; Bashk., Mesch., *Kara-koz*.

*Anser segetum*, Gmel. Has not been remarked, as Pallas followed it during migration on the Ufa near 55° N. lat., so of course it migrates through the Government of Perm; however, the sportsmen do not distinguish it from the following species. See Middendorff's *Isepiptesen*, p. 75.

*Anser arvensis*, Brehm. During migration it is less numerous than the *Anser albifrons*. Russ., *Nemoi gus nemaja* (dumb); *Kazarka hrushkaja* (great); also, *Nemock*; Bashk., *Koba-koz*.

*Anser leucopsis*, Bechst. Is more numerous than the *Anser albifrons*, and its migration on the lakes is very considerable. Russ., *Nemter-nemaja kazarka*; Bashk., *Sangaldak-koz*.

*Anser minutus*, Naum. Is very numerous, and migrates especially through the district of Shadrinsk by tens of thousands. Generally their migration is not in the Ural and on the western slope. *Anser cinereus* is the only goose not met with during migration. Russ., *Malaya kazarka pesculka*. I think the *Anser brenta*, Pall., is also seen during migration, and perhaps the *Anser ruficollis*; however, the latter one has been acknowledged by sportsmen on Nauman's painting.

*Anser cinereus*, Meyer. The Common Goose builds in great numbers on the south-eastern parts of the Ekaterinburg and Shadrinsk districts; in the former as high as 56° N. lat. Near Ekaterinburg it does not breed, but according to information, it builds again in the district of Irbitk. On the western slope it builds but seldom, perhaps nearer to Kama. Russ., *Gus*; Bashk., *Kaz*; Zirián, *Djozeg*.

*Vulpanser tadorna*, (L.) In the spring, migrates to the Ekaterinburg district as high as 56° N. lat. I think it builds on the boundaries of the Shadrinsk and Cheliabiansk districts. The

Cheliabiansk Cossacks call it *Pegush*. Eversmann is not right in saying that it is met with only as far as the latitude of Orenburg (*op. cit.*, p. 509). Some time ago Pallas (*Voyages*, vol. ii., p. 421) had seen it in great numbers on the lakes of Kulatowa, in the district of Cheliabiansk, and says that it builds there, together with *Anas rutila* (which, according to this, must migrate here). According to Bogdanoff, *A. tadorna* goes as far as the Promzino village in the Government of Simbirsk (*op. cit.*, p. 148).

*Anas penelope*, L. Near Ekaterinburg it builds, but rather seldom; however, it is very common in the south-eastern district of the Government, and also in the Government of Shadrinsk, but it seems to be more numerous on the Ural lakes than on the steppe lakes. Russ., *Swestun-swez*; Bashk., *Blé*; Zirián, *Vöz* (on the Tinsha). Eversmann says that it is mostly met with in the southern parts (*op. cit.*, p. 527), but Hoffmann found it (*op. cit.*, p. 70) near 62° N. lat., together with *Anas crecca*.

*Anas querquedula*, L. Is numerous everywhere, especially on the lakes; however, it is rarer on the Ural lakes and in Cherock, near Ekaterinburg. Russ., *Sesick*; Bashk., *Suragai-urdeck*; Zirián, *Jeedatch*.

*Anas crecca*, L. Is met with more seldom than the preceding species, especially in the southern parts. It is very numerous in the north (Pavda) *vide* Hoffmann, (*op. cit.*, p. 70). *Cherushka*, near Ekaterinburg; Zirián, *Gerd-nerr-jeedatch*.

*Anas strepera*, L. In the districts of Ekaterinburg it is rare, and is not found in Pavda; on the lakes it is very numerous, especially in the districts of Shadrinsk and Cheliabiansk. Russ., *Criakushka*.

*Anas acuta*, L. Everywhere, according to localities, more or less common. Russ., *Astrohevest*; Mesch, *Ala-urdeck*; Bashk., *Kalkins rock*; Zirián, *Jeydjeed-golia-kerag* (white necked).

*Anas boschas*, L. Is spread all over, especially on the lakes of the Black-earth plain Seruha. In the Polevsky works, *Selezen*; Bashk., Mesch., *Kugal urdeck*; Zirián, *Kirag*.

*Anas*, sp., Z. The size of this duck is not larger than that of a Starling. I have never had it in my hands, but I have seen it several times in the districts of Ekaterinburg (Berezowsky works). According to sportsmen it is common in the Pavdinsky and Bogoslovsky Dacha; it also breeds along the River Arduja north of Ekaterinburg, and sometimes in the Kaslinsky Ural. Builds

always along the rocky shores of the rivers. In Pavda, *Smettannick*, *Kamennaja utka* (stone duck), *Skreben*; near Ekaterenburg, *Malenky-cherock*.

*Rhynchaspis clypeata*, L. Is very common on the lakes to the north from 50° N. lat.; it is rather rare, but I think it is met with in Pavdinsky Dacha (Tagila also). Russ., *Sherokonoska*, *Sacktun*, *Socksun-bogater*. In the district of Perm, *Plutonos* (Tep-louhoff); Bashk., *Hog-hog* (by the voice).

*Oidemia fusca*, L. It is very numerous on the lakes, and builds in small numbers throughout the Government of Perm. Russ., *Turpan chernimshka chernuha*; Bashk., *Kara-urdeck*.

*Oidemia nigra*, L. Is met with on the lakes during migration only, and it is also seen in the summer. Probably builds on the Ural and north part of the Perm Government. Russ., *Maley-turpan-chernimshka*; Bashk., *Suktabash*. Eversmann has never traced it even during migration (*op. cit.*, p. 540). According to Nordmann, it builds in Lapland (*op. cit.*, p. 46); according to sportsmen in Kaslinsky, *O. perspicillata* (?) is sometimes seen and breeds there.

*Undina mersa*, Pall. Breeds on the lakes of the Shadrinsk district (lake Uvelky), and sometimes on the lakes of the Kasha Ural. Bashk., *Aumbach* (?). According to Eversmann, it is met with in the northern parts of the Orenburg Government (*op. cit.*, p. 542), which was also remarked by Pallas (Voyages, vol. iii, p. 61) in the district of Cheliabiansk.

*Glaucion clangula*, L. Breeds throughout the Government of Perm, especially on the northern half; on the steppe lakes only during migration. Russ., *Gogol*; Bashk., *Alasabar*.

*Harelda glacialis*, L. Is very common in the Ural, and probably breeds on the lakes of the Shadrinsk district; during migration it is very numerous there. In the district of Ekaterinburg, *Kaveka* (by the voice), and sometimes *Lüneek*; in Pavda, *Savka*; Bashk., *Shaitan-cash*.

*Harelda histrionica*, (L.) Is met with more seldom than the first species, but according to the Bashkires it builds in the district of Shadrinsk. Of course, *H. glacialis* also breeds in the Government of Orenburg, as was remarked by Eversmann (*op. cit.*, p. 545), which Bogdanoff doubts (*op. cit.*, p. 150). According to our observation, it breeds in the Government of Jaroslav (Danilov district); according to Nordmann it also nests in

Finland (*op. cit.*, p. 47); according to Eversmann, *H. histrionica* is also met with on the lakes of the eastern slope (*op. cit.*, p. 546). Probably nests in Finland, as it was seen there in the month of July (*op. cit.*, p. 47). According to Kaslinsky sportsmen, *H. stelleri*, Pall., is also met with during migration.

*Fuligula marila*, L. Has been seen only during migration, and then seldom. If it builds, then only in the northern parts of the Perm Government Seziak. According to Nordmann, it builds in the north of Lapland (*op. cit.*, p. 47). Falk found it in the Tsetsk Province, very likely during migration (*op. cit.*, p. 312).

*Fuligula cristata*, Raj. Builds throughout the Government of Perm, but on the steppe lakes only, during migration; in the north, and also in the south-western slope, it is very common. Russ., *Hohlushka golubaja chernet*; Bashk., *Karasa-urdeck*, and sometimes *Alasabar*; Zirián, (the same as the other tufted duck), *Sed-utka* (?)

*Fuligula ferina*, (L.) Is very common on the lakes, perhaps even more numerous than the *Anas boschas*. In the Ural it breeds but seldom; it also builds in small numbers north of Ekaterinburg. Russ., *Krasnogolovich*, sometimes *Sezon*.

*Fuligula nyroca*, Güld. According to sportsmen it is met with in the spring, and sometimes builds on the Kaslinsky lakes. It is also known in Tagila. This species has been remarked in the spring, in the Governments of Moscow and Jaroslav.

*Mergus castor*, L. Is met with and builds throughout the Government of Perm, except the lakes of the Black-earth plain. On the south-western slope of the Ural it is common. Russ., *Krohal*; Bashk., *Balaksia*.

*Mergus serrator*, L. It is also met with in the same districts as *M. castor*, but more seldom.

*Mergus albellus*, L. It is very common, and also nests on the lakes of the Black-earth plains. Russ., *Lutuck*; Bashk., *Keskai*; *Balaksia*, sometimes *Aumbach*. According to Nordmann, it builds in the northern Karelia and Lapland; according to Eversmann and Bogdanoff, it is common in the Governments of Kazan, Orenburg, Saratoff, and Simbirsk (see Bogdanoff, *op. cit.*, p. 152).

*Pelecanus crispus*, Bruch. The Pelican was killed a few years ago on the Itkul lake in the Kaslinsky Ural; in 1856 one was killed

near Ekaterinburg; in 1867 some were seen near Tagila; and in 1868, I think, near Ekaterinburg.

*Podiceps auritus*, Briss. Is very numerous on the lakes of the south-eastern slope. Russ., *Gagara*; Bashk., *Sepkai*.

*Podiceps cornutus*, Lath. More common, and sometimes builds in whole colonies. It is not distinguished from the preceding species. Hoffmann found it near Berezoff (*op. cit.*, p. 70).

*Podiceps cristatus*, L. Is very numerous, and breeds by hundreds, so that the nests are very near one to the other. Bashk., *Urlan*; Zirián, *Gerd-dura-gogara*.

*Podiceps subcristatus*, Tacq. Has not been remarked by me, but Middendorff followed its migration near Ekaterinburg (see Isepiptesen, p. 79). Probably it is also met with on the lakes of the Black-earth plain. According to Nordmann, it also builds in Finland (*op. cit.*, p. 49).

*Colymbus arcticus*, L. Is distributed all over the Government of Perm, but is especially numerous on the lakes. Russ., *Bolshaja, Setzevaja gagara*; Bashk., Mesch., *Kukey*.

*Colymbus septentrionalis*, L. Is more seldom met with, but it seems its distribution is about the same as that of the preceding species. Russ., *Bolshaja Setzevaja gagara*, sometimes *Krasnozobaja*. Bogdanoff doubts that both *Colymbi*, as Eversmann says, build in the Government of Kazan. However, they build in the Governments of Jaroslav, Vladimir and Twer (Bogdanoff, *op. cit.*, p. 158). They also build in Finland (Nordmann, *op. cit.*, p. 50).

*Lestris pomarinus*, Temm. (?) It is uncertain whether it is this or another species of Skua. According to sportsmen, sometimes nests on the lakes of the Kaslinsky Ural; and in the spring and autumn it is met with very often there. Russ., *Chernaja-klusha*.

*Larus minutus*, Pall. Contrary to Eversmann's opinion, it breeds on the lakes in great colonies, and it is more numerous than any other species of gull. Russ., *Maley-rebalow*; Bashk., Mesch., *Ak-sardack*.

*Larus ridibundus*, L. Is met with everywhere, and is also very common, especially on the lakes Charka. Zirián, *Lez-kalia*.

*Larus canus*, L. More seldom than the preceding species; builds in the bogs (marshes), also in colonies. Russ., *Klusha, Baklusha* (Teplouhoff); Bashk., Mesch., *Ak-bash, Ak-sardack* (meaning white, white-headed); Zirián, *Teydjid-kalia*.

*Larus cachinnans*, Pall. Is met with here and there on the lakes; a great number have been remarked on one of the islands of Irtiash. Russ., *Bolshaja-klusha*.

*Larus argentatus*, L. According to Bogdanoff, it is rather common on the Kama (*op. cit.*, p. 153), but I have not seen it once. *Lestris pomarinus* and *L. parasiticus*, according to Nordmann, build in the Gulf of Finland (*op. cit.*, p. 52); *Larus minutus* (see Eversmann, *op. cit.*, p. 574), according to Lilljeborg, is numerous near Novaya Ladoga (*op. cit.*, p. 110), but in Finland it was killed only once, near Uleaborg (Nordmann, p. 52). I have followed it as far as Pavda. Very strange that Bogdanoff has never met with the *Larus canus* (*op. cit.*, p. 153), as it is very common in Central Russia. *Larus cachinnans*, according to Eversmann, is met with on the large lakes of the Kirkiz steppes (*op. cit.*, p. 569). Bogdanoff traced it as far as Samarska Luka (*op. cit.*, p. 153). *Larus argentatus* migrates sometimes as far as the Government of Jaroslav, and according to Meshakoff (*op. cit.*, p. 635), even builds in the Government of Vologda.

*Sterna hirundo*, L. Is met with everywhere; has been also remarked in Pavda, but not common; it is on the lakes. Bashk., *Karabash-ak-sardak*; Zirián, *Voja-kalia*.

*Sterna nigra*, L. It does not go far to the north, and it is not met with higher than 57° N. lat. (on the eastern slope). On the lakes it is more numerous than the *Larus minutus*. Russ., *Cherney-rebalow* (black-fisherman).

*Sterna minuta*, L. Much more seldom than the preceding, and does not build on the lakes in colonies. Bashkire, *Koba-cash-ak-sardak*. *Sterna nigra* is very common in the Government of Moscow, and in parts of the Government of Jaroslav. According to Nordmann, it has been only once killed near Abo (*op. cit.*, p. 53). *Sterna minuta*, according to Nordmann, is distributed as far as the White Sea (*op. cit.*, p. 54). It is not certain whether *Sterna leucoptera* is met with on the Ural lakes of the eastern slope; it is common on the lakes of the plains in the Governments of Riazan and Tambow, and according to Bogdanoff (*op. cit.*, p. 156), it is met with rather seldom in the Kazan Government. Perhaps *Phalacrocorax carbo* is also met with on the lakes of the eastern slope.

NOTE.—Owing to the absence of the translator, Mr Craemers, in Russia, this paper may contain some errors in the local names.—ED.

JANUARY 29TH, 1878.

Mr Thomas Chapman, V.P., in the chair.

Captain John William Powlett-Orde, F.Z.S. ; Messrs. William Dick Cleland, and William M'Culloch, jun., were elected ordinary members.

The Secretary read a letter from Mr John A. Harvie-Brown, relating to the total wreck of the Union S.S. Co.'s steamer "European" on the Ushant rocks, off the coast of France, in which disaster the vessel foundered with her entire cargo, the passengers alone being saved. Among them was Mr A. J. Grant of New Zealand, who on more than one occasion had sent to the Society interesting papers on the birds of that country, and who had with him two papers intended to form part of the Proceedings of this session. Mr Harvie-Brown in his note gave an extract from a letter received from Mr Grant in reference to his loss, as follows:—"Suffice it to say that I have lost everything. Amongst my luggage are things of value I shall never be able to replace: a large box of most valuable books, rare copies, also some very valuable medical books, and a very large collection of beautiful photographs of the scenery of New Zealand, the Sandwich Islands, and Madeira. These things represent only a very small proportion of my loss. Among the things I much regret is a really fine collection of Madeira birds I had made. I had about 130 splendid skins for you, besides a fine collection of plants, etc. All my work for the last six months has gone for nothing. Besides all this, I had worked up a great many of my notes on the birds of New Zealand, and had prepared a number of them ready for printing. I had also numerous notes on the birds of Madeira. It is somewhat disheartening. All has gone! but I am thankful my life has been saved."

Several members expressed their regret at the loss of the valuable papers which Mr Grant intended to have sent to the Society, and the Secretary was instructed to convey an expression of sincere sympathy with him in the misfortune which had caused the destruction of so much valuable property, and by which he was deprived of the results of many years' labour.

It was resolved to enter in the minutes a notice of the death of Mr Charles Malloch, one of the life members of the Society, who, although only lately joining, had previously taken an interest

in the proceedings of the Society, by sending specimens for exhibition. During a recent tour in the United States, he had visited the mammoth caves of Kentucky, and had there obtained specimens of their blind fauna. These were shown by Mr Archibald Robertson, who read a paper descriptive of the caves and their various inhabitants. Mr Malloch was well known in Glasgow, having been prominently connected with several of the benevolent and charitable institutions of the city.

#### SPECIMENS EXHIBITED.

Mr James Coutts exhibited a number of fine specimens of copalite, a fossil resin from Zanzibar, in which were enclosed insects of various forms, along with bits of wood, leaves of plants, etc. Mr Coutts gave some information regarding the uses to which copalite is applied; and Mr D. C. Glen, F.G.S., also showed a number of examples from the same locality, taken from the collection of Mr James Albert Smith, C.E., one of which enclosed a small and perfect specimen of a scorpion. Mr John Young, F.G.S., made some remarks upon copalite, stating that it was first discovered in the London Clay divisions of the tertiary formation, at Highgate Hill, near London, and named from the locality, Highgate resin. It was afterwards found more abundantly in India. Zanzibar is a third locality for the mineral, where it is found by probing the ground with an iron rod. Mr Young stated that copalite was very closely allied to amber or succinite in its chemical composition and colour, both being resins which had been exuded from various kinds of trees in a semi-fluid condition, and it was while in this viscous state, that insects and impurities got entangled in it. It would be interesting to the members to know that amongst the oxygenated hydro-carbon minerals found in the earth's crust, Bathvillite, named from the Torbanehill cannel, near Bathgate, and even the coal of that locality, approached more closely to copalite and amber in their chemical composition than any other known mineral substance, although the colour and general appearance of the two were very dissimilar.

Dr Francis P. Flemyng, F.R.G.S., exhibited a very fine specimen of the Gar-fish or Sea-pike, *Esox belone*, which was taken off Dunoon, in the Firth of Clyde, on the 25th of last May. The head and bones were in good preservation. When alive it

measured 28 inches in length and 5 inches in girth. On the back and sides it resembled a very brilliant coloured mackerel, the belly being of a silvery white. The nose ran out to a fine point, measuring  $6\frac{1}{4}$  inches from the eyes to its needle-like extremity. He likewise showed a very perfect but small specimen of the Spider crab, *Naia squinado*, found by one of his sons amongst the rocks between Dunoon and Innellan, and the shell of a larger variety, which he had obtained from a fisherman, who had captured it in Lochlong. These were of local interest, especially the Gar-fish, which was one of the largest ever taken in the Clyde. Dr Flemyng also exhibited specimens of the Box-crab, *Griphia*; the Sponge-crab, *Dromia*; and the Hermit-crab, *Pagurus*, from Mauritius; and a very fine skull and tusks of the Babyrussa, *Sus babyrussa*, from Java; a skull and teeth of a hyaena, the tusks of a wild boar, the tooth and part of the skin of a hippopotamus, the head and horns of a small antelope, and a very fine stuffed specimen of the deadly puff-adder. These, together with a pipe made of assagai wood, and inlaid with lead, and a Kaffir snuff-box of native manufacture, were also from south-eastern Africa. In describing the various objects, Dr Flemyng gave interesting accounts of the incidents connected with the capture of each.

Mr Robert Hill, corresponding member, exhibited a series of finely preserved skins of birds, from Berbice, British Guiana. The collection embraced examples of the Horned owl, Crested eagle, Jay, Climbing bird, Humming bird, etc. With these Mr Hill showed a number of various objects of interest from the same country, Mr John Kirsop and Mr James Lumsden, F.Z.S., making some explanatory remarks on them.

Mr John Kirsop exhibited a fine specimen of a recent brain-coral, *Meandrina labyrinthica*, from Belize, British Honduras, which measured 18 inches in diameter by 9 inches in height. Mr John Young, F.G.S., spoke of the growth of such corals in the tropical seas in which they are found. Some species of corals grow more rapidly than others. According to Professor Dana, a specimen of *Meandrina labyrinthica* attained a size of 12 inches in diameter by 4 inches in height in the course of 20 years, while another species only attained a radius of 6 inches in 12 years. The estimated growth upwards of a living coral-reef is apparently very slow, being only one-sixteenth of an inch in the year, or 5 feet in 1000 years.

Mr D. C. Glen, F.G.S., exhibited a number of varieties of coloured sand, which were obtained by Mr James Albert Smith, C.E., during the progress of some engineering operations near Rutherglen, in the old raised sea-beach beds that fringe the shores of the Firth of Clyde at the height of 40 feet above the present sea-level. The sands, which were of varying colours, from yellowish-white to orange-brown and black, the latter yielding magnetic iron ore in small grains, had evidently been deposited while the sea stood at this former level, as is testified by the occurrence of marine shells in the deposit, such as the common whelk, *Littorina littorea* and *Turritella communis*. The beds have also yielded the hinder portions of the skull of a horse, and fragments of ancient pottery.

Mr Peter Cameron exhibited some new or little-known British Hymenoptera, which he described in detail. The collection contained specimens of *Nematus dubius*, Cam., a new species of the gall-making group, having close affinity with *N. pedunculi*, but readily distinguishable from it; *N. strongylogaster*, Cam., a very distinct form, not readily referable to any of the groups into which the genus has been split up; *N. crassiventris*, Cam.; *N. turgidus*, Zad.; *N. arcticus*, Thom.; *N. placidus*, Cam.; *Tenthredo lachlaniana*, etc.

PAPER READ.

*On the British Phytophagus Hymenoptera.* By Mr  
PETER CAMERON.

In this paper were enumerated all the British species of the Linnean genera of *Tenthredo*, *Sirex*, and *Cynips*. About 460 species were included in the list, this being more than the number recorded in previous catalogues, in which more than half the species are wrongly identified. As the number stands at present, it compares favourably with that recorded for Continental countries.

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FEBRUARY 26TH, 1878.

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

Messrs. Archibald Campbell and James Archibald Ferguson

were elected ordinary members, and Mr John Eaton Reid a life member, of the Society.

SPECIMENS EXHIBITED.

Mr John M. Campbell exhibited specimens of the Penguin, *Spheniscus demersus*, Linn., with its eggs, and the Crested Penguin, *Eudyptes cataractes* (Gmelin), from Patagonia. Mr Campbell gave some interesting notes on the history and habits of these aquatic fowls, as he had observed them in South America, in many parts of which they are found in immense numbers. During the breeding season they frequent the land, where they may be seen in large flocks, running with great rapidity in an erect position. They burrow like rabbits, and swim very quickly, their webbed feet, assisted by their fin-like short wings, enabling them to go through the water with great speed.

Mr Peter Cameron exhibited *Sirex melanocerus*, Thoms., a species not hitherto found in Britain. It was taken at Crewe, where it had probably been introduced in railway sleepers or pit timber. Also, *Taxonus fletcheri*, Cam., a new species discovered last year by Mr J. E. Fletcher of Worcester, near that place. It comes near to *Taxonus glabratis*, but is much smaller, and is readily recognised by having the collar white.

The Secretary exhibited a small collection of plants received from Canada, which contained a number of species widely prevalent there, but comparatively rare here. Amongst these were specimens of *Linnaea borealis*, from Quebec and Lake Superior, in which districts it seems to be generally diffused, while in this country it is chiefly found in the northern counties. This plant must always be regarded with interest, having been selected by the great naturalist to bear his name, and corresponding as it does in its humble and unpretentious growth with the character of the "Immortal Swede." *Aconitum Napellus*, although found generally in gardens here, is not considered naturalized. It is quite common in Canada everywhere, the woods and fields being brilliant with its handsome blue flowers. Although yielding a valuable medicine, the roots are a deadly poison, and are sometimes mistaken for those of a culinary plant, which they closely resemble, the partaking of them being often followed by fatal effects. *Polystichum Lonchitis*, a strictly northern fern, seems to be common also. *Potentilla tridentata*, of the British flora, stated to have been found

by Don, in Clova, though this has not been confirmed. *Oxalis corniculata* finds a place in the Clydesdale flora, the authority being Hopkirk, who gives Barncluith as its station, but it has not been found by any one else. There were other species in the collection which, although not so noteworthy as the foregoing, are by no means common here, such as *Melilotus officinalis*, *Sagittaria sagittifolia*, *Lonicera caprifolium*, *Cynoglossum officinale*, *Lycopodium annotinum*, etc. There were also a number of specimens belonging to orders which are unknown here, and others of genera corresponding to ours, but of species of which we have no representative, and which have no recognised place in our lists. Among these were fine specimens of *Adiantum pedatum*, belonging to a genus only found in warm or sub-tropical countries. *Adiantum Capillus-Veneris* is the only one out of 62 species that is found in Britain, and that only in the southern counties. Canada, which is in a lower latitude than the British islands, has a more rigid winter, but in summer the heat is almost tropical, and *Adiantum pedatum* is as common in the woods and fields as the grasses are with us.

## PAPERS READ.

I.—*On Chitonellus, recent and fossil.* By Mr JOHN YOUNG, F.G.S.

Mr Young stated that in the valuable collection of natural history objects recently presented by Dr Allen Thomson to the Hunterian Museum, he was much gratified to find a fine specimen of a recent *Chitonellus* preserved in spirits, which showed in a very satisfactory manner the arrangement of the eight plates which are inserted in the mantle of the animal. *Chitonellus* forms a sub-genus of the Chitonidae, a family of molluscs, in which the shell is composed of eight imbricating plates, inserted in an overlapping series in the coriaceous mantle by means of projecting processes on the plates termed apophyses. The plates in the various species of Chitons differ considerably in form, as well as in their external sculpturing, and these differences constitute the distinctions between the several sub-genera and species. Of the true Chitons more than two hundred and fifty living species are known, and they are found in all seas throughout the world, ranging from the rocks at low water to depths of from 10 to 25 fathoms; but, according to Professor E. Forbes, some of the British species are found at a depth of 100 fathoms. The family of the Chitonidae

is found in a fossil state so far back as the Silurian period, thirty-seven species being known. Until the discovery of the specimens now exhibited, which he (Mr Young) had found in the lower limestone shales at Craigen Glen, Campsie, no fossil specimens of the sub-genus *Chitonellus* had been recorded for Scotland. The recent living representatives of this sub-genus, of which ten species are known, are said to be found in the fissures of coral rock, and their present distribution is in the seas of the West Indies, Western Africa, the Philippines, Australia, the Pacific, and Panama. It is interesting, therefore, to find that they have lived so far back in time as in the Carboniferous seas of Scotland, and so far away from their present habitats; although it does appear to be somewhat strange that remains of true *Chitonelli* have not yet been detected in any strata of the several formations that intervene between the Carboniferous and the recent period. This organism seems never to have been abundant, and the conditions under which it lived, in most cases in the midst of coral reefs, may have been unfavourable to its after preservation. The beds in Craigen Glen in which these fossils are found are shales alternating with a bed of *Lithodendron junceum* and *L. fasciculatum*, corals which were the representatives of reef-building forms during the Carboniferous limestone period, and in the fissures of which the *Chitonellus* may have found a suitable habitat in this early stage of its existence. *Chitonellus* differs from the true Chitons in the much smaller size of the plates, and in the small portion of the plate exposed. This is well seen in Dr Thomson's specimen, which is about 3 inches in length and  $\frac{3}{4}$  of an inch in diameter. The animal is slug-like, and has the small plates inserted in the mantle at increasingly wider intervals as they extend from the anterior to the posterior end, where they are widest apart. The exposed portion of the plate is seen to be rather less than  $\frac{1}{4}$  of an inch in length, the inserted portion being narrow, and having the apophyses close together. In these characters the recent and fossil species agree very closely. For the sake of comparison, Mr Young had mounted the plates of another species, *Chitonellus striatus*. These were obtained from a dried and much-shrivelled specimen in the Hunterian Museum, and they likewise show how closely the recent and fossil species are related to one another. Two species of *Chitonellus* have been obtained from the shales of Craigen Glen, which still continues,

notwithstanding the close examination of other limestone shales, to be the only locality which has yielded these interesting remains. Mr J. W. Kirkby has identified and described the species, naming them *Chitonellus Youngianus* and *C. subquadratus* respectively (Geol. Mag., 1867). Of the latter, only one plate has been found, but it is perfect and in fine preservation. The exposed portion of the plate has been small, showing a heart-shaped ornament, which terminates in two prong-like ridges. Of *C. Youngianus*, four plates have been obtained; two are perfect and in fine preservation, the other two have parts of the inserted ends broken away. The exposed portion of the plates in this species is of an oval form, slightly raised, and surrounded by a narrow tuberculated border and radiating striae. Mr Kirkby, in the description referred to, says:—"There are other palaeozoic Chitons which have been referred to the genus *Chitonellus*, such as *C. Barrandeanus* (De Ryckholt), of the Carboniferous rocks of Belgium; *C. antiquus* (Howse), and *C. Hancockianus* (Kirkby), of the Permian strata of Durham; but I do not know of any that appear to so nearly approach the recent *Chitonelli* as the species under notice." In the second edition of Dr S. P. Woodward's "Manual of Recent and Fossil Shells," only the species found in the Carboniferous rocks of Scotland are admitted as being true *Chitonelli* by the editor. Plates of other species referred to the true Chitonidae have been found in the limestone shales of one or two localities in the West of Scotland, but are, however, very rare organisms. The species which have been noted are *Chiton gemmatus* (De Koninck), Gallowhill, Strathaven; *C. humilis* (Kirkby), Robroyston, Lanarkshire; *C. Burrowianus* (Kirkby), Orchard, Renfrewshire; and a few undetermined plates, probably of other species.

II.—Notes on the state of Vegetation in the Public Parks, and Observations regarding the Weather, etc., during last year (1877).

By Mr DUNCAN M'LELLAN, Superintendent of Parks.

The writer stated that, on reviewing the changeable character of the previous year, it would be at once perceived that it was a remarkable one in many respects. During the months of January and February there were only 9 dry days, as compared with 25 in the corresponding months of 1876. This was a very unsatisfactory beginning, and presented anything but a bright

aspect. The weather, however, underwent a favourable change during March, April, and May, so that vegetation looked brighter; but it required a strong reaction to make up the leeway of the previous month. June was dry and warm, hence plants and flowers made rapid growth; but all expectations were blighted in July and August, which were two of the wettest summer months that have been experienced for many years. During these months there were only 13 dry days, as compared with 38 in the same months of 1876. The blooms which had been formed during a favourable fortnight in June never had an opportunity of expanding, and owing to the absence of sunshine and the prevalence of damp weather, the majority of them wasted away. *Violas* were the only flowers which seemed to thrive with the wet, *geraniums*, *calceolarias*, etc., making no show whatever. In September there was a continuance of good harvest weather, but it came too late in the season. Not only in the flower garden, but in the fields, this was severely felt, the farmers having a late and a poor harvest, and in many cases the crops were not worth the trouble of gathering. The closing months were like too many of their predecessors, and the year ended as it had begun, there being only 10 dry days during November and December, against 30 in the corresponding period of 1876. The total rainfall for 1877 amounted to 48·03, against 37·31 in the previous year, showing the marked increase of nearly a foot of water. The mean temperature was much the same as in 1876, viz., 40·50, as against 40. The lowest point to which the thermometer fell was 13 degrees, on the 27th February; the highest point it reached was on the 14th and 16th of June, when it stood at 79 degrees in the shade. The number of dry days last year was 131, the number in the previous year was 195, showing a difference of 64 days. Snow fell on three days during January, on the 12th, 28th, and 29th, to the extent of fully four inches. During February it snowed only on one day, but the quantity that fell was equal to the whole fall in January. In March snow fell on three days, to the extent of fully five inches, but there was none in April, or in any of the succeeding months, until the 25th November, when there was a slight shower, and on 26th December there was a fall of fully two and a half inches. Upon the whole, the weather up to the close of the year was remarkably open and mild, the Christmas rose of last winter being a Christmas rose indeed.

The following plants were in flower in the parks during December:—*Bellis perennis*, with all its cultivated varieties; *Heleborus niger*, *H. purpurescens*, *Poa annua*, *Cheiranthus Cheiri*, *Primula vulgaris*, both single and double, in all its various colours, and *Sambucus racemosa*. The mildness of the close of the year is indicated by the fact that the common marygold, *Calendula officinalis* continued in flower to the latter end of December, when it was killed by frost between Christmas and New Year's day. Geraniums and fuschias remained in good foliage in the open air, in all the parks except the Green, until about 20th December. From the absence of sunshine during the spring months, flowering trees and shrubs were fully three weeks later than usual, and during summer the show of flowers was exceedingly meagre. The grasses, however, never lost their luxuriant verdure, and the foliage on the trees during summer was well maintained, and remained in good condition longer than usual; but the flowerbuds never became properly matured, and the present scarcity of them on the rhododendron may be attributed to the dampness of autumn and the want of sunshine. It is to be hoped, however, that the case of the rhododendrons may be an exception; and as last year was "long foul," we may expect, according to the Scotch proverb, that this year it may be "long fair."

*Copy of Meteorological Record kept at Queen's Park, Glasgow, for the last three years.*

MONTH.	1877.				1876.				1875.			
	Rain-fall.	THERMO-METER.		Dry Days	Rain-fall.	THERMO-METER.		Dry Days	Rain-fall.	THERMO-METER.		Dry Days
		Max.	Min.			Max.	Min.			Max.	Min.	
January, .....	9.39	41	31	4	3.35	42	31	15	5.60	44	35	9
February, .....	4.45	48	33	5	3.11	32	29	10	1.42	41	32	18
March, .....	2.33	45	30	12	5.00	35	29	13	1.75	46	35	23
April, .....	2.26	47	34	18	1.66	52	36	17	1.28	55	36	22
May, .....	1.57	54	37	22	.44	61	38	27	1.57	61	44	16
June, .....	2.86	68	47	14	2.35	66	45	17	2.54	62	45	13
July, .....	3.07	64	49	4	2.58	75	49	17	1.40	70	48	23
August, .....	6.20	63	48	9	2.68	69	48	21	2.62	67	51	12
September, ...	1.50	60	41	22	2.97	61	43	14	4.08	62	47	16
October, .....	4.71	54	39	11	5.52	55	44	16	6.19	51	41	12
November, ...	5.22	52	40	2	2.84	43	33	22	3.83	44	33	16
December, ...	4.47	44	33	8	4.81	42	34	6	3.37	42	29	18
	48.03	53	38	131	37.31	52	38	195	35.65	53	39	198

It will be observed from the above Record that the Rainfall for 1877 has been about  $\frac{1}{4}$  in excess of the two previous years, the dry days being  $\frac{1}{3}$  less, while the mean temperature is nearly equal.

MARCH 26TH, 1878.

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

Messrs. William D. Gordon and James Burns were elected ordinary members.

SPECIMENS EXHIBITED.

Mr James Coutts exhibited a number of specimens of sclerobasic corals of different species, land and marine shells, pods and seeds of leguminous plants, sponges, and other objects of interest from Victoria, Western Africa, which had been forwarded by Mr George Thomson, corresponding member. The Chairman, in making some remarks on the collection, pointed out the distinction between the sclerobasic corals and the sclerodermic or calcareous-reef-building group.

Mr James Lumsden, F.Z.S., exhibited two living specimens of *Proteus anguinus*, from the stalactite caverns at Adelsberg, near Trieste. These had been kindly forwarded by Mr G. A. Burns, who had also sent some interesting notes by the Rev. Canon Miles, containing observations on the habits of a specimen in his possession. He found that it remained quiet or asleep during the day, and only moved about during the night. Although supposed to be blind, the eyes being but imperfectly developed, it was very sensitive to light, and he thought that the great difficulty found in keeping them alive in confinement was owing to proper care not being taken to keep them in the dark and to prevent them from being disturbed during the day, which is their natural period of rest, together with the further difficulty of finding them proper food. The Chairman pointed out, from diagrams and preserved specimens of the salamander and newt, the place which this genus holds in the class Amphibia. He also explained its affinity to the Labyrinthodon of Triassic times, and to the Batrachia, and illustrated the transition of the tadpole of the frog into the perfect form by a series of models, which showed the tufted gills with great distinctness.

Professor Young exhibited an Otter, *Lutra vulgaris*, Erx., found in the Botanic Gardens on the 11th of this month. This animal, which proved to be a female, had been seen frequently in the river opposite the Gardens for about a week, and was observed in the water about two hours before it was found on the land dead.

It was in very poor condition, and had a rabbit trap on its right fore leg, which must have prevented it from procuring its proper food. A discussion took place as to the probable quarter from which this specimen had come, in which several members took part. Mr Lumsden read a letter he had received from Mr George E. Paterson, New Kilpatrick, stating that he had been making inquiry as to the occurrence of otters in the Kelvin, and expressing indebtedness to Mr Hendry, head keeper at Garscube, for much interesting information on the subject. Mr Hendry informed him that they were sometimes seen in the river at Killermont and Garscube, feeding no doubt on the trout, pike, and perch, which were still to be found there.

Mr Harvie-Brown stated that otters were very common in the Carron, and they had been found to come from a considerable distance overland, their footmarks having been traced in the snow for nearly five miles.

Other members thought that this animal might have come from the Endrick, where otters are often met with, and that some evidence as to the locality from which it had migrated might yet be forthcoming.

Dr Young stated that the specimen was a very fine one, the fur being in excellent condition, and that its body had been of considerable use to one of his colleagues, in clearing up some obscure points in the anatomy of the species.

Mr John M. Campbell mentioned, as showing that fish still frequented the Kelvin even in its lower reaches, that in the Aquarium at Kelvingrove they had three specimens of perch which were taken out of the river opposite the Museum.

Mr John Young, F.G.S., exhibited a number of specimens of Carboniferous shale enclosing various organisms from the calciferous or cement-stone series lying at the base of the Carboniferous system in Ayrshire, and which had been sent him by Mr E. Denholm Young, M.A., Green Lodge, Ayr, for examination. The strata from which they were obtained are found cropping out on the shore, between the heads of Ayr and the "Deil's Dyke," an intrusive mass of dolerite which cuts through the strata. Mr Young stated that the lower calciferous strata of the West of Scotland are usually singularly barren of fossils. They underlie the bedded traps of lower Carboniferous age forming the range of hills which extend from near the town of

Stirling to Ardrossan. Good sections of these rocks are to be seen in the several glens that traverse these hills in the Campsie, Strathblane, and Fintry districts, as well as in the valley of the Leven, and amongst the hills above Greenock, in the district around Loch Thom; but the only organisms yet found in any of these localities are a few plant remains, and fragmentary scales of fishes, both of which, however, are very rare. The tract of country from which the specimens under notice were obtained lies beyond the range of bedded traps referred to, and it is very probable that this fossiliferous group of the calciferous series is of newer age than that which underlies the trap of the hills. The shales are of a dark-grey colour, and are more or less arenaceous in their composition. They resemble very closely in this respect those found in the calciferous series of Fifeshire, which also contains similar groups of fossils. The following are the organisms which Mr Young had been able to identify—sphenoid bone of fish resembling that of *Ctenodus*, scales of a fish like those of *Rhizodus*, or *Strepsodus*, small tooth of fish, bivalve shells like those of *Anthracomya* or *Modiola*, impressions of the limb of a crustacean, entomostraca of various species with the valves often crushed. Amongst these he had found *Beyrichia subarcuata*, *Leperditia Scotoburdigalensis*, and a large species of *Cythere*. *Spirorbis carbonarius* is seen attached to the shells, and a layer of the shale is almost composed of the crushed shells of *Spirorbis helicteres*. In washing a portion of the shale containing this annelide he had noticed the interesting fact that in many of the specimens where the tube was filled with calcite, these tubes when broken across showed that they were often traversed by thin septa of a concave form like those seen in cephalopod shells, but not perforated with a siphuncle, as in these shells. These septa appear to occur in the tubes at irregular distances, one specimen showing two septa at about a line apart. This septate character had not, so far as he was aware, been noticed in connection with this annelide before, and he could find no specimens or descriptions of tubicolar annelides, recent or fossil, in which similar septa were found, although it was probable such did occur.\* *Spirorbis helicteres* is found abundantly in one of the musselband ironstones in the upper coal measures of Lanarkshire,

\* Since this date Mr Young has discovered concave septa in two specimens of recent *Serpula* in the Hunterian Museum.

but in these he had not been yet able to trace the septa. Probably this is owing to the different state of fossilisation of the organisms in the two deposits, those found in Ayrshire being preserved in a soft shale, in which the tubes are often found fractured in the line of the septa, as was seen in the specimens mounted for examination. Mr Young concluded his remarks by observing that the fossils were all apparently of a freshwater or estuarine character, and in this feature they agreed with what was already known of the cement-stone series of the West of Scotland. It was probable, however, that alternations of marine and freshwater strata might yet be found in this group on the Ayrshire coast, as is the case in the calciferous series of the East of Scotland. He also hoped that his friend Mr Denholm Young would be able more fully to explore this interesting group of strata, so that a fuller list of the fossils might be obtained.

Mr David Robertson, jun., exhibited a fine specimen of the Whitetailed Eagle, *Haliaëtus albicilla*, got in Skye in the beginning of January this year. He stated that he was indebted to Mr M'Culloch, Sauchiehall Street, for sending the specimen for exhibition. It was a young bird, probably in the second year. This species is not so rare as the golden eagle, its eyries being found in the Hebrides and other parts of the western coast of Scotland pretty frequently, but like all the large birds of prey it is getting scarcer every year. It is the largest of the British rapacious birds, measuring about three inches longer than the Golden Eagle.

Mr Robertson also exhibited albino varieties of several species of birds, including the Blackbird, *Turdus merula*, the Rook, *Corvus frugilegus*, the Bullfinch, *Pyrrhula europaea*, and a pair of white Sand-martins, *Hirundo riparia*, got at Hungryside on the Forth and Clyde Canal in August, 1876, by Mr Martin, residing there. White varieties of this species are rather uncommon. Macgillivray says he had heard of them, but had never seen them, and Mr Stevenson mentions a light cream-coloured variety got at Eaton in July, 1861, and another at Weasenhams in the following September. A discussion regarding albinism followed, in which the Chairman, Mr Harvie-Brown, and others, took part. Mr James Lumsden remarked that there seemed to be two kinds of albinism common to birds and animals, in illustration of which he exhibited two specimens of the common Hare,

*Lepus europaeus*. Both were partial albinos, the one having patches of white, the rest of the fur being of the normal colour. In the other the whole of the fur was of a uniform shade, giving the animal a bleached appearance. The Rook shown by Mr Robertson was peculiarly interesting from the fact that there was combined on it the two forms, some of the feathers being patched with white, while the others were of an abnormally light shade. Mr Lumsden expressed himself indebted to Mr Martin, Exchange Square, and Mr J. D. Dougall, Gordon Street, for forwarding these specimens for exhibition.

Mr John A. Harvie-Brown, F.Z.S., read to the meeting a circular regarding the "New Falconry Club," which he had been asked by Mr J. E. Harting to bring before the notice of Scottish Naturalists.

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APRIL 30TH, 1878.

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

Mr Ernest Gibson, Buenos Ayres, was elected a corresponding member, and Messrs. George A. Burns and Alan Cornwall Blackstone, M.A., ordinary members, of the Society.

The Chairman said that since last meeting had occurred the death of Mr Thomas S. Hutcheson, for many years an active and useful member of the Society; and he proposed that a notice of the event should be entered in the record, and a copy of that portion of the minute sent to the brother of the deceased. This proposal having met with the unanimous agreement of the meeting, the Secretary was instructed accordingly.

Mr Hutcheson became a member in 1858, and during his connection with the Society did much to promote its interests and further its usefulness. When in 1860 a library was established, it owed its origin mainly to the exertions of Mr Hutcheson, under whose charge it was at first placed, and he did much to develop it, devoting much time and attention to its management. Of late years he acted as Treasurer to the Society, and besides attending to the duties of that office, he was always ready to give assistance in any other department where his aid might be required. He took a lively and intelligent interest in all that related to his native town, Paisley, being well versed in its history

and literature. He specially directed his attention to everything pertaining to the life and writings of his celebrated townsman, Alexander Wilson, the poet and ornithologist; and he took an active part in promoting the monument to the memory of that distinguished naturalist which was recently inaugurated in Paisley, besides editing an edition of his poems and letters. From failing health, Mr Hutcheson was incapacitated from attending the meetings of the Society for the last two years, and his illness terminated fatally, at Govan, on the 2d of this month.

## PAPERS READ.

I.—*Notes on the Food of the Long-tailed Duck, Harelda glacialis.*

By Mr DAVID ROBERTSON, Jun.

The food of birds and fishes often affords much information regarding their habits, and many interesting specimens of natural history have been obtained from their stomachs. The well-known Banff naturalist, Mr Thomas Edwards, and many others, have procured the greater number of their rarest specimens from such sources. Water birds have many opportunities on their feeding grounds of picking up shells not procurable by any ordinary means,—the Long-tailed Duck more especially, as it feeds almost exclusively on shell-fish. We have an interesting example of the fact that these ducks are good collectors, in the shells which are now before us, which were taken from the crop of one shot in Skye. It is well known that the Long-tailed Duck is purely a sea-bird, gathering its food wholly beyond tide-mark, and never seen on shore except at the breeding time. It finds most of its food by diving to a depth of from 20 to 80 feet, and remains under the water for a considerable time, picking up the small shell-fish attached to the algae and stones on the sea-bottom. I have in my collection several small boxes containing shells taken from the crops of various ducks, and all carefully labelled. When my father was looking over the shells taken from the duck got in Skye, he found two which seemed new to him. He submitted them for examination to Dr Jeffreys, who identified them as belonging to a Mediterranean species, *Cyclope neritea*, not known to Britain. What makes the fact more interesting is, that owing to one being a young one, he was able to determine them as both belonging to the same species, although formerly considered as two distinct species. As the shells had not

undergone any trituration in the gizzard, it remains for us to suppose either that the duck, after picking up the shells in the Mediterranean, had flown direct to Skye, and was then immediately shot, or else that the shells must have been picked up by the bird near the spot where it was killed. The Long-tailed Duck has very rarely been met with in the Mediterranean, its principal habitat being the northern shores; and taking all the circumstances into account, I think we may allow this bird the undoubted credit of being the means of bringing to light the fact that this shell, hitherto known only as Mediterranean, belongs to the fauna of the British seas.

II.—*Notes and Observations on Injured or Diseased Crinoids, also some Short Notes on Fossils.* Communicated by Mr JOHN YOUNG, F.G.S.

[Second Paper.]

In a short article (read 25th April, 1876, Vol. III., p. 91), descriptions of a series of tumid or barrel-shaped crinoidea, essentially bearing on the various aspects presented during repair of injury and relative phenomena, were given. In prosecuting this subject further, many confirmations of the previous observations were seen, and a few varieties were noted which, perhaps, may be usefully recorded.

Of the specimens referred to, short descriptions follow :

1. A well-preserved specimen of half an inch long,—3 lines diameter at one end, and 4 lines at the other,—attracted notice, as it seemed to have been disturbed in its natural growth. There was, however, no thickening of the apparently involved ossicula, no enlargement of surface ornamentation, no staining of stem,—indications, which, when present, may be pronounced pathognomonic of injured and healing stems. On this account it was about to be thrown aside, when a small neat patch on the stem was observed. This patch was of one piece—not traversed by the separation lines of the individual ossicles, although bearing the same granular character of surface markings.

On examination it appeared to be a specimen of a completely healed-up scar of a broken off branch,—not by attempted reproduction, but by a simple filling up of the gap and its angles, presenting a small elevation on the stem.

2. The above observations brought to memory a little detached specimen, rounded on one side, and flat, bearing joint radiations,

on the other, a specimen that had been often looked at, without suggesting any satisfactory purpose in use. No doubt this is a detached patch similar to that above noticed. Little acquainted with the observations of others, or with the special literature regarding crinoids, one may possibly be dealing thus, innocently, with well known facts; but what is seen among thousands of fragments only once in fifty years, gives a kind of guarantee for claiming such facts to be new or rare.

3. A markedly tumid specimen, depressed and incurved on one side, seemed a good example of an injured or diseased stem, the depression being filled up with a sort of plug of mineral matter. There is no decided thickening of the tumid ossicles, nor any decided enlargement of surface ornamentation, but staining of the stem around and under the depression is distinct. The plug, doubtless, has nothing to do in the production of the observed tumidity.

4. This specimen distinctly, though slightly, tumid, with little depression on one side, is also a diseased production. The slight swelling seems to have been less gradual than common. Two ossicles curve rather abruptly outward, including three others somewhat raised and slightly thickened, but little rounded or bulged. The under part of one of the union scars of a now detached branch indicates that it had been connected to the living animal, and so far involved in the diseased and healing process,—the process of union of the branch bearing the marks of altered form, or of repair, if not of symmetrical restoration. It is evident that destruction and healing of parts existed partially under the branch when attached, which is exceptional. In this instance, the surface markings are enlarged near the injury, and the characteristic staining of the stem also exists, with notable restoration of ossicles and lines of separation.

These instances, with those formerly given, present all the features that the specimens collected and preserved afford of the varieties of the "tumid," "swelled out," or "barrel-shaped" crinoidea.

In the former paper the sockets, cup-shaped cavities, or variously formed fixed foot, or supporting base of the crinoidea, were incidentally alluded to. A few words now may be added. During long years of observation by the writer, these sockets, with various other adventitious structures, were always seen to

be numerous on broken stems, but bore little evidence to explain their nature to one ignorant of marine organisms other than fossil; and it may be said to be a comparatively recent revelation that determined positively these sockets of crinoids.

A. Is a type specimen of a socket of a crinoid, one may suppose, from its rarity. It is an inverted cone, in a mass of calcareous matter, wider than deep, with ratch-like work inside of the rim, smooth sides, expanding at the bottom somewhat. Suppose a pivot adapted to work in this socket attached to the bottom by a ligament, and the fixture and movements may be thoroughly comprehended. The pivot supposed above needed little farther illustration, but since the reading of the former paper, that, too, has absolutely been found.

B. In this confused-looking specimen, covered almost with the numerous basement portions of crinoids, there is one easily observed to be dislocated, the socket and pivot being appositely seen. Another shows the pivot, in situ, with ratch-work corresponding to the socket. The demonstration, therefore, may be pronounced satisfactory.

#### *Adventitious structures on crinoidal fragments.*

The stems of crinoids, in countless numbers, are often peopled strangely, constituting, in a sense, a little world for study. A few observations relating to these, restricted at present to *Stenopora Diastopora*, and *Archaeopora*, so plentifully found on the stems of crinoidea in limestone strata of the Carboniferous epoch, may be made, with the view of pointing out certain characteristic habits.

1. *Stenopora tumida*.—Observing for long years this coralloid, and carefully re-examining thirty specimens attached in clusters to varieties of marine exuviae, but commonly to one side of the larger and much worn or abraded stems of *Poteriocrinus crassus* (specimen A), facts were noted which merit record. Fifteen of that number present not only these clustered specimens, but specimens with clusters which extend more or less to both ends (specimen B). The clusters, in some instances, appear to spring from several centres, which coalesce (specimen C). The site of the clusters, their extent and behaviour, indicate that the crinoids had evidently been dead, and partially buried, before the little active colony took possession. Nine of thirty specimens occupy only one side of the crinoid. Three specimens are

clustered on *Actinocrinus*—which is rare—neither worn nor eroded, and otherwise specially marked. One has first accommodated a *Crania*, subsequently the clustered coralloid under consideration; another was first the resting-place of a *Crania*, then of the coralloid, and afterward of the basement portion or foot of a young crinoid (specimen D). What a throng of life! More remarkable still, the third is an example of a cluster of great rarity, and appears to have been constructed on a living crinoid! This specimen is most instructive; the stem had evidently continued to grow, while the spot occupied by the coral patch seems to have been arrested in growth (specimen E). This specimen, glanced at and put aside for examination during the past sixty years, is the only example noted as bearing evidence that the polypi engaged in the process of construction adopted a living encrinite as the field on which to labour. Two other specimens are notable, because rare. On short stems of *Poteriocrinus*, the cluster on each covers the entire joint-disc or end of ossiculi, passes over the edge on to the stem, encircling what may be supposed to have been the only exposed part, the other end having been fixed in the mud (specimen F). Hence it is certain that *Stenopora tumida* did encircle stems when placed favourably for the operation. How this coralloid clung so closely to old worn stems of *Poteriocrinus crassus* as a building station may be a question difficult to solve.

2. *Archaeopora nexilis*.—Of this polyzoon thirty specimens were likewise examined, all—with rare exceptions—attached to small and short well-preserved or unworn crinoid stems. Fifteen of that number encircle, but do not in any instance pass on or over, the ends of the stems (specimens A, B, C). Twelve are on *Poteriocrinus*, two on *Rhodocrinus*, and one on *Actinocrinus*. Fifteen others do not entirely complete the encircling process, nor do they pass over or on the ends of the stems; of which number eleven are on *Poteriocrinus*, three on *Actinocrinus*, and one on *Rhodocrinus*. The fabric of this species is thin, comparatively equal or smooth, not exceeding in thickness a calling card on an average, and in every instance that structure, when the crinoid on which it is constructed has been broken, or at severed joints, is found irregularly fractured. Encircling of the stems, and their freshness, implies that the crinoids had been erect during the operations of the special polypi; and it may be farther implied that the crinoids lived while the construction proceeded.

3. *Diastopora megastoma*.—Thirty specimens were examined. The fabricators of this structure follow those of *Archaeopora* in their style and manner of work, although less deftly finished, and likewise in selecting small stems, not worn or tarnished, on which to squat. They seem, too, to have constructed their characteristic fabric when the crinoid was in the erect position,—including in the web short broken branches, which are seen or indicated by irregularity of surface,—and also of encircling the crinoids without passing on or over the ends of the stems—hence, probably, when alive. The substance or mass of the organism is from two to six times thicker than the more delicate and ornate *Archaeopora*. Of the thirty specimens examined it has been found that twenty encircle the stems, thus: eleven on *Rhodocrinus*, seven on *Poteriocrinus*, and two on *Actinocrinus*. Nine, which do not encircle completely, consist of seven of *Poteriocrinus*, and two of a species of *Rhodocrinus*.

It would thus appear that *Stenopora tumida* had been constructed in clusters, almost exclusively on large and dead stems, and their form and limits suggest the idea that these stems must have been partially sunk in the mud. It is equally apparent that *Archaeopora* had been constructed on small, erect, perhaps living stems and branches, conditions which equally apply to *Diastopora*.

Now the primary object of this examination was a search for evidence of a repelling agency, or of a defensive or protective force exercised by crinoids infested by irritating parasites. One would naturally conclude in the case of the two last-mentioned species, that if any resistance had been made in any form to the progressive course of the aggressive action, it would have been found in connection with these encircling polyzoa. Nothing of the kind has been observed. But, where least expected, it has been found that a fragment of *Actinocrinus* has attached to it a fine specimen of *Stenopora tumida*, which, after construction, seems to have repressed or hindered the growth of the crinoid, so far as the cluster extended, while beyond the edges of that cluster the stem is enlarged, giving the specimen the appearance of being slightly sunk in the stem, or what amounts to the same thing, the stem is raised or bulged above the level of the invading body, and presents throughout a corresponding general enlarged and healthy condition. Such an operation is undoubtedly the result of life-action; but there is no evidence that this action was, in the

smallest degree, either protective or defensive in design or character.

That the fragments of crinoids were more suitable than other marine exuviae for parasitic constructions is unlikely; but they may, probably, have been more abundant in the oceans of the Carboniferous eras. These structures are apt to puzzle young palaeontologists, for long observation is often necessary to interpret what is oftenest seen. Nothing is more common, for example, than the basement portion of crinoids, but it may be long before connection of parts establish their nature.

The same thing may take place with regard to the basement or root portions of the polyzoa, often found on crinoids without stem or frond. A few specimens of this order may be described to exemplify the fact :

1. A fragment of encrinite, fully half an inch long and 2 lines diameter, has evidently an adventitious structure on one side, of calcareous matter, and irregularly rounded in form; thin, but with strong strengthening bands, on which appear fine striations and several raised small round apertures. The construction, in this instance, may be mistaken for the work of *Serpula*.

2. Another fragment, similar in most respects, but less perfectly marked.

3. A fragment of encrinite, with the tumid or diseased aspect, has on one end a very distinct structure, identical in character with the two previous specimens; but, in addition, the frond of a *Fenestella* is in connection, bearing strong evidence of having been based and supported on and by the structure. Thus a puzzle of long duration was solved. This specimen has the characteristic perforation on one side, with other characteristics common in injured crinoids; but somewhat strangely, the hole in the side is occupied with the root and part of the stem of another polyzoon. This is a most interesting and instructive specimen.

4. Is a small bit of encrinite, with a comparatively large tubercle of adventitious calcareous substance, which seems set in, rather than on, the fragment, it being contorted somewhat, and interrupted in development. This is seen distinctly in the lower ossicle, as well as in the depression of the stem. This structure must have been made during the life of the animal. The tubercle, although without characteristic striations, seems, in structure, to be the same as those described as roots of polyzoa. The genius

of life, put in play to form a basement for a polyzoon, had to depart from the well-established mode, in order to produce a projection beyond the surface line of a living encrinite. A little light is shed on the phenomenon by observing that on the upper side of the tubercle, and there only, a part of the stem exists, as seen in the other examples.

*Petalodus Hastingsiae*, Owen.

In forming a polished cross-section of the tooth of *Petalodus Hastingsiae*, characters were observed of much interest, tending to give edge and strength,—much in the manner of the blacksmith inserting a piece of steel between plies of iron in the axe to admit of a fine edge, which the iron incasement tends to prevent from petty fractures or destruction. This tooth, in section, is conical, half as broad at the base of the crown as the entire length. The whole crown is covered with enamel not thicker than the edge of a sheet of note paper, and apparently this delicate covering meets so as to form the cutting edge. But a mid-bar, apparently of enamel, forms the true cutting edge, which passes centrally between them for nearly half the length of the crown. About one-third of the length of the tooth from the cutting edge is white (bone-like, with the mid-bar distinct), the rest dark within the enamel. The white part has, on each side of the mid-bar, delicate lines passing between it and the outer enamel. The cutting edge is produced, technically, by a short channel or abrupt finish.

These remarks probably comprehend all the particulars of structure as seen in section, and inferences. But a few words more may be said in reference to M'Coy's description of this tooth (Brit. Pal. Fossils, page 635). He states that "the cutting edge alone being marked with a row of punctures (twelve in one line); when worn, however, a fine line extends from each of these punctures half way down the crown, producing a structure scarcely visible to the naked eye." Now this description, true to the facts observed by him, admits of explanation. Between the external enamel and the mid-bar described above, which forms the cutting edge, numerous partitions of bone, with equally numerous interspaces, are easily discerned on each side of the cutting edge, and these extend as far down the tooth as the mid-bar reaches. An interpreter is needed at this point. This fish sharpened its own teeth, and it was easier and more fit to grind a partitioned

structure than more solid bone. The "twelve punctures in one line" of M'Coy are not distinctive. Strictly, there are two lines of puncture-like spaces, one on each side of the cutting edge, amounting in specimens under examination to 12 per  $\frac{1}{10}$  inch, or 144 in each, in a tooth measuring fully an inch broad at the widest part of the crown, or laterally, and three-fourths of an inch long.

III.—*Notes on the effects of Smoke on Vegetation, with a list of Trees and Shrubs specially adapted for planting in the neighbourhood of large towns.* By MR DUNCAN M'LELLAN, Superintendent of Public Parks.

It is almost unnecessary to say that smoke is injurious to vegetation. In the neighbourhood of large towns and of chemical works, for instance, where great quantities of smoke are daily emitted, vegetation as a rule does not nearly come up to the usual standard of nature. The moisture which is so prevalent in our northern climate does not help to alleviate this evil, but only renders it worse, soot being much more liable to adhere to a wet surface than to a dry one. Evergreens are more susceptible to injury from this cause than deciduous trees and shrubs, which is to be accounted for by the fact that their pores are constantly exposed over the whole year to the sulphureous gases and smoke. Deciduous trees, on the other hand, have the advantage of throwing off their faded summer foliage, and of enjoying a rest of several months, so that during that period, the worst of the year for vegetation, they escape most of the injurious effects of smoke, little or no sap circulating through the bark. In spring, as we see at present, nature renews their suits of foliage, to be cast aside when they have served their purpose.

The varieties of deciduous trees and shrubs which are late of bursting into leaf are those best suited for planting in towns. The earlier sorts are liable to injury from the cutting east winds which are prevalent in spring, and the foliage then being tender cannot withstand the bad effects of smoke. The constitution of the plants is thus impaired year by year, and they very soon sicken off and die. Amongst evergreens the Coniferae or fir tribe are the first to suffer from smoke, owing to the resinous nature of their bark and spines, which retain almost every particle of soot that falls upon them. Portugal laurels, Laurestinas, and

all thin-leaved plants, very soon lose their foliage and die. The evergreen shrubs which stand best in towns are such as have thick smooth leaves, Hollies, Aucubas, and hybrid Rhododendrons, for example, which should be planted in a compost of, say, two parts peat, one part horse or cow manure, and one part turfy loam.

Sulphureous smoke and large quantities of soot are also very injurious to grass and cereal and green crops. In the central part of Glasgow, grass thrives very well during the summer and autumn months, but in winter and spring, owing to the large amount of soot and moisture then falling, it damps away and disappears to a greater or less extent. In such a case it is better to turn over the ground and re-sow it every year during the months of April or May.

In mining districts, where the calcining of ironstone goes on, the crops suffer very much from the sulphureous fumes which are emitted in the process. In several instances heavy damages have been paid to the farmers, and sometimes the ground itself has had to be taken over by the owners of the pits. The bad effects of the sulphureous smoke may to a certain extent be alleviated when the calcining takes place only in the winter time, as then vegetation being practically at rest, does not suffer to the same extent. In Lancashire, around Runcorn and Widnes, where there are very extensive chemical works, the effects of gaseous fumes may be seen for miles around upon all sorts of vegetation. In our own neighbourhood, near St. Rollox, though not to the same extent, many skeletons of trees and shrubs are to be seen standing naked and bare, though once clothed in all the beauty and luxuriance of summer pride. A few years ago, when Blochairn iron-works were in full blast, the calcining of the debris heaps was going on night and day. The sulphureous fumes from these heaps, along with dense quantities of smoke from the chimneys, scorched all vegetation in the neighbourhood within a radius of half a mile. Since these works stopped their operations three years ago, the young trees and shrubs planted at the Alexandra Park have made amazing progress, almost equal to those at the Queen's Park, thereby affording a striking proof of the effects of gaseous smoke.

The planting of trees and shrubs in the centre of, and around large manufacturing towns, should be done in the most careful

manner as regards soil and situation, and in selecting them it is much better to have varieties which will grow, however common they may be, than to plant such as will die off in the course of a year or two. In the following list of trees and shrubs which have been found to succeed pretty well in towns and smoky neighbourhoods, my aim has been to arrange the names in the order of the suitability of the plants for such purposes; those of each group which possess the greatest power of endurance being placed first, with the others following in relative order.

*Salix caprea*, goat willow; *S. rubra*, seaside or scarlet willow; *S. Russeliana*, Bedford willow; *S. alba*, white or Huntingdon willow; *S. Americana*, weeping willow.

*Populus nigra*, black poplar; *P. canescens*, gray poplar; *P. tremula*, aspen; *P. alba*, abele; *P. monilifera*, black Italian poplar.

*Crataegus oxyacantha*, common hawthorn, with its varieties; *C. punicea flore-pleno*, the double crimson; *C. multiplex*, the double white; and *C. aurea*, the yellow fruited hawthorn; *C. Crus-galli*, cockspur thorn; and others.

*Laburnum alpinum*, Scotch laburnum; *L. vulgare*, common laburnum.

*Robinia Pseudacacia*, locust tree or false acacia.

*Ulmus montana*, wych elm; *U. campestris*, English or common elm.

*Fraxinus excelsior*, common ash; *F. lentiscifolia*; *F. ornus*, flowering ash.

*Betula alba*, common birch.

*Prunus Padus*, bird cherry.

*Cerasus flore-pleno*, double flowered cherry.

*Pyrus Sorbus*, service tree; *P. Malus prunifolia*, Siberian crab; *P. spectabilis*, Chinese crab; *P. Aucuparia*, mountain ash.

*Amelanchier Botryapium*, snowy mespilus.

*Euonymus Europaeus*, spindle tree; *E. angustifolius*, *E. latifolius*.

*Caragana arborescens*, pea tree.

*Alnus glutinosa*, common alder; *A. g. lutinora asplenifolia*, fern-leaved alder; *A. americana*, American alder.

*Rhus typhina*, stag's-horn sumach; *R. Cotinus*, Venetian sumach or wig tree.

*Quercus Cerris*, Turkey oak; *Q. coccinea*, scarlet oak.

*Salisburia adiantifolia*, Ginkgo or maiden-hair tree.

*Sambucus nigra*, common alder; *S. racemosa*, scarlet alder.

This tree will grow and flourish where most shrubs would perish. It may be kept in good order by frequent pruning.

*Syringa vulgaris*, common lilac; *S. persica*, Persian lilac.

*Ribes sanguineum*, flowering currant; *R. aureum*.

*Symphoricarpos racemosus*, snowberry.

*Artemisia Abrotanum*, southernwood.

*Cornus sanguinea*, common dogwood.

*Hippophaë rhamnoides*, sea buckthorn.

*Berberis vulgaris*, common berberry.

*Viburnum Opulus sterile*, guelder rose; *V. Lantana*, wayfaring-tree.

*Philadelphus coronarius*, mock orange.

*Weigela rosea*.

*Genista (Cytisus) alba*, white or Portuguese broom; *G. tinctoria flore-pleno*, dyer's broom.

*Daphne Mezereum*, mezereon.

*Spiraea callosa*; *S. Douglasii*; *S. trilobata*; *S. Lindleyana* and others.

*Forsythia viridissima*.

*Leycesteria formosa*.

*Kerria japonica*.

*Yucca recurva*.

*Potentilla fruticosa*.

*Ligustrum vulgare*, common privet.

*Hypericum Androsaemum*, St. John's Wort; *H. calycinum*, Aaron's beard.

*Jasminum officinale*, white Jasmine; *J. nudiflorum*.

*Buddlea globosa*.

*Ampelopsis hederacea*, Virginian creeper.

*Aucuba japonica* and its varieties. By far the best evergreen shrub for planting in towns.

*Rhododendron Cunninghami*, Empress Eugénie; *R. Catawbiense* and its varieties; *R. ferrugineum*; *R. hirsutum*.

*Ilex Aquifolium Hodginsii*, Hodgins' holly; *I. Aquifolium crassifolia*, leather-leaved holly; *I. Aquifolium balearica (Maderiensis)*; *I. Aquifolium laurifolia*.

*Hedera Helix*, common ivy; *H. Algeriensis*; *H. Roegneriana-syn colchica*; *H. canariensis*. The tree ivies do well.

*Cerasus Laurocerasus colchica*, Colchican cherry-laurel.

*Ligustrum vulgare sempervirens*, evergreen privet.

*Cotoneaster Simonsii*; *C. microphylla*.

*Vinca major*, periwinkle of sorts.

*Berberis Jamiesoni*; *B. Darwinii*; *B. dulcis*; *B. empetrifolia*;

*B. (Mahonia) aquifolium*.

*Pernettya mucronata*.

*Erica carnea*; *E. multiflora*.

*Gaultheria Shallon*.

IV. — *On the Nutria (Myoptomus coypus), a South American species of Rodent.* By MR ERNEST GIBSON, Buenos Ayres, Corresponding Member.

This Brobdignagian water rat—for such it much resembles—is of so very shy and retiring a disposition, that any observations offered on its habits can only be the result of lengthened study. It is true that wherever there are swamps or water courses it abounds; but, sheltered by high reeds and rushes, and gifted with an acute sense of sight, hearing, and scent, in addition to its natatory powers, an occasional glimpse of one is all that can be had, and that only occasionally. Fortunately, in the locality from which I write, the “cañadas” (swamps) form in some places a regular network of fen, the home of an innumerable number of water-fowl, from *Cygnus nigricollis* down to *Regulus omnicolor*, and from having passed many a pleasant hour in my canoe ensconced amongst the reeds, I have naturally had frequent opportunities of watching the Nutria also. But while referring to swamps and water courses as its general habitat, the apparent anomaly of its often being found among the sand-dunes of the coast—sometimes half a league from fresh water—deserves also to be noted, as exemplifying its powers of sustaining life under a total absence of water, and confined entirely to pampas and esparto grass for sustenance—certainly not a very succulent diet. That to a considerable extent it can put up with brackish water is shown by its being also found in a certain district where not only the water courses are salt, being indeed creeks of the sea, but the soil and herbage also. However, as the true fresh-water swamps are its favourite and natural abode, I had best treat of it there, and detail its history at length.

Born one of a family of four or five, on some deserted water-fowl's nest among the reeds, in the spring months (September and October), it passes the first few days of its existence pretty

tranquilly, only scuttling into the water when alarmed, where it submerges itself completely, the tip of the black nose being alone visible. Grown older, it accompanies the mother on all its excursions, swimming alongside of her, and being suckled in the water, for which the arrangement of the teats is admirably adapted, namely, along the side, indeed, almost on the back. Finally, when arrived at days of discretion, in about three months, it enters the Nutria world on its own account, pulling up the "hunco" stalks, chewing the blanched ends, and forming them into small piles or nests; stealing out of the swamps at night along regularly beaten tracks, to feed on the grass or other plants on the dry ground, and facing all the dangers of droughts, dogs, and skin-hunting native boys.

As the droughts draw on, the Nutrias travel gradually away from here, following the larger water courses to their mergence into the more permanent swamps and lagunas; but frequently a large number will remain isolated in some particular swamp, their runs through it in every direction being strictly defined, and showing always a few more inches of water than in the surrounding fen. Then, and when they are driven to lurk among the reeds and rushes (for most of these "cañadas" never contain more than five feet of water, and are dry, or nearly so, every summer), they are easily found, and are killed in great numbers. In the first case, the hunter looks for a slight bulging-up of the "camalote," a thick floating duckweed or vegetable scum, clears it gently away with the end of his stick, and gives the cause—Don Nutria's head—a smart tap, which is always sufficient to kill him. When there is no water at all, dogs are used to find and bring them to bay, when club law is again the rule. On one occasion, while beating up a favourite ornithological haunt, a swamp some four or five acres in extent, I found two piles of their carcasses (skinned), amounting to at least three hundred in number. The skins sell in the native stores for about 4s. per dozen, but at the time when beaver skins were much in request for hats, they were worth far more. Native peons could hardly be got during the summer months,—they were all Nutria hunting. One "pulpero" told me that he dated his rise in life from the summer following the great flood of 1857, when he made about £300 clear profit from his purchases of Nutria skins. They are quoted pretty regularly in the produce market, generally following the sales of

ostrich feathers. Though rather tender till dried, they strip off very quickly and easily; their colour is a dark blue-black.

To the fragile formation of the cranium I have already alluded—a mere tap being sufficient to fracture it. But the muscles of the jaws resemble those of the Biscacho (*Lutra trichodactylus*) in respect of power, while the teeth are even sharper. At bay, the Nutria adopts the same posture as the Kangeroo, upright, and with the forepaws dangling on the breast, while it faces round and snaps on all sides. If it gets a fair bite at its antagonist, it generally manages to take the piece out, and many a plucky young terrier comes to an untimely end by closing with one as it would do with other “vermin.” It possesses the senses of scent and hearing to an acute degree, examining everything by scent rather than sight, and attentive to the slightest strange sound. The cry of the adult resembles a child’s wailing, but when young it possesses great variety and power of expression.

Its food, as I have already mentioned, consists of the blanched ends of certain water-plants, and various field-grasses, which latter it leaves the swamps at night to obtain. I have also seen lucerne used as a bait to entice them to prove the retentive power of fox-traps, and so keen was their appreciation of the one and disregard of the other, that half-a-dozen would be found in the morning, all trapped within a few feet of each other. I have heard, on good authority, that Nutrias had multiplied so much after the flood of 1845, as greatly to injure certain low-lying lands, digging up even the very roots of the grasses. It remains to be seen whether last year’s flood—1877—will increase them greatly, but as yet the bulk of the fens are too full to enable one to judge.

On certain *arroyos* that have a pretension to banks, and occasionally among the sandhills of the coast, I have found them in burrows, but these are never of any great depth, and are apparently exceptional cases.

When taken young, the Nutria forms, without exception, the tamest, most amusing, harmless, and cleanly pet I have ever seen, and accordingly I cannot do better than conclude these remarks with some notes upon the one or two I have had in my own possession. The first one brought me was so young that I had to feed it on milk alone, using for that purpose an oological blow-pipe, and on the second day it was intelligent enough to grasp

the tube with one of its rat-like forepaws and satisfy itself. It was then barely the size of a rat, but grew rapidly during the ensuing four or five months,—the time I retained it. Biscuit, soaked in milk, was its next food, after which it shortly took to lucerne, “malva” (mallow), cabbage leaves, etc., etc. While feeding it sat upright, supported by the long heavy tail, and held the food in its forepaws. A stalk of lucerne was stripped of its leaflets in an incredibly short time, and thrown aside; but with any large leaf, or with a piece of biscuit or knot of sugar (a favourite delicacy) it had to raise the object above its nose—preparatory to each bite—in order to ascertain where was the next convenient corner for that purpose; each time the delicate little forehands would twirl the morsel round and round, until a satisfactory angle was found, when “Cobbie” (as I called him) would give a contented grunt and guide it to his mouth. After feeding, it had a most comical habit of complacently stroking its stomach and combing out its whiskers. Thinking I would give it a bath, I dropped it into a tub of water, to its intense horror and dismay at first, but after a few days there was no keeping it from the water. After washing itself, it combed out all its fur, and wound up by seizing its long tail and smoothing that down also. Never at rest, its mishaps were without number; it was always falling off some elevation. If seated in my easy chair, it was not satisfied till it had scrambled on to my shoulder, and only waived its right to sit on the top of my head after various vain attempts to maintain its equilibrium there. When writing, it would cry and whimper till it was placed on the table, putting its nose into the ink-bottle, and tasting everything, coughing, and rubbing mouth and nose energetically when it had picked up the end of a cigarette or inspected a hot lamp glass too closely. If alarmed by the approach of a stranger, it vanished into some hiding-place, only to return when I called it. At the sight of a dog there was no attempt at flight, but the back was drawn up like that of a cat, the fur erected, and the tail stretched rigidly out, with the tip almost touching the ground, while it gave utterance to a low moan, peculiar to such occasions. If its antagonist then showed any hostile demonstrations, it at once sat up and faced it. There was nothing it disliked so much as to have liberties taken with its caudal appendage, and a sudden nip there would make it jump its own height and assume a warlike

attitude. But on no occasion, though often much provoked, did it ever endeavour to bite me, nor show any active hostilities to strangers. "Cobbie" was the name it answered to, giving a little grunt of acknowledgment each time I called it, just as in a similar case a dog wags its tail. If I walked up and down my room, it followed my boots, getting always in their way when I turned, and being awfully put out if I quietly stepped on to a chair and it could not find them. When neglected, it passed through three stages of resentment; first endeavouring to ascertain my whereabouts by a loud guttural call, then whimpering plaintively, and finally losing its temper and dashing frantically about, giving vent to violent screams, with a droll nasal intonation, like an enraged Yankee baby. After a heavy fall it would gather itself slowly together, indulge in a moment's reflection, and then utter a long and most portentous groan. But indeed I have never yet met with any quadruped whose power of expressing its emotions so closely resembled that of a human being, articulation excepted.

In conclusion, I may mention that about the years 1845, 1846, and 1847, the Nutria was the indirect cause of great loss to the stock-breeders, in this district at least. Peons could not be got to attend to the cattle as long as they could find Nutrias, and the former consequently turned wild and unmanageable, which "meant ruination," as the owner of 10,000 head emphatically said to me. Then all these men kept packs of eight and ten dogs, which, when the Nutria hunting was prohibited by Rosas (the governor), or their owners taken for army service by that tyrant, were driven away, strayed, and caused the wild-dog plague. Sheep and young calves were killed by thousands, and only vigorous persecution gradually reduced the evil. It is many years since this establishment dropped paying head-money for the dogs, but the account then registered over 2,200. We have a few still existing, but they only kill a few sheep, comparatively speaking, perhaps fifty per annum.

V.—*On the Capercaillie in Scotland (Tetrao urogallus, L.), with special reference to damage done to Pine forests.* By Mr JOHN A. HARVIE-BROWN, F.Z.S., M.B.O.U.

The writer stated that the present paper was preliminary to an extended one, for which he was collecting information, which

would extend to a considerable length, and would take some time for its preparation. His object at present was more to solicit than to impart information; and he invited the co-operation of all who took an interest in the subject, and would be obliged by their sending him the results of their observations on any examples of this bird that might come under their notice during the summer and autumn months.

He treated the subject under several heads.

(First). Whether the Capercaillie does damage to trees, by picking out the leading buds, thus dwarfing the tree and rendering it unfit for timber?

(Second). Whether the importation of impure seed may not cause an inferior growth of less healthy wood, not so able to stand the rigour of late frosts as the native and undegenerate Scotch fir which is still to be found in some parts of the country?

(Third). Whether the damage to pines may not be attributed to the ravages of insects, especially beetles, which attack the cores of the buds and young shoots, piping the latter, and causing the former to drop off, with the result of stunting the growth of the trees and making them bushy and twisted, while some species bore into the wood and bark, many of them besides feeding upon the leaves?

(Fourth). Whether it is not a fact that the Capercaillie feeds largely upon insects, and that young birds especially destroy large numbers of the larvae of Tenthredinidae and other insects which live upon or are destructive to pines?

Mr Harvie-Brown dwelt upon these points at some length, and concluded with directions to gentlemen willing to co-operate with him in endeavouring to solve these and other minor questions. He gave the names of several naturalists who are taking an interest in the subject, and who would be willing to impart further information to any inquiries.

VI.—*On the occurrence of the Blackcap Warbler (Sylvia atricapilla) in Scotland during winter.* By Mr ROBERT GRAY, F.R.S.E., Honorary Member.

In 1862 Mr Osborne recorded in the Proceedings of the Royal Physical Society of Edinburgh, that he had shot two specimens of this warbler in Caithness; one in the beginning of October, the

other at the close of the same month. The announcement gave rise at the time to an expression of considerable doubt on the part of one of the London critics who, indeed, did not hesitate to say that Mr Osborne had made a mistake. Not long afterwards, however, other specimens having been met with even later in the season and in the same county, his suspicions were allayed by the production of the birds themselves, and the fact was thereafter made known through one of the London Magazines, that Blackcap warblers could not only survive the rigours of our Scottish climate in Caithness, but that they could keep themselves in good condition by feeding entirely upon fruits. Here, then, were two novelties proved; first, that a bird previously regarded as a strictly migratory species was found located during the winter months in the extreme north of the Scottish mainland; and second, that it subsisted at that season upon fruits after its usual insect food had failed. In this country we have been so long accustomed to regard all our warblers as summer migrants, whose movements were regulated by the scarcity or abundance of insect life, that we must look upon this discovery of Mr Osborne as a point of some interest. Since his observations were published I have taken every favourable opportunity of watching the habits of what may now with propriety be called our fruit-eating warblers (for there are others beside the Blackcap), and I find that towards the close of autumn, as insects become scarce, or perhaps indeed through preference, these birds betake themselves to the glens and gullies of many of our mountains and hills of moderate elevation, where they flit silently from tree to tree, and greedily devour quantities of the berries of the mountain ash, and other fruits which are then hanging in luxuriant clusters in sheltered places. Later in the season, as these haunts are more exposed to the earlier winter blasts, the birds come nearer towns and villages, and are then seen frequenting gardens and orchards picking up what they can find, especially in those places where the smaller fruits and berries have not been carefully gathered.

The specimen which I now exhibit was observed by one of the boys at Merchiston School, near Edinburgh, on the 5th January, and brought down by a stone from a catapult, in the use of which these boys are certainly proficient, however much they may be behind in other attainments.

I have no doubt that in many parts of Scotland the Blackcap

will be found to remain throughout the year, if carefully looked for. I do not say that the warblers which are reared in any one locality remain there permanently; but if they really leave in September, as they are said to do, their places are taken by others whose flight has extended perhaps beyond Scotland altogether, and whose return journey has been cut short by the temptations of what we now know to be their winter diet.

VII.—*On Spiders, with some additions to the Scottish lists.*

By Mr HENRY C. YOUNG.

Having recently captured several species of spiders which are not noted in any published Scottish list, I have brought them forward this evening in order that they may be recorded, as I find it will be some time yet before the list which I am preparing of the spiders of Clydesdale for publication by this Society is ready.

*Argyroneta aquatica*, Clerck. This species, the well-known "Water spider," has not, I believe, been previously recorded for Scotland, although it was known to occur. Its peculiar habit of constructing its habitation beneath the surface of the water makes it conspicuous among all the members of the class, for although there are several spiders which, when in pursuit of prey, have no hesitation in descending beneath the surface, there are none which habitually remain there. The specimen before us was obtained from Possil Marsh, and I have not succeeded in finding it in any other locality here. It occurs in England as far north as Durham, and is found in nearly every country on the Continent of Europe.

*Linyphia frenata*, Reuss-Wider. I have several examples of this species from the neighbourhood of Glasgow. By Blackwall it was considered rare in England; and Dr Thorell notes it as rare in Russia and Sweden. Menge, however, says it is common in the vicinity of Danzig.

*Linyphia montana*, Clerck. This spider is more common than the preceding spider, and is generally distributed in Europe. The specimens before us are from Dunoon and Rannoch.

*Linyphia nebulosa*, Sundevall. I have obtained a number of specimens of this species from a building in Glasgow. It is very rare in England; and is not a common species on the Continent; having been met with sparingly in Germany. I have examined 30 or 40

specimens, and find considerable diversity in the colour, but after a little practice there is no difficulty in their identification. The web is of considerable size, and consists of an irregular network of fine lines, usually horizontal. Not uncommonly it is placed close beside the snare of the house spider (*Tegenaria Derhamii*, Scop.), and each insect seems to respect the prey which falls on the other's web, but I have noticed on more than one occasion that when *Linyphia nebulosa* trespassed on the web of its larger neighbour, it was promptly seized and devoured.

The other spiders I exhibit, although not new to Scotland, are yet of interest.

*Chiracanthium carnifex*, C. Koch, I found in abundance on Craigmaddie Moor last autumn. The cocoons were of considerable size, and being of white silk, and fastened to the tops of the ling heather (*Calluna vulgaris*), they could be seen from a considerable distance; and at one place the moor was dotted all over with them, looking not unlike the heads of the cotton grass (*Eriophorum*). I had previously noticed the same appearance in Glen Rosa, Arran; but then it was the cocoons of *Epeira cornuta*, Clerck, which were attached to the rushes. In Arran I also got a specimen of *Chiracanthium nutrix*, West., and found a few females of *Drassus lapidicolens*, Walek., by the side of the road from Brodick to Lamlash: these latter were under stones beside their large lenticular egg-bags.

Under the name of *Philodromus lineatipes*, Cam., a new species was described in the "Annals and Magazine of Natural History" for February last. This description was made from an immature specimen in the possession of Mr Cambridge; but, in a small collection of spiders made for me in Perthshire by Mr J. J. King, I found several adult females of this species; and it will consequently require to be figured and described anew from the adult specimen.

VIII.—*On the larvae of the Tenthredinidae, with special reference to Protective Resemblance.* By Mr P. CAMERON.

In this paper the author discussed the question of the colours of Caterpillars, with special reference to protective resemblance. Protective resemblance, he pointed out, was of three kinds. In one case the larvae were protected by the resemblance of their

bodies to the food plants, so that in this way they were not easily noticed, while it was found that larvae of this class were readily eaten by birds and other animals. On the other hand, larvae which possessed noxious properties were so coloured and marked as to be readily seen; and these, too, fed openly. A third class again escaped destruction by their curious and grotesque shapes, although otherwise they were harmless. Proceeding to apply this theory (which had been only hitherto done to the caterpillars of lepidoptera) to the larvae of sawflies, Mr Cameron said that the flat larvae which fed on the upper side of the leaf were green, but as they ate only the upper epidermis, the leaf in this way became quite white, which rendered them visible, while they gave out either a foul smell, or were covered with a resinous exudation. The flat larvae which fed on the lower side of the leaf ate the leaf through and through, and possessed no bad qualities. Again, with the margin feeders innocuous larvae were green, and if they had any markings these took the form of white or pink continuous lateral or dorsal lines, which, no doubt, represented shadow lines. They also in feeding followed the outline of the leaf or the portion eaten out with their bodies which were closely pressed to the edge. Noxious larvae, on the other hand, were marked with contrasting colours and marked with various irregular markings or lines, while they fed with the after part of the body extended in the air. Alluding to the habit these larvae have of keeping their bodies in a state of agitation, Mr Cameron suggested that this was for the purpose of keeping away ichneumons, a view confirmed by his having seen an ichneumon driven away by the larvae of *Croesus septentrionalis*, by actively whipping their bodies. Various individual cases of protective resemblance were mentioned in the paper, and allusion was made to some of the active and passive means of defence possessed by different larvae.

X.—*On two new species of Carboniferous Polyzoa.* By Professor JOHN YOUNG, M.D., and Mr JOHN YOUNG, F.G.S.

[ Read October 30th, 1877. ]

In a former Part of the Transactions of this Society, Vol. II., p. 325, we described seven species of what we considered to be new forms of *Glauconome*, from the Carboniferous limestone

strata of Western Scotland, leaving at that time two other forms for further determination. One of these was a stout form of *Glaucanome*, closely allied to the species which we have named *G. retroflexa*, but differing from it in the number of cell pores between a given number of branchlets, and in one or two other points of external structure. The other form, from the fragments then found, we also believed to be a species of *Glaucanome*, allied by its double cell pores to our subgenus *Diplopora*. Of both species better preserved specimens have since turned up, and of the latter a small frond has been found which shows that it was fenestrated in its upper portion, and agreeing in general characters with the Carboniferous forms of *Synocladia*, in which genus we now provisionally leave it; not being, however, quite satisfied that the characters of the Carboniferous and Permian *Synocladia* are exactly the same.

GLAUCANOME ROBUSTA, *n. sp.*

Polyzoary erect, slightly flexuous, bipinnately branching at irregular intervals. Branchlets opposite, or slightly sub-alternate, bent towards obverse face, seven in one quarter inch. Cells oval, alternate, about their own length apart, sixteen in one quarter inch, bounded on main branches and branchlets by a prominent, rounded, tuberculated keel, which gives to the cells a buried appearance. Tubercles on keel large, irregularly placed, seven to eight in one quarter inch. Obverse face finely striato-granulate, ornamentated with numerous irregularly scattered small tubercles.

Of the several species of *Glaucanome* found in the Carboniferous limestone strata of the West of Scotland, this form is the most robust in its manner of growth. In size it corresponds with *G. grandis*, M'Coy, but is easily distinguished from that species by the smaller number of cells between the branchlets, and by its strongly tuberculated keel. From *G. retroflexa* it is distinguished by its stouter branches, the wider position of the tubercles on the keel, and the more numerous cells in proportion to the branchlets.

*Localities:* Lower limestone shales of the Beith and Dalry districts in Ayrshire, in fragments of fronds from one to three inches in length. Brockley, near Lesmahagow, in fragments in the lower limestone shale. Upper limestone series, Gillfoot,

Carluke, fragments in the shale. Rather a rare species in most of the localities.

SYNOCLADIA (?) SCOTICA, *n. sp.*

Polyzoary erect, consisting of a main stem with rounded raised keel, slightly tuberculated, and with secondary branchlets that in the upper portion of the frond unite and become fenestrated. Branchlets sub-alternate, five in one quarter inch on lower portion of frond. On upper portion, where the branchlets unite, they form irregularly shaped fenestrules. Cells on the main stem and branchlets slightly oval, more than their own diameter apart, with the margins slightly raised; one cell at the base of each branchlet, and three between; twenty in one quarter inch. Secondary cell pores small, about one fourth the diameter of main cells; one, very rarely two, above and in line with each main cell, and about its own diameter apart, the margins slightly raised; there are also a few scattered small pores on the obverse face. Both faces striated longitudinally.

This species was first known to us from fragments found by Dr Rankin in the Gillfoot limestone shale, Carluke. At that time, as already stated, the fenestrated character of the frond was not known, and we were inclined to place it with *Glauconome* in our sub-genus *Diplopora*, but since that time we have found a small frond amongst some shale sent us by Mr John Smith, Eglinton Iron Works, Kilwinning, from the Garple Burn, Muirkirk, which shows that while the polyzoary commences with a central stem and secondary branchlets, as in *Glauconome*, yet towards the upper portion of the frond these unite and form a fenestrated frond like that seen in *Synocladia carbonaria*, Etheridge, jun. Our species differs from it, however, in the regular number of cells between the branchlets on the main stems, in its distinctly striated celluliferous and reverse faces, and in having the small secondary cell pores more in line with the main cells. In *S. carbonaria* these small cell pores are seldom in line with the main cells, being sometimes below or above, sometimes on the keel or dissepiments, or irregularly scattered about.

*Localities:* Upper limestone shales, Gillfoot, Carluke; Garple Burn, Muirkirk; in both localities it is very rare.

## EXPLANATION OF PLATE II.

(*Figures drawn with Camera lucida*).

Figs. 1, 2, 3, 5, 6.—*Synocladia* (?) *Scotica* n. sp.

Fig. 1a.—Natural size of small frond.

Fig. 1b.—Portion of 1a enlarged to show fenestration.

Figs. 2, 3, show small secondary pores on celluliferous face.

Figs. 5, 6, show the longitudinal striation of non-celluliferous surface.

Figs. 4, 7, 8, 9, 10.—*Glauconome robusta*, n. sp.

Fig. 4.—Worn specimen showing celluliferous face.

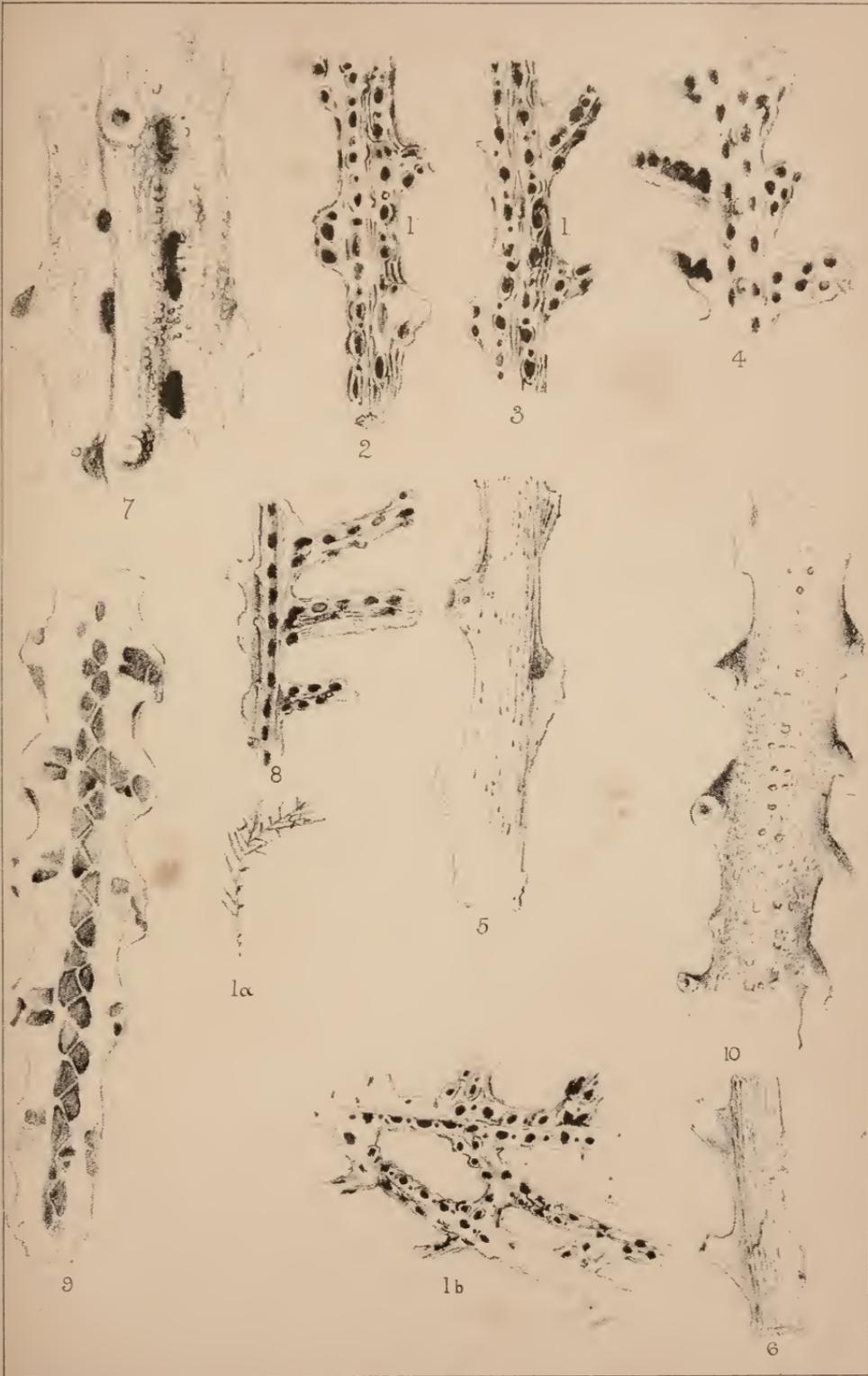
Fig. 7 shows granulation of surface of celluliferous face, and position of tubercles on keel.

Fig. 8.—Well preserved specimen, showing prominent tubercles on keel, cells of main stem, and secondary branchlets.

Fig. 9.—Mesial-vertical section, polished to show the internal form and arrangement of the cells (placed upside down on the Plate).

Fig. 10.—Showing tubercles—granulate ornament of non-celluliferous face.

*Note*.—All the figures are much enlarged, with the exception of Fig. 1, which is drawn natural size.





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St. Louis Academy of Science.

Toronto.—Entomological Society of the Province of Ontario.

Washington.—Smithsonian Institution.

Washington.—U.S. Survey of the Territories, per Prof. Hayden.

### NATURAL HISTORY SOCIETY OF GLASGOW.

#### *Abstract Statement of Accounts—Session 1876-77.*

To Cash in Bank per last Account, £39 1 4	By Rent and Attendance, - £3 0 0
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£99 17 11	£99 17 11
To Balance—Cash in Bank, - - - - £40 14 8	
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GLASGOW, 12th September, 1877.—Compared with Vouchers, and found correct.

(Signed) A. ROBERTSON.  
J. MANFORD.

# THE FAUNA OF SCOTLAND,

WITH SPECIAL REFERENCE TO CLYDESDALE AND  
THE WESTERN DISTRICT.

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## H Y M E N O P T E R A.—P A R T I.

IN the preparation of the present Catalogue, I have had to rely mostly on my own exertions for the material, as the family of which it treats is one which has not as yet become a favourite with the now numerous band of insect collectors. Of previous local lists there are none, beyond some papers published by myself,\* and some notes by Mr James Hardy, in the Berwickshire Club Proceedings. The references to Scotch species by Stephens in the seventh volume of his Illustrations of British Entomology, are scarcely to be relied on, and in most cases I have ignored them entirely. The sources of information being thus limited, my indebtedness is the greater to those who have assisted me with specimens, and in this respect my thanks are especially due to Dr Sharp of Thornhill, Dr Buchanan White, and Prof. J. W. H. Trail, for the loan of collections made by them in districts which I had not an opportunity of investigating personally. †

The nomenclature adopted is that which properly belongs to each species, that is to say, the oldest name which can be fixed with certainty. This is, however, a matter which can scarcely be settled to every one's satisfaction for some time yet, especially with some of the intricate and variable groups like the *Nematides*.

In the synonymy I have only given references to the names in

\* On Tenthredinidae in the Glenelg Valley, Inverness-shire (Scot. Nat. ii., 61-62); Tenthredinidae in Rannoch (*l.c.* 358-359); Notes on Hymenoptera observed in Inverness-shire (Proc. Nat. Hist. Soc. of Glasgow ii., 290-294); On the Hymenoptera of Kingussie (*l.c.* iii., p. 86-90); A contribution to the Hymenoptera of Sutherlandshire (*l.c.* iii., p. 248); Tenthredinidae in Braemar (Scot. Nat. iv., 10-11), and the lists in the "Fauna and Flora of the West of Scotland," Glasgow, 1876.

† I have included the whole of Scotland, and for the sake of comparison, have placed the westerly and easterly localities in separate lines.

the monographs of the Swedish and German authors, and then only when the name adopted happens to differ from one in general use. I have also mentioned the food plants of the larvae, so far as they are known to me. As the species of *Nematus* are so very puzzling to a beginner, I have given descriptions of all the known larvae.

For information regarding the collecting and preserving of these insects, I must refer the reader to a paper in the Proc. Nat. Hist. Soc. of Glasgow, Vol. iii., p. 141.

The classification which I have followed requires a word or two of explanation, since it differs very considerably from anything hitherto in use. My views may be best explained by the following table, which shows what I take to be the natural relations of the tribes:—

TENTHREDINA.	CIMBICIDINA.	HYLOTOMINA.
		<div style="border-top: 1px solid black; border-bottom: 1px solid black; width: 100%; margin: 0 auto;"></div> (Cephalocera. Syzygonia).
NEMATINA.	<div style="border-top: 1px solid black; border-bottom: 1px solid black; width: 100%; margin: 0 auto;"></div>	
	LOPHYRIDINA.	PTERYGOPHORINA.
	LYDINA.	XYELINA.
	CEPHINA.	
	SIRICIDAE.	

It will be observed from this table that on the one hand we have a number of small, sharply defined specialised groups containing few species, and on the other two large homogenous tribes, with few closely allied genera differing but little (comparatively), from each other, and embracing a large number of species, which are mainly found in the Palaearctic and Nearctic regions. Our ideas of the classification of the family will depend largely upon our views as to the systematic position of *Lophyrus*. In my opinion, its natural situation is close to *Lyda*, with which it agrees in its multi-articulate antennae; it seems to me to have no affinity whatever with the *Tenthredina*. If this be granted, then I think further that the *Cimbicina* and *Hylotoma* must be located near it, for these two groups show considerable relationship with *Lophyrus*. Westwood, in his Classical

Introduction, formed *Lophyrus* and *Lyda* into a sub-tribe, but he placed the *Tenthredina* between them and *Cimbex* and *Hylotoma*; though these are so nearly related to *Lophyrus* that I cannot see how they can be separated in this way without violating many affinities. No doubt, if we regard only the European genera, the evidence in favour of my classification will appear rather weak, and it must be recollected that the Tenthredinidae have only been properly classified according to the Palaearctic forms; but I say that if we take into consideration all the genera of the world, we find then many evidences tending to prove the correctness of my views. *Cimbex*, *Hylotoma*, and *Lophyrus*, are so sharply cut off from each other by the structure of the antennae, that we must rely on other points to show their relation to the lower groups and to each other. This, I think, is found in the possession of a small appendicular cellule in both the wings, and the presence of spines (none of which are found in *Tenthredina*), on the tibiae as in *Lyda*; they seem indeed to indicate that *Cimbex*, etc., branched off early from some common ancestor, while the *Tenthredina* and *Nematina* branched off later from some form allied to *Lophyrus*.\*

*Hylotoma* is connected with the *Cimbicides* through *Syzygonia*, while *Pterygophorus* unites it with *Lophyrus*. Whatever views we may hold regarding the position of *Cimbex* and *Hylotoma*, it seems to me very unnatural to place *Tenthredo* next to *Lyda*, with which it has no affinity whatever, as is usually done. I regard *Tenthredo* as more highly organised than *Cimbex*, which is probably only a remnant of a once extensive family. Size in the Hymenoptera is of no value as indicating the higher systematic position of a genus; rather the reverse. I may here remark that seemingly unimportant structures like spines on the tibiae, appendicular cellules, etc., are of greater value in indicating affinity in this group, because less liable to vary, than other organs of more importance to the animal. And I would also point out that it is only (except in *Cladius*) among the *Cimbicina*, *Hylotomina*, and *Lophyrina* that we find secondary sexual characters developed to any extent, these being in the two last groups very conspicuous. In the Tenthredinidae the possession of numerous joints in the antennae must be regarded as evidence of low development, and consequently of greater antiquity.

\* In this respect *Cladomacra* and *Monoctenus* are suggestive.

But the converse of this, namely, that the possession of the fewest number of joints marks the most recent origin, does not necessarily follow. For, as has just been remarked, it is precisely in those groups which now have the greatest and fewest number of joints that sexual selection has played the greatest rôle in causing the greatest difference between the sexes; and there can, I think, be no hesitation in affirming, that the peculiar antennae of *Hylotoma* have been produced by that agency, since everything tends to show that the original ancestor of the family must have had multi-articulate antennae, while in the other Hymenoptera, as well as among insects generally, it is among the lower tribes that secondary sexual characters are most marked.

So far as the division into tribes and sub-tribes goes, my arrangement does not differ much from that of Thomson, whose work (except in so far that nothing or next to nothing is said about the larvae), is one of the best and most suggestive that has yet appeared on the family. We differ in so much that I form *Lophyrus* and its allies into a distinct tribe, instead of regarding them as only a sub-tribe of the *Tenthredina*. The *Nematides* again are so sharply cut off from the rest of the family, not only by the structure of the perfect insects, but also by the larvae having 20 legs, that I follow Prof. Zaddach in forming them into a tribe. They are naturally united to the *Tenthredina* by the strong affinities *Dineura* has with *Hoplocampa*. The last mentioned genus too has gall-making species, while in the alar neuration it is almost identical with *Dineura*. With the sub-tribes again I form the *Phyllotoma* section into a sub-tribe (as was done by Newman under the name of *Druidae*, without his having a very clear idea of the group), which their peculiar habits and structure appear quite to warrant. *Strongylogaster*, *Pocillosoma*, *Taxonus*, and *Emphytus*, I form also into a sub-tribe. These genera appear to me to have been most unnaturally separated in our books, notwithstanding that they are very closely related in many respects, while the larvae are very similar, and all agree in pupating in stems (either of their food plants or others), without spinning any cocoons.

To this union it may be objected that the four genera exhibit considerable diversity in their alar neuration. It is true that *Emphytus* has only three marginal cellules, while *Pocillosoma* has one, and *Strongylogaster* two medial cellules in the posterior wing. But



when we bear in mind that *Poecilosoma* contains species that have only three marginal cellules, and no medial cellule in the posterior wing, this can scarcely be regarded as a serious objection against uniting these genera into a sub-tribe. In the form of the lanceolate cellule, they all coincide more or less, there being a nervure (generally oblique) in all of them except *Strongylogaster*. I am not sure, however, but that the proper position of the last named genus may be among the *Selandriades*.

The *Dolerides* are most nearly related to *Tenthredo*, and have no relationship with *Emphytus*, near which they are placed by the German authors. I place them between *Allantus* and *Strongylogaster*, as perhaps the best position, but they are very distinct from any of the other sub-tribes. In seeking to place such anomalous tribes in a series in our Catalogues, we must bear in mind that a natural classification is one which represents the different forms branching out in various directions from a common stem, and that of the once numerous branches we only now know a few disjointed twigs—not one which shows them in a straight row.

A word or two may also be said regarding the formation of the genera in this family. For my own part, I consider that if any group is distinct enough to have a name attached to it, it should be called a genus; sub-genera I consider to be more apt to lead to confusion than anything else. In this respect, the named sub-sub-sub-sections of Hartig are cases in point. No doubt if the above view is followed it may lead to mere artificial sections being formed into genera, but I hold that, in the present state of the Hymenoptera, this is a less evil than to have large genera containing a number of well marked sections. Take, for example, the loose way in which the terms "*Selandria*" and "*Allantus*" are used. I could point out numerous descriptions of new species described under these names where there is nothing to show in what limit the genus is defined; *i.e.*, whether the species is a *Selandria* in the restricted sense, or a *Blennocampa*, or perhaps it may be a *Poecilosoma*. And this loose definition is especially troublesome in investigating foreign insects.

The parts most useful in defining genera are (a) the antennae; the number and position of the joints, (when the number exceeds 9 they are variable, and consequently mere number then is not of much use); their covering; and the relative lengths of the joints; (b) the neurulation of the wings, more especially the number of

marginal and sub-marginal cellules; the number and position of the recurrent nervures; the form of the "lanceolate" cellule, (the importance of which is too little known); and the form of the neuriation in the posterior wings, and the number of cellules in them. It will depend, however, very much on the group as to what value will be placed on any particular nervures or cellules. Thus among the *Nematides* the first sub-marginal nervure is often absent, either constantly in particular species or groups, or variable in particular species, and the genus *Pristophora* is founded mainly on this character, but the absence of this nervure occurs in so many different groups of *Nematus*, that it loses all generic value. In the same way in some groups, e.g., *Emphytides*, *Selandriades*, the fact of there being one or more medial cellules in the posterior wings is not of itself of value, since the dividing nervure is as frequently absent as present in particular species, and again with others the females have a medial cell, while the males have none. (c) The structure of the legs, i.e., whether they are provided with spurs or spines; the formation of the tarsi and trochanters, etc. These are the characters which I consider to be of most importance, and they, moreover, can be seen without dissection. But there are other characters which, in connection with the above, are of great value in defining genera. For instance, the form and position of the eyes, of the clypeus and mouth organs, (the form of the palpi appears to be of little value), of the scutellum and of the thorax generally; so also the form of the abdomen, and especially the form of the ovipositor. It is difficult to say what value is to be placed on the form and habits of the larvae in respect to the question we are discussing. In some genera the larvae are very useful in this way. Thus, in *Dineura* (*sensu str.*), all the larvae are very similar in form and markings, and all feed on the flat surface of the leaf, and hence I hold that this genus should be restricted to the *Degeeri* group, and the small species at present placed in it transferred to *Blennocampa*, or to whatever genus they are most nearly related.

Now in other genera, the larvae vary almost with each species. In *Eriocampa*, for instance, we have slimeless larvae, slimy larvae, and larvae covered with a white flaky substance. In *Nematus* again, we have round and flat larvae, elaborately coloured and marked larvae, and others which can scarcely be distinguished from the leaf on which they rest. So also all the larvae of

*Blennocampa* are not spiny. Those of *Emphytus*, and other genera of the group, are very similarly formed, and all bore into stems to pass the pupa state. The larvae of *Dolerus*, *Allantus*, *Macrophya*, and *Tenthredo* cannot be defined from each other. It is thus perfectly clear that the forms of the larvae are far too much of an adaptive nature to play an important rôle in the definition of genera.

We know too little of the embryology of the family to say whether it is of any use; but judging from what is known about the embryology of insects generally, I should say it will be of little value, and indeed it appears to be of little importance in defining and classifying the *orders* of insects.

There is another character which has been employed in the making of genera that requires to be considered. I allude to secondary sexual characters. For example, in *Cladius* we have three groups which are distinguished by the males having differently formed antennae, the difference in the case of *Cladius difformis* and *C. padi* being considerable, while the females of the three divisions cannot be defined. In a case like this, I should certainly say that genera ought not to be founded on structures that are confined solely to one sex, no matter how conspicuous such structures may be.

There are other points, not perhaps of generic value, which are nevertheless of use in indicating the affinities of particular species or genera,—such as the manner of oviposition, of pupation, the general habits of the larvae and imago, and their geographical distribution.

In connection with the classification it may be of interest to consider for a moment the geographical distribution of the sub-tribes. This will be best shown by the Table, in which the regions and sub-regions are given after the masterly work of A. R. Wallace on the geographical distribution of animals (see Table, page 5).

From this table it will be seen that the *Tenthredina* are nearly confined to the Palaearctic and Nearctic regions, and when they extend beyond them, *e.g.*, into the Oriental, they are either represented by Palaearctic genera, or by genera differing but little from them, and which fall naturally into Palaearctic sub-tribes. The true *Cimbicides* are also Palaearctic and Nearctic, penetrating no further south than the Alleghanian sub-region of the latter. In the Neotropical region there are three peculiar

sub-tribes, and in Australia the singular genus *Perga*. The *Lophyrides* proper are attached to Coniferae. They are mostly Palaearctic and Nearctic, occurring rarely in the Oriental and Central Indian sub-regions. Sub-tribes of it are found in the Neotropical and Australian regions (Austro-Malayan). The *Hylotomina* are numerous represented in the Palaearctic, more rarely in the Oriental, while they are exceedingly common in the Neotropical; but these belong mostly to different groups from the European. *Lyda* is only found in the Palaearctic (where it extends into China), and the Nearctic regions. The Ethiopian region appears to be singularly poor in Tenthredinidae. Two species of *Athalia* are known from it (one being apparently our *A. rosae*), and on the west coast a species is found with the neuration of *Dineura*, but more of the form of *Blennocampa* (*Dineura? africana*, Cam.) A few species of *Hylotoma* are found in the southern sub-region. *Dolerus* is spread over the Nearctic, Palaearctic, and Oriental regions. Of wide distribution of British species, may be mentioned *Hylotoma pagana* in the Nearctic (?), Palaearctic and Oriental regions, *Athalia spinarum* represented in the Oriental by a distinct variety, and in the Manchurian sub-region of the Palaearctic by another form, while *A. rosae* is found on the west coast of Africa. Some of our species of *Cimbex* extend into North America, and apparently some of the American species of *Nematus* are merely climatic varieties of European species. *Tenthredo scalaris* is a native of Japan. Besides *Perga* Australia has another peculiar genus, *Pterygophorus*. Another genus belonging to the Australian region is *Dictynna*, which has the alar neuration of *Nematus*, and the ten-jointed sub-clavate antennae of *Athalia*. Generally exotics differ from European species through having the wings more or less banded with, or entirely, blue or bluish-black, and the body metallic blue, green, or purple. Thus Indian species of *Tenthredo* are more or less metallic, so are Malayan species of the *Selandriades*.

The *Nematides* are more confined to the northern regions than almost any other sub-tribe, and also they appear to extend into a higher latitude, five or six species being known from Spitzbergen and Iceland. Mr Smith has ascribed a *Cryptocampus* from the Malay Archipelago; but possibly it may not really belong to this division, but rather to the *Lophyrides*.

With regard to the Scottish Tenthredinidae, their general

character may be best seen by comparing the following table, where the number of our species is contrasted with that of Sweden and France.

From this table it is observed that our strong points lie in the *Nematides* and the other smaller species, while we are very poor in species of *Allantus*, *Macrophya*, and *Hylotoma*. We want also the genera *Clavellaria*, *Amasis*, *Schizocera*, *Monoctenus*, *Fenella*, and *Harpiphorus*, which are found in Sweden and France (except *Fenella* in the latter country).

GENERA.	SCOTLAND.	SWEDEN.	FRANCE.
Tenthredo - - -	19	15	21
Perineura - - -	4	6	7?
Synaerema - - -	1	1	1
Macrophya - - -	3	11	14
Pachyprotasis - - -	3	4	4
Allantus - - -	2	8	12
Sciopteryx - - -	1	2	2
Athalia - - -	4	5	6
Dolerus - - -	11	29	16
Strongylogaster - - -	4	6	2
Poecilosoma - - -	4	8	4
Taxonus - - -	4	4	4
Emphytus - - -	8	15	17
Phyllotoma - - -	3	4	2
Fenusa - - -	7	5	4
Coenoneura - - -	1	1	...
Selandria - - -	5	10	4
Eriocampa - - -	4	7	4
Blennocampa - - -	15	28	18
Hoplocampa - - -	3	8	7
Dineura - - -	4	4	3
Hemichroa - - -	2	3	1
Camponiscus - - -	1	1	...
Cryptocampus - - -	3	3	4
Nematus - - -	60	93	41
Croesus - - -	3	2	3
Cladius - - -	6	7	4
Cimbex - - -	2	3	8?
Trichiosoma - - -	4	4	4
Abia - - -	1	3	2
Zaraea - - -	1	1	1
Hylotoma - - -	3	11	13
Cyphona - - -	1	2	1
Lophyrus - - -	5	12	6
Lyda - - -	5	23	18
Xyela - - -	1	3	1
Cephus - - -	1	8	9
	209	360	268

## CLASS: INSECTA.

## ORDER: HYMENOPTERA.

## Family: TENTHREDINIDAE.

## Tribe: TENTHREDINA.

## Sub-Tribe: TENTHREDINIDES.

## GENUS: TENTHREDO (Lin.), Cam.

## 1. T. LIVIDA, Lin.

Very common. Imago in June. Larva in September and October, on *Lonicera*.

Cadder, Milngavie, Kenmuir, Glenelg.

Rannoch, Braemar, Kingussie, Bonar Bridge, Berwickshire.

A very variable species. One form occurs not uncommonly with the legs and abdomen black; and this aberration I have received two or three times, bearing the name of *bipunctata*, Klug, which may or may not be really a variety of *livida*.

## 2. T. COLON, Klug.

Rare. Imago in May. Larva in summer, on *Circaea* and *Epilobium*. Thornhill (Dr Sharp).

## 3. T. VELOX, Fabr.

Common. Imago in June. Larva unknown.

Paisley (Mr Morris Young), Kintail.

Rannoch, Braemar, Kingussie, Bonar Bridge, Polmont (Mr Binnie).

The aberration *nigro-lineata*, Cam., with the legs in both sexes lined with black, is not uncommon.

## 4. T. BALTEATA, Klug.

Very common. Imago on birch, in June and July. Larva unknown.

Cadder, Clober, Kilsyth, Ardlui, Bishopton, Glenelg.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge, Altnaharra, Berwickshire.

## 5. T. RUFIVENTRIS, Fab.

Common. Imago in June and July. Larva unknown.

Cadder, Milngavie, Kilsyth, Bishopton, Kintail.

Rannoch, Braemar, Strath-Glass, Bonar Bridge, Berwickshire.

6. *T. LACHLANIANA*, *Cam.*, sp. n.

*T. nigra*, ore, orbitis oculorum, linea pronoti, maculisque 2 supra coxas posticas, albis; abdomine medio rufo, pedibus rufis, femoribus anticis basi, posticis fere totis nigris; alis hyalinis, costa et stigmatibus pallide fuscis.

Long 5-6 lin.; alar exp. 11-12 lin.

Black, mandibles, labrum, clypeus, inner orbits of the eyes, a triangular spot between the antennae; tegulae, the edge of the pronotum, and two spots over the posterior coxae, white; the middle abdominal segments broadly banded with red, the apices of the four anterior femora, and the tibiae and tarsi pale red; the thorax opaque, the head and abdomen shining; the wings hyaline, the costa and stigma pale fuscous.

Length, 5-6 lines, alar exp. 11-12 lines.

Very similar to *T. moniliata*, Kl. (with which it is no doubt confounded), but it may be readily known from that species by having the inner orbits of the eyes, and a spot between the antennae, white, the posterior femora quite black. The markings on the head and thorax are white—not yellow, and the posterior tarsi and the apex of the tibiae are not marked with black. It has also two marks over posterior coxae, while Klug's species has only one.

In one of my Scotch specimens the red abdominal band is very obscure, and two others have only one side of the pronotum white. Generally the 3d, 4th, and 5th abdominal segments are red.

This species was captured by myself in June at Rannoch, Perthshire, and I have also seen in the collection of Mr R. M'Lachlan, F.R.S. (after whom I have named it), a German specimen taken by Prof. Zeller.

7. *T. MONILIATA*, *Klug.*

Not common. Imago in June. Larva unknown.  
Aberlady (Mr R. M'Lachlan, F.R.S.)

8. *T. DISPAR*, *Klug.*

Common. Imago in June. Larva in the autumn, on *Scabiosa succisa*.  
(*Vide Proc. Nat. Hist. Soc. Glas. iii.*, p. 89).

Cadder, Milngavie, Bishopton, Kilsyth, Kintail.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge, Altnaharra.  
Berwickshire, Orkney (Reuter).

9. *T. ATRA*, *Lin.*

Rare. Imago in June. Larva in the autumn, on alder, according to Rudow.

Kilsyth.

Braemar, Altnaharra.

10. *T. ZONATA*, *Pz.*

Rare. Imago in May, on oak. Larva unknown.  
Kenmuir Bank, Cadder.

11. *T. BICINCTA*, *Lin.*

Not rare, but seemingly local. Imago in May. Larva unknown.  
Kenmuir Bank.  
Berwickshire.

12. *T. OBSOLETA*, *Klug.*

Very rare. Imago in June. Larva unknown.  
Cadder Wilderness.

This species is no doubt passed over for *Mesomela*, from which it differs in having the pleurae and sternum black, except one or two green splashes on the former; the antennae much shorter, and thicker at the apex, the last joint being much shorter in proportion to the eighth. The wings are clearer, and scarcely darker at the apex than at the base; it is also shorter and more slim.

13. *T. MESOMELA*, *Lin.*

= *T. viridis*, *Klug.*; *nec L.*

Very common. Imago in June. Larva in August and September, on *Ranunculus*, *Heracleum*, *Veronica*.

Kelvinside, Cadder, Milngavie, Kenmuir, Kilsyth, Touch Hills, Paisley, Bishopton, Bute, Kintail.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge, Altnaharra.  
Berwickshire.

14. *T. OLIVACEA*, *Klug.*

Abundant. Imago in June, especially in birch woods. Larva unknown.  
Cadder, Milngavie, Kilsyth, Glenelg.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge, Altnaharra.  
Orkney (Reuter).

A variety occurs without the usual black dorsal stripe on abdomen.

15. *T. PUNCTULATA*, *Kl.*

Very common. Imago in June and July. Larva on birch in the autumn.

Cadder, Clober, Strathblane, Bishopton.

Rannoch, Braemar, Bonar Bridge, Altnaharra.

16. *T. SCALARIS*, *Klug.*

Abundant. Imago in June. Larva unknown.

Possil, Milngavie, Touch Hills, Kilsyth, Glenelg, Skye, etc.

Rannoch, Kingussie, Braemar, Sutherlandshire, Berwickshire.

17. *T. VIRIDIS*, *Lin.*

*nec T. viridis*, Klug = *picta*, Kl.

Rare. Imago in June. Larva unknown.

Possil, Touch Hills.

Braemar, Bonar Bridge.

18. *T. GIBBOSA*, *Fall.*

= *aucupariae*, Kl. = *solitaria*, Fall., Th.; *nec* Scop.

Common. Imago in May. Larva unknown.

Kelvinside, Cadder, Clober.

Berwickshire.

19. *T. LATERALIS*, *Fab.*

Common. Imago in May. Larva unknown.

Kelvinside, Cadder, Milngavie, Paisley, Bishopton.

Braemar, Berwickshire.

## PERINEURA, Htg.

*Obs.* Hartig formed his genus *Perineura* for *Tenthredo rubi*, Pz., female, while he made another genus (*Synaerema*) for the male of that insect. Thomson retains *Synaerema* for *rubi*, and *Perineura* for the *T. instabilis* group of Klug, as well as for *T. lateralis* and *T. gibbosa*, and also *T. viridis*, *scalaris*, and *punctulata*; making, as it seems to me, a more unnatural genus of it. I retain *Perineura* for the "*instabilis*" group, the others I place in *Tenthredo*. In the nomenclature of the species I follow Thomson, as it seems impossible to know what species are meant by employing the older names. Costa formed a genus, *Tenthredopsis* for *instabilis*.

1. *P. NASSATA*, *Lin.* (male), *sec. Thoms.*

= *dimidiata*, Fab., Klug.

Very common. Imago in June and July. Larva unknown.

Cadder, Strathblane, Kenmuir, Glenelg.

Rannoch, Braemar, Kingussie, Bonar Bridge, Altnaharra.

2. *P. BREVISPIA*, *Thoms.*

= *scutellaris*, Fab.; *ambigua*, Klug.

Very common. Imago in June and July. Larva unknown.

Cadder, Bishopton, Kenmuir, Glenelg, etc.

Rannoch, Kingussie, Braemar, Bonar Bridge, Berwickshire.

3. *P. SORDIDA*, *Thoms.* (? *Klug.*)

Abundant everywhere. June and July.

4. *P. EXCISA*, *Thoms.*

Not common. In June and July.  
Strathblane.

SYNAEREMA, *Htg.*1. *S. RUBI*, *Pz.*

= *delicatula*, *Htg.*

Very rare. Imago at end of June. Larva unknown.  
Cadder Wilderness.

MACROPHYA, *Dahlbom.*1. *M. ALBICINCTA*, *Schrank.*

= *ribis*, *Thoms.*; *nec* *Schr.*

Not common. Imago in June. Larva on *Sambucus nigra* and *racemosa*.  
Milngavie, Dalry.  
Rannoch, Kingussie, Braemar, Bonar Bridge, Berwickshire.

2. *M. ALBIPUNCTATA*, *Fall.*

Rare. Imago in June. Larva unknown.  
Rannoch, Muchalls, Aberdeenshire (Prof. Trail).

3. *M. PUNCTUM ALBUM*, *Lin.*

Very rare. Imago in June. Larva on *Fraxinus* and *Ligustrum*.  
It is quite green, according to Kaltenbach.  
Thornhill (Dr Sharp).

PACHYPROTASIS, *Hartig.*1. *P. RAPAE*, *Lin.*

Very common. Imago in June and July. Larva unknown.  
Cadder, Milngavie, Cannisburn, Kenmuir, Paisley, Bishopston, Bute, etc.  
Rannoch, Kingussie, Strath-Glass, Sutherlandshire, Braemar, Berwickshire.  
Orkney (Reuter).

2. *P. VARIEGATA*, *Klug.*

Not very common. Imago in June. Larva unknown.  
Glen Moriston, Glenelg.  
Kingussie.

3. *P. ANTENNATA*, *Klug.*

Common. Imago in June and July. Larva unknown.  
Cadder, Kintail.  
Rannoch, Kingussie, Braemar, Sutherlandshire.

## ALLANTUS, Jurine.

1. A. TRICINCTUS, *Fab.*

Not common. Local. Imago in July. Larva in August and September, on *Viburnum*, *Lonicera*, *Jasminum*, *Syringa*, *Symphoricarpos*, *Fraxinus*, and *Alnus*, according to Rudow.

Clober.

2. A. NOTHUS, *Klug.*

Most abundant on flowers of Ranunculaceae, Compositae, and Umbelliferae, in June and July. The larva feeds on alder, according to Rudow.

Generally distributed. The imago is very carnivorous.

In Orkney and Shetland (Reuter).

## SCIOPTERYX, Stephens.

= *Eniscia*, Thomson.

1. S. COSTALIS, *Fab.*

Seemingly rare. Imago in May. Larva unknown.

Braemar (Dr White).

## ATHALIA, Leach.

1. A. GLABRICOLLIS, *Thoms.*

Not uncommon. Imago in June and (?) August. Larva in July and August, on Cruciferous plants. It is scarcely to be known from that of *A. spinarum*.

Clydesdale.

Berwickshire, Aberdeen, Dornoch.

2. A. SPINARUM, *Fab.*

Rare. Imago in early summer. Larva on turnip.

Mr Hardy states that this destructive insect destroyed in 1859, at Old Cambus, some acres of turnips.

It also occurred at some other places, and its ravages were becoming hurtful when its progress was arrested by applying lime.

3. A. ROSAE, *Lin.*

Abundant everywhere in June and July. Larva on the *Rosa canina*, in autumn.

4. A. LUGENS, *Klug.*

Not common. Imago in July. Larva on (?) *Clematis*.

Gleniffer Braes, Kilsyth Glen.

## D O L E R I D E S.

## DOLERUS, Jur.

1. D. PRATENSIS, *Lin.*

= *Eglanteriae*, Kl.

Common. Imago in May and June, among horsetails in marshy grounds.

Larva unknown.

Possil Marsh, Cadder, Clober, Craigmaddie, Kintail.

Rannoch, Braemar, Kingussie, Sutherlandshire.

2. D. LATERITIUS, *Klug.*

Rare. Imago in June.

Possil Marsh, Paisley.

3. D. PALUSTRIS, *Klug.*

Common. Imago in June, in marshy grounds.

Possil Marsh, Paisley, Bishopton, Kintail.

Rannoch, Braemar, Kingussie, Bonar Bridge.

4. D. FULIGINOSUS, *Klug.*

= *fuscipennis*, Stephens.

Not common. Imago in May and June.

Possil Marsh, Paisley Dams.

5. D. GONAGER, *Kl.*

Common. Imago in May and June. Larva in June, on grasses.

Kenmuir.

Braemar.

6. D. VESTIGIALIS, *Kl.*

Common in early summer.

Kenmuir, Cambuslang, Cadder, Milngavie.

7. D. HAEMATODIS, *Kl.*

Seemingly rare. Imago at end of May. Larva in July on grasses.

Kenmuir.

Aberdeen.

8. D. NIGER, *Lin.*

Common. Imago in early summer.

Kenmuir.

Braemar, Kingussie.

9. *D. GIBBOSUS*, *Htg.*

Common. Imago in May and June, among grasses.  
 Kenmuir, Cadder, Milngavie, Western Inverness-shire.  
 Braemar, Kingussie.  
 Ascends to near 3000 feet.

10. *D. AENEUS*, *Htg.*

Common in early summer.  
 Saint Germain's Loch, Cadder, Clober, Paisley, Bishopton, Western  
 Inverness-shire.  
 Kingussie.

11. *D. VARISPINUS*, *Htg.*

Rare. Locality uncertain (Dr Sharp). Berwickshire (Hardy).

*EMPHYTIDES*, *Cam.**STRONGYLOGASTER*, *Hartig.*1. *S. CINGULATUS*, *Fab.*

Very common. Imago in May and June. Larva abundantly on *Pteris  
 aquilina*, in July and August. It feeds also on *Polystichum filix mas*.  
 Moors near Milngavie, Kilpatrick Hills, Hawick, Kintail, Glenelg.  
 Rannoch, Kingussie, Braemar, Sutherlandshire.

2. *S. MIXTUS*, *Kl.*

Not common. Imago on ferns, in May and beginning of June.  
 Cadder Wilderness, Glenelg.  
 Berwickshire.

3. *S. FEMORALIS*, *Cam.*

Ent. Monthly Mag. xi., 250.  
 Not common. Imago in May and June, on ferns.  
 Cadder, Kilpatrick Hills, Gleniffer Braes.

4. *S. DELICATULUS*, *Fall.*

Acta. Holm., 1808 = *eborinus*, Klug. = *phthisica*, Voll.  
 Very common. Imago in May, June, and July. Larva in July to  
 September, on *Polystichum*.  
 Cadder, Milngavie, near Cambuslang, Glenelg.  
 Rannoch, Kingussie, Braemar, Strath-Glass, near Edinburgh, Berwick-  
 shire.

## TAXONUS, Megerle.

## 1. T. AGRORUM, Fall.

Acta. Holm., 1808, 59, 18 = *nitida*, Klug = *anomala*, Eversmann.

Rare. Imago in June. Larva unknown.

Strath-Carron, near the Dornoch Frith.

## 2. T. EQUISETI, Fall.

Acta. Holm., 1808, 60, 20 = *bicolor*, Klug.

Common. Imago in June. Larva in the autumn. Food plants—*Veronica*, *Rumex*.

Possil Marsh, Cadder, Kelvinside, Clober, Bishopton, Paisley, Dalry (var. *coxalis*, Kl.)

Rannoch (var. *coxalis*, Kl.), Kingussie, Glenelg, Bonar Bridge, Berwickshire.

The commonest variety in Scotland has only a triangular blotch on the 3d abdominal segment. A form with 4 of the abdominal segments red is also met with.

## 3. T. GLABRATUS, Fall.

Acta. Holm., 1808, 108, 43 = *agilis*, Klug.

Very common. Imago in May and June. Larva in the autumn. Food plant—*Polygonum bistorta*.

Possil Marsh, Cadder, Clober Moor, Cambuslang, Bishopton.

Altnaharra.

## 4. T. GLOTTIANUS, Cam.

Ent. M. M. x., 220.

Extremely rare. Kenmuir Bank, end of May. Larva unknown.

## POECILOSOMA, Dahlbom.

## 1. P. PULVERATUM, Retz.

= *obesa*, Klug = *leucozonias*, Htg.\*

Very common. Imago in May and early in June. Larva end of June and July. Food plant—alder.

Clober, Balloch, Glen Fruin, Ardlui, Western Inverness-shire, Loch Alsh.

Blair-Athole, Rannoch, Kingussie, Bonar Bridge, Altnaharra, Strath-Carron, Braemar, Berwickshire.

\* Rudow, in his revision of the German species of *Allantus*, sensu str., includes in it *leucozonias*, although it is well known to be only *pulveratum*.

2. *P. FLETCHERI*, Cameron.

= *obtusa*, Thomson, Hymen. Scand. i., 231; *nee* Klug and Hartig.

Rare. Imago in June. Larva unknown.

Rannoch, Braemar.

This species is distinguished from the true *obtusum* by its longer antennae (they are as long, if not longer, than the abdomen; in *obtusum* they are only as long as the thorax); black mouth (in *obtusum* the clypeus is white); there is a distinct white line on the pronotum; the legs are more or less luteous, with a black line on the femora, and the base of the tibiae white; the anus is distinctly luteous; and lastly, *obtusum* is larger than *pulveratum*, while the present insect is smaller. *Obtusum* was originally taken in Hungary, and I can find no record of its having been captured since it was first described.

I have great pleasure in naming it after Mr J. E. Fletcher of Worcester, the discoverer of many novelties in the neglected orders of insects, and to whom I am much indebted in many ways.

3. *P. SUBMUTICUM*, Thoms.

= *impressum*, Klug (part).

Common. Imago in May and June. Larva (?).

Possil Marsh, Clober, Strathblane, Craigmaddie, Kintail.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge.

I bred this species from among *Emphytus calceatus*, and hence suspect that it is attached to *Spiraea*, upon which I have found a larva like that of *calceatus*, but with black marks along the sides.

4. *P. EXCISUM*, Thoms.

Not common. Imago in June. Larva unknown.

Western Inverness-shire.

Rannoch, Kingussie, Braemar, Strath-Glass, Bonar Bridge.

## EMPHYTUS, Klug.

1. *E. CINCTUS*, Lin.

Not uncommon. Imago in June and early in July. Larva in the autumn. Food plant—*Rosa canina*.

Cadder, Clober, Campsie, Strathblane, Kilsyth Glen, Kenmuir, Kintail.

Blair-Athole, Rannoch, Braemar.

2. *E. RUFO-CINCTUS*, Kl.

Common. Imago in June. Larva in August and September. Food plant—rose.

Cadder, Kenmuir, Paisley.

Rannoch, Braemar, Bonar Bridge.

3. *E. CALCEATUS*, Kl.

Probably common. Imago in June. Larva from end of July to September. Food plant—*Spiraea ulmaria*.

Cadder, Clober, Kilmalcolm.

Rannoch.

The larva has the head deep black, with the mouth paler. The upper part of the body to the spiracles is slaty-black, often with a greenish tint; the rest of the body, with the legs as well as the claws, white. The skin is wrinkled and in furrows, and bears a few hairs; the spiracles are blackish. When full fed, the upper portion of the body becomes of a shining dull slate.

An aberration of the imago occurs without a red abdominal band (Rannoch).

4. *E. TIBIALIS*, Panz.

Seemingly not common. Imago in September. Larva in June and July. Food plant—oak.

Cadder, Clober (Mr King).

5. *E. SEROTINUS*, Klug.

Very common. Imago in September. Larva in June and July. Food plant—oak. [Does the imago hibernate?].

Cadder, Clober, Kenmuir.

Rannoch, Glen Lyon, Bonar Bridge, Lairg, Berwickshire.

6. *E. CARPINI*, Htg.

Not uncommon. Imago in June and July. Larva on *Geranium robertianum*.

Kenmuir, Cannisburn, Cadder.

Braemar.

7. *E. TENER*, Fall.

Acta. Holm., 1808 = *patellatus*, Klug.

Common. Imago in June. Larva unknown.

Possil Marsh, Cadder, Cannisburn, Kenmuir, Bishopton, Western Inverness-shire.

Rannoch, Berwickshire.

8. *E. PERLA*, Klug.

Very rare. Imago end of June. Larva in the autumn, on *Rubus*.

Rannoch.

*PHYLLOTOMIDES*, Cameron.

## COENONEURA, Thomson.

C. DAHLBOMI, *Thoms.*

Not common. Imago in May, June, July, and August. Larva unknown.

At the Clyde near Newton. Cadder.

## FENUSA, Leach.

1. F. MELANOPODA, *Cam.*

Proc. Nat. Hist. Soc. Glas. ii., 6 = *F. nigricans*, Thomson; *nec* Klug.

Not common. Imago in June. Larva probably mines the leaves of the alder. See Proc. Nat. Hist. Soc. Glas. iii., p. 7.

Cadder, Clober, Bishopton (a specimen somewhat larger than usual, and with 10-jointed antennae. A distinct species?).

Bonar Bridge.

2. F. PUMILA, *Klug.*

Very common. Imago in May and June, and August. Larva mines the leaves of birch, in early summer and autumn. Double brooded.

Cadder, Clober.

Rannoch, Kingussie, Braemar.

3. F. ULMI, *Sundvall.*

Förh. Skandin. Naturf. in Christ. (1847), 240 = *intermedia*, Thoms. Larva mines leaves of the elm.

Not common. Kenmuir.

4. F. PYGMAEA, *Kl.*

Not common. Imago in June. Larva mines the leaves of the oak, in the autumn.

Dalry (Dr Sharp), Clober, Tarbert, Loch Lomond.

5. F. ALBIPES, *Cam.*

Ent. M. M. xii., 131; Proc. Nat. Hist. Soc. Glas. iii., p. 11.

Very rare. Imago on rose, on 20th August.

Cadder.

6. F. PUMILIO, *Htg.*

Common, but rather local. Imago in May and June. Larva mines the leaves of *Rubus fruticosus* and *R. idaeus*, in autumn.

Cadder, St Germain's Loch.

## 7. F. BETULAE, Zaddach.

Beschr., p. 29 = *Phyllotoma mellita*, Newman, Ent. v., 1-7.

Very common. Imago in May. Larva in May and June, and again in the autumn in the leaves of birch.

Cadder, Clober, Bishopton, Houston.

Rannoch, Kingussie.

## PHYLLOTOMA, Fallén.

## 1. P. NEMORATA, Fallén.

Acta. Holm., 1808, 47, 23 = *Druida parviceps*, Newman = *Phyllotoma tenella*, Zaddach.

Common. Imago in June and early in August. The larva mines the leaves of the birch, in early summer and late in autumn.

Cadder, Clober.

Rannoch, Kingussie, Lairg, Sutherlandshire.

## 2. P. VAGANS, Fall.

Acta. Holm., 1808, 47, 24 = *Phyllotoma melanopyga*, Klug.

Common. Imago in May and June, and in August. Larva mines the leaves of the alder, in early summer and in autumn.

Banks of Kelvin, Allander, Clyde, and Cart.

Rannoch, Berwickshire.

## 3. P. MICROCEPHALA, Klug.

Common. Imago in early summer and in August. Larva mines the leaves of various willows.

Possil Marsh, Cadder, Clober.

Kenmuir, Bishopton.

## SELANDRIA DES.

## SELANDRIA, Sensu str.

## 1. S. SERVA, Fab.

Very common. Imago in June. Larva unknown.

Possil, Cadder, Clober, Ardlui, Touch Hills, Western Inverness-shire.

Rannoch, Kingussie, Braemar, Altnaharra.

## 2. S. GRANDIS, Zaddach.

Beschr., p. 36 = *interstitialis*, Thoms.

Not common. Imago end of June. Larva unknown.

Gleniffer Braes, Kintail.

Altnaharra.

3. *S. FLAVESCENS*, *Klug.*

Not common. Imago in June and July. Larva unknown.  
Possil, Tollcross sandhills.  
Braemar, Berwickshire.

4. *S. STRAMINEIPES*, *Klug.*

Not uncommon. Imago in May and June. Larva (?).  
Kenmuir, Cadder, Kintail.  
Rannoch, Kingussie, Strath-Glass, Braemar.

The form with yellow coxae (probably identical with *S. analis*, Thoms., Hymen. Scand. i., 239, 1871 = *S. cercipes*, Vollenhoven, Tdj. Ent., 1873, p. 13 *certe*) has occurred at Kenmuir Bank and Strath-Glass. *Analis*, according to Vollenhoven, feeds on *Polystichum filix mas*.

5. *S. MORIO*, *Fab.*

Not uncommon. Imago in June. The larva is stated to feed on gooseberry.  
Cadder, Kenmuir, Kintail.  
Rannoch, Kingussie, Braemar.

ERIOCAMPA, *Htg.*1. *E. OVATA*, *L.*

Occasionally common. Imago early in June. The white flaky larva feeds on alder, in August.  
Clober, Ardlui, Balloch, Glen Fruin.  
Rannoch, Strath-Glass.

2. *E. ADUMBRATA*, *Kl.*

Seemingly not common. Imago in May and June. The slimy slug-like larva feeds during the summer and autumn on fruit trees.  
Of this destructive insect (commonly called "*cerasi*," but wrongly), I only know of it from Berwickshire, where it occurs, according to Mr Hardy.

3. *E. ANNULIPES*, *Klug.*

Common. Imago in June. Larva in the autumn, on willows, oaks, limes.  
Possil Marsh, Cadder, Kenmuir.  
Rannoch, Kingussie, Kintail.

4. *E. TESTACEIPES*, *Cam.*

Ent. M. M. xi., 128.  
Very rare. Imago in June. Larva unknown.  
Kilmorack, near Beauly.

## B L E N N O C A M P A, Htg.

1. B. ASSIMILIS, *Fall.*

Acta. Holm., 1807 = *hyalina*, Klug.

Very rare. Imago end of May. Larva unknown.

St Germain's Loch.

2. B. NANA, *Klug.*

Not common. Imago on birch, in June. Larva unknown.

St Germain's Loch.

Kingussie.

3. B. PUSILLA, *Klug.*

Not uncommon. Imago early in June. Larva in July, in rolled up leaves of the common rose.

Cadder, Clober, Strathblane, Kenmuir, Western Inverness-shire.

Rannoch, Kingussie, Braemar, Bonar Bridge, Berwickshire.

4. B. SUBCANA, *Zaddach.*

Beschr. neuer oder wenig. bekant. Blattw., p. 34; Cameron, Ent. M. M. xiv., 56.

Not uncommon. Imago in May and early in June. Larva unknown.

Possil Marsh, Cadder, Paisley.

Rannoch.

5. B. CINEREIPES, *Klug.*

Not very common. Imago early in May and June. Larva unknown.

Kenmuir, Western Inverness-shire.

Rannoch, Braemar, Bonar Bridge.

6. B. FULIGINOSA, *Schr.*

Seemingly uncommon. Imago in May. Larva unknown.

Paisley (Mr Morris Young).

7. B. FUSCIPENNIS, *Fall.*

Acta. Holm., 1808 = *luteiventris*, Kl.

Common. Imago in marshy places in June. Larva unknown.

Paisley Dams.

Rannoch, Berwickshire.

8. B. MELANOCEPHALA, *Klug.*

Rare. Imago in May. The green spiny larva feeds on oak, in June.

Exact locality unknown (Dr Sharp).

9. *B. LINEOLATA*, Kl.

Not common. Imago in May. The green spiny larva in June, on oak. Perth (Dr White).

10. *B. BIPUNCTATA*, Klug.

Not common. Imago in June. The larva lives in early summer in the young branches of the rose.

Rannoch, Kingussie, Bonar Bridge.

11. *B. ALCHEMILLAE*, Cam.

Proc. Nat. Hist. Soc. Glas. iii., p. 107.

Seemingly common. Imago in June. The green spiny larva feeds in autumn on *Alchemilla vulgaris* and (?) *A. alpina*.

Cadder, Clober.

Rannoch, Bonar Bridge, Ben Clibrich (at an elevation of about 1500 feet, among *Alchemilla alpina*).

12. *B. ALBIPES*, Gmel.

Not uncommon. Imago in June. Larva on *Ranunculus*.

Possil, Cadder, Touch Hills, Paisley.

Rannoch, Kingussie, Braemar, Bonar Bridge.

13. *B. GENICULATA*, Htg.

= *longicornis*, Htg. Male.

Not uncommon. Imago in May and June. Larva in July and August, on *Spiraea ulmaria*. It is green and spiny.

Possil, Paisley.

Braemar.

14. *B. MICANS*, Klug.

Very rare. Imago in June. Larva unknown.

Dalry (Dr Sharp).

15. *B. FUSCULA*, Klug.

Very rare. Imago in May. Larva unknown.

Cadder Wilderness.

## HOPLOCAMPA, Htg.

1. *H. CRATAEGI*, Klug.

Not very common. Imago early in June, on *Pyrus aucuparia*. Larva unknown.

Cadder, Clober.

Braemar, Altnaharra.

2. *H. RUTILICORNIS*, Kl.

Rare. Imago in June (early). Larva unknown.  
Dalry (Dr Sharp).

3. *H. PECTORALIS*, Thoms.

Not common. Imago in June. Larva unknown.  
Cannisburn.

## NEMATIDINA.

## DINEURA, Dbm.

1. *D. DEGEERI*, Klug.

Very common. Imago in June. Larva, August to beginning of  
October. Food plant—birch.

Cadder, Clober, Paisley, Bishopton, Kintail.

Rannoch, Braemar, Kingussie, Strath-Glass, Altnaharra, Berwickshire.

The flat pale-green larva feeds on the upper surface of the leaf. A very  
variable species.

2. *D. STILATA*, Klug.

Not common. Imago in June. Larva in August. Food plant—*Pyrus  
aucuparia*.

Cadder Wilderness.

Berwickshire.

3. *D. TESTACEIPES*, Klug.

Common. Imago in June and July. Larva in July, August, and  
September. Food plants—*Pyrus aucuparia* and *Crataegus oxyacantha*.

Cadder, Possil Road, Cannisburn, Kintail.

Rannoch, Kingussie, Braemar, Berwickshire.

Var. *ventralis*, Zad. Not uncommon.

4. *D. VERNA*, Klug.

= *opaca*, Htg.; *nec* Fab.

Rare. Imago in May. Larva in early summer. Food plant—oak.

Cadder, Strathblane, Aberdeen (Prof. Trail).

The green larva feeds, according to Giraud, on the upper surface of the  
leaf.

## HEMICHROA, Ste. (1835).

= *Leptocerus*, Htg. (1837).

1. *H. ALNI*, L.

Common. Imago in June. Larva in August. Food plants—birch and  
alder, (?) willows.

Cadder, Clober, Kenmuir, Cambuslang.

Beauly, Berwickshire.

## 2. H. RUFA, Pz.

Commonly distributed. Imago in June. Larva in August. Food plants—birch and alder.

Bishopton, Clober, Kingussie.

Beauly, Bonar Bridge.

I bred a very small specimen of this species from birch, at the end of August, the larva having been obtained at Bishopton in June. The colour of it is a deep, very shining black, the usual red being scarcely visible; the wings are intensely black, except at the apex, where the colour is lighter; the costal nervure is absent. This specimen pupated in a cork.

The male of this species is quite unknown.

## CAMPONISCUS, Newman.

= *Leptopus*, Htg.

## 1. C. LURIDIVENTRIS, Fall.

= *hypogastricus*, Htg. = *healaci*, Newm.

Common. Imago in June. The flat onisciform larva on alder in autumn.

Clober, Loch Lomond, Dalry, Glen Moriston, Kintail.

Berwickshire, Rannoch, Glen Lyon, Braemar, Sutherlandshire.

## CLADIUS, Illiger.

## 1. C. DIFFORMIS, Panz.

Common. Imago in May and June. Larva in May and early part of June; a second brood in August and September. Food plant—rose.

Cadder, Cannisburn, Bishopton, Dalry, Kintail.

Braemar, Rannoch, Strath-Glass, Sutherlandshire, Berwickshire.

## 2. C. VIMINALIS, Fall.

= *eucera*, Htg.

Local. Imago in June. Larva in August and September. Food plant—poplar.

Cadder.

Kingussie.

The larvae feed in a row on the under surface of the leaf.

## 3. C. ERADIATUS, Htg.

Not common. Imago in June. Larva unknown, beyond that it was reared from the stem of *Anthriscus sylvestris*.

Rannoch.

## 4. C. DREWSENI, Thoms.

Rare. Imago in June. Larva unknown.

Rannoch.

## 5. C. PADI, L.

= *albipes*, Htg.

Very common. Imago in May, June, and July. Larva in early summer; a second brood in autumn. Food plants—rose, hawthorn, bramble, rowan, pear, plum, and birch.

Kintail, Glenelg, Skye, Lambhill, Kelvindale, Possil, Cadder, Milngavie, Strathblane, Fintry, Kilsyth, Kenmuir, Cambuslang, Paisley, Bishopton, Dalry, Moffat.

Rannoch, Braemar, Aberdeen, Kingussie, Strath-Glass, Beauly, Bonar Bridge, Berwickshire.

## 6. C. BRULLAEI, Dbm.

Very rare. Imago in June. Larva in August. Food plants—*Rubus fruticosus* and *R. idaeus*.

Cadder.

## CROESUS, Leach.

## 1. C. SEPTENTRIONALIS, L.

Commonly distributed. Imago appears in June. Larva from July to end of September. Food plants—alder, birch, poplar.

Cadder Wilderness, Banks of Allander, Bishopton, Kintail.

Rannoch, Kingussie, Braemar, Berwickshire.

## 2. C. VARUS, Vill.

Not uncommon. Imago in June and August. Larva in August and early part of September. Double brooded? Food plant—alder.

Banks of Allander, Kintail.

Rannoch, Kingussie, Glen Feshie.

## 3. C. LATIPES, Vill.

I found what appeared to be the larva of this species at Clober Wood, in September, but did not rear it. Food plant—birch.

## NEMATUS, Jurine.

## 1. N. QUERCUS, Htg.

Not common. Imago in June and July. Larva in August. Food plant—*Vaccinium myrtillus*.

Cadder Wilderness.

Craig Dhu, Kingussie.

The larva is pale ochreous red, with black dorsal marks.

## 2. N. PALLIDIVENTRIS, Fall.

Common. Imago June and July. Larva unknown. Imago generally taken with the sweeping net. It is rather variable in coloration. The abdomen often wants the black dorsal stripes.

## 3. N. LUCIDUS, Pz.

Seemingly not common. Imago end of May. Larva July. Food plant—hawthorn.

Touch Hills, near Stirling.

The larva, according to Brischke and Zaddach, is 9 to 10 lines long, cylindrical, shining, deep green, darkest on the back. The spiracles are elliptical, brownish-red, and through them goes a white line. The 2d segment behind the head bears a black shining spot, and there is another of the same colour at the base of each foot. Over the claspers are a number of round, shining, black tubercles; the side folds are beset with small, black, hairy points, standing together in a straight row. The anal segment bears two stumpy, deep-brownish-red cerci, which become black at the last moult; between the cerci stand two black points. The head is pubescent, deep brown; the face and vertex, along with the eye-spots, darker; the mouth is dark-brown.

## 4. N. HISTRIO, Lep.

= *rufescens*, Htg.

Rare. Imago in May. Larva in June and July. Food plants—*Salix fragilis* and *S. aurita*.

Larva shining, pale green, often with a slight bluish tinge; the skin (except at the thoracic and anal segments) beset with small black dots; on the back is a darker green dorsal stripe, enclosed between two lines which, when the larva is feeding, are white. The head is of a paler green than the body, and bears a few fuscous dots; the mouth brown. The legs are glassy-green, with brown claws. When full-fed it becomes of a uniform green colour. The pupa is pale green.

Kenmuir, Glenelg.

Berwickshire.

## 5. N. LONGISERRA, Thoms.

Rare. Imago in May? Larva end of June. Food plant—*Salix aurita*. Glenelg.

I bred this species from larvae which at the time I took for those of *histrion*, and suspect therefore that they are similar.

## 6. N. FALLAX, Lep.

= *striatus*, Htg.

Common. Imago in June. Larva in July. Food plant—*Salix fusca*.

Larva: head glassy-green, dotted at the top with minute brownish dots, and on each side is a longish brown mark, in which are the eyes; another brown line is on the centre of the vertex. All these marks, however, become frequently united, so that the head becomes of a brown colour. The mouth is deep brown. A few hairs are scattered over the head.

Legs yellowish-green, claws brown. The body dark-grayish or whitish-green, with a faint white line along the sides, and marked also with some darker-green spots.

Possil Marsh.

Rannoch, Strath-Carron, above Ardgay.

Specimens from Possil are rather dark coloured; the abdomen is quite black, except at the extreme tip; the mesonotum bears three black marks. The mesonotum is quite black.

#### 7. *N. APICALIS*, *Htg.*

Rare. Imago in May. Larva unknown.

Cadder, Bishopton.

A black species, with more or less pale legs, mouth, anus, and alar nervures; seems to be the *apicalis* of Hartig, but there is a possibility that Hartig's insect may have been a black variety of *fallax* (= *humeralis*, Zett.), which our insect is certainly not.

#### 8. *N. CAPREAE*, *Pz.*

= *kirbyi*, Dbm., Thoms.

Abundant. Imago in May and June, and again in July. Larva in July and the autumn months. Food plants—carices and grasses.

The larva has the head of the size of the 2d segment; the ground colour is yellowish-green or gray; the vertex covered with small brown dots; eye-spots black, and above them is a small dark stripe, in the centre of the face a clear light green triangular space; the mouth brown. The body is cylindrical, rather thin, narrowed behind; the skin beset with small dots, each ending in a hair; the colour is dark-green to the spiracles, where there is a narrow white line, below which the colour assumes a lighter tint. The dorsal vessel is observed as a thin black line, bordered on each side by a white one of the same breadth. These are not visible on the 2d and last segments. The junction of the segments is marked by a white line. Over the legs the skin is raised in folds, like blisters; when full-fed the body becomes entirely green. A rather rare variety of the larva is of a crimson-red colour, with the usual white lines.

Loch Lomond, Troon, Kilsyth, Dunoon, Possil Marsh, Cadder, Milngavie, Paisley, etc., Touch Hills, Blair-Athole, Kintail, Loch Alsh, Loch Hourn, Skye, Oban.

Berwickshire, Rannoch, Aberdeen, Braemar, Sutherlandshire.

An extremely variable species, varying from almost all black to pale yellow, in both sexes. Ascends to nearly 2,800 feet.

#### 9. *N. IMPERFECTUS*, *Zadd.*

Rare. Imago in June. Larva unknown.

Cambuslang.

Craig Dhu, at a height of 1,200 feet.

10. *N. CANALICULATUS*, *Htg.*

= *stenogaster*, Foer. = *pleuralis*, Thoms.

Very rare. Imago in June. It was bred by Brischke from a larva indistinguishable from that of *Nematus umbripennis*, Evers., from aspen. The larva of *umbripennis* is stated to be slender, narrowed posteriorly, of a clear bluish-green colour, with shining head, black eye-spots, and dark mouth. The dark dorsal canal is bordered on each side by a thin white line, and another very thin white line is on the sides, at the spiracles. The segmental divisions are white. Sometimes the skin-folds over the legs bear two rows of fine black tubercles. At the last moult it becomes clear shining grass-green.

One specimen near Lairg, Sutherlandshire, on birch.

11. *N. PROBLEMATICUS*, *Cameron.*

Very rare. Imago in June. Larva unknown.  
Braemar (Dr White).

12. *N. HYPERBOREUS*, *Thoms.*

Very rare. Imago in June. Larva unknown.  
Braemar (Dr Sharp).

My specimens scarcely agree *in toto* with Thomson's description, but do not differ to such a great extent as to consider our species distinct.

13. *N. CLIBRICHELLUS*, *Cameron*, sp. n.

Male.—Antennae black, as long as the body, almost bare, slightly flattened, each joint drawn out to a truncated bead-like point at the apex, which is thicker than the base of the succeeding joint; the 4th joint is distinctly longer than the 3d, the rest become gradually shorter and thinner. Head black, sparsely covered with longish black hair; the vertex finely punctured; frontal area distinct; palpi black. Thorax smooth, shining, sparsely covered with long black hair; pleurae scarcely so shining as the mesonotum, punctured, and covered with long black hair; the cenchri are very pale white. Abdomen slightly punctured at base, the last segment, and the gaping anal lobes, sordid testaceous. Legs black; the coxae and base of tibiae sordid testaceous; the posterior tibiae totally black; the four anterior tarsi are longer than the tibiae; the posterior are also longer, but not so long in proportion as the anterior; spurs very short. Wings hyaline, nervures black, the costa and stigma sordid white; the 1st submarginal cellule is small, its nervure very pale; the second is almost double the length of 3d, and forms a very sharp angle where it receives the 1st recurrent nervure; the 3d is a very little widened at the apex. Tegulae black.

Length, a little more than 3 lines.

At the first examination I took this to be the undescribed male of

*hyperboreus*, but a closer examination showed so many points of distinction as scarcely to warrant such a conclusion. The pubescence, for instance, is shorter, blacker, and thinner; the tegulae are quite black, the legs much more darkly coloured, the costa and stigma are not so clearly white, the vertex has the puncturing more rugged, the labrum black.

Very rare. Imago end of June. Larva unknown.

One specimen on the top (at the cairn) of Ben Clibrich, Sutherlandshire (3,180 feet).

14. *N. UMBRINUS*, Zaddach.

Rare. Imago June. Larva unknown.

Rannoch.

15. *N. FURVESCENS*, Cameron.\*

Not uncommon on spruce. Imago in May.

Near Strathblane.

16. *N. LEUCOSTIGMUS*, Cam.†

Rare. Imago in June. Larva unknown.

Rannoch.

17. *N. ALNIVORUS*, Cam.‡

Common. Imago in May, June, and August. Larva unknown.

Possil Marsh, Cadder, St Germain's Loch, Kintail.

Rannoch, Braemar, Sutherlandshire.

18. *N. FULVIPES*, Fallén.

= *brevis*, Htg.

Rare. Imago in June. Larva (?) July. Food plant—*Salix aurita*.

Kintail.

According to Brischke and Zaddach's fig. 18, *op. cit.* pl. iii., the larva is pale-green, with the segmental divisions darker; the head marked with fuscous-black on the vertex at the sides, and a spot in the centre, while the anal segment is red. Apparently, also, the dorsal stripe is darker. Their description has not yet appeared.

19. *N. INTERSTITIALIS*, Cam.

Very rare. Imago in June. Larva unknown.

Probably Braemar.

20. *N. APPENDICULATUS*, Htg.

Not common. Imago in June. The green, slender larva in June and July. Food plants—*Ribes rubrum* and *R. grossularia*.

Braemar, Bonar Bridge.

\* Proc. Nat. Hist. Soc. Glas. ii., p. 309.

† *l. c.*, p. 308.

‡ Ent. M. M. xi., 107.

The specimen from Bonar Bridge has the femora nearly all black, instead of only the usual fuscous tinge in the middle. The slender, green, almost unicolorous larva is injurious to the currant and gooseberry bushes, according to the observations of Gimmerthal and Van Vollenhoven.

21. *N. FRAXINI*, *Htg.*, *sec. Thoms.*

Very common. The imago in May, and again in August. The larva in July and the autumn months. Double brooded. Food plants—birch, *Salix aurita*, and other willows.

Possil Marsh, Cadder, Kenmuir, Paisley Moss, Kilsyth, Touch Hills, Kintail.

Rannoch, Strath-Glass, Braemar, Bonar Bridge, Altnaharra.

The larva is green; the body long. The head is paler than the body, and has a line on each side, touching the eyes, but not uniting on the top, and another line goes down the centre of the face. The mouth is brownish. There are two blackish marks over the thorax, and another small one in front of the first pair of legs. The cocoon is spun in the earth; the pupa green. In some specimens the head is dotted all over with minute fuscous dots.

22. *N. PUNCTICEPS*, *Thoms.*

Rare. Imago in June. Larva unknown.

A specimen taken by Dr Sharp in Braemar seems to belong to this species. I have another specimen (a male) from Milngavie, which is probably the same.

23. *N. ABBREVIATUS*, *Htg.*

Very rare. Imago in June. Larva (?) July (May in Holland).

Van Vollenhoven says that it feeds on the apple, in the leaves of which it devours, when young, round holes in the centre, feeding in a curved position on the edge of the hole; when it becomes older, it feeds indifferently, on the edge of the leaf, or in any other part. Its colour is green, which has a yellowish tinge when the creature is young; when older, it becomes of a grayish-green along the back, the belly and legs being paler, and of a tint approaching to yellow. The head is of a faint brown tint, or very pale *feuille-morte*. The body is somewhat slender, smooth, hairless, a little narrowed posteriorly. On each segment are two rather thick folds, reaching to the spiracles; of these, that on the 1st segment only is conspicuous, being comparatively large, and bordered with black; the others are much smaller, and have white borders. The mandibles are brownish, eye-spots black. There are no abdominal legs on the anal segment.

Kaltenbach states that the larvae feed likewise on the pear, on which, in Switzerland, they appear in great numbers, and do considerable damage. Braemar (Dr Sharp).

24. *N. RUMICIS*, *Fall.*

= *capreae*, Htg.; *flavipennis*, Cam.

Not common. Imago in June and August. Larva on *Rumex obtusifolius*. It is dark-green, paler on the lower half of the body; the head pale-yellow. (?) Double brooded.

Bishopton.

Rannoch, Kingussie, Altnaharra, Berwickshire.

25. *N. OBDUCTUS*, *Htg.*

Not very common. Imago in May and June. Larva unknown.

Cadder, Possil, St Germain's Loch, Bishopton, Kintail.

Schiehallion, Braemar, Kingussie, Sutherlandshire, Berwickshire.

26. *N. CONDUCTUS*, *Ruthe.*

= *graminis*, Cam.

Common. Imago in June and August. Larva in July, August, and September. Double brooded. Food plant—grasses.

Cadder, Milngavie, Kilsyth, Ardlui, Cambuslang, Touch Hills, Arran.

Rannoch, Kingussie, Strath-Glass, Bonar Bridge, Dornoch, Glen Moriston, Kintail, Aberdeen, Braemar.

The larva has the head green, a little smaller than the second segment, flat in front, with a fuscous tinge, and a darker stripe down the centre; the eye-spots black, mouth brownish-black, the legs glassy-white; body cylindrical, grass-green, and covered with long hairs. A pale line runs down the sides. Pupates in the earth.

27. *N. LEUCOTROCHUS*, *Htg.*

= *punctulatus* (Dbm.) Thoms.

Not uncommon. Imago in June and July, among willows. Larva unknown.

Possil Marsh, Cannisburn, Bishopton, Kintail.

Rannoch, Braemar, Bonar Bridge.

28. *N. PALLIPES*, *Fall.*

Not common. Imago in June. Larva unknown.

Braemar, Rannoch; on mountain tops, at an elevation of upwards of 3,000 feet. At Rannoch, where I first discovered this species, I found on the mountain, on the spot where I caught it, a number of *Nematococcus* cocoons, in moss and grass, which may have been spun by *pallipes*.

29. *N. WHITEI*, *Cam.*, sp. n.

Rare.

Braemar (Dr White).

I only know the male of this species, but it is very distinct from anything described. It closely resembles *pallipes*, but the head is scarcely so

rugose; the labrum, clypeus, and palpi are quite black; the mandibles scarcely piceous; the pleurae not so much punctured, a little smoother, more pubescent; mesonotum shining; coxae, trochanters, and femora (except at the extreme apex) quite black, and posterior tarsi fuscous. Wings clear hyaline, costa and stigma fuscous, and the 3d submarginal cellule longer, more dilated at apex. The frontal sutures are not distinct, the apex of abdomen testaceous. In size they are nearly the same.

30. *N. MOLLIS*, *Htg.*

Not common. Imago in June. The larva, according to Saxesen, feeds on the pine.

Rannoch, Braemar.

31. *N. CRASSUS*, *Fall.*

Local. Imago in June. Larva uncertain.

Braemar, Kingussie (on aspen).

Thomson has split off from *Crassus* a species which he names *brachyacanthus*. They may be distinguished as follows:—

Coxae, trochanters, and spurs, black—*crassus*.

Coxae, trochanters at base, and spurs, red—*brachyacanthus*.

The larva of *brachyacanthus* is well known, but that of *crassus* remains to be discovered.

32. *N. MINIATUS*, *Htg.*

= *zetterstedti* (Dbm.) Thoms.

Rare. June.

Braemar (Dr White).

33. *N. MYOSOTIDES*, *Fab.*

= *papillosus*, Thoms.; *nec* Retz.

Very common. Imago in June and July. Larva August. Food plant—red clover.

Possil Marsh, Cadder, Kilsyth, Cambuslang, Paisley, Ardlui, Killin, Kintail, Lochalsh.

Blair-Athole, Perth, Rannoch, Kingussie, Aberdeen, Braemar, Bonar Bridge, Lairg, Golspie, Altnaharra, Dornoch, Berwickshire.

The larva is pale-green, with a paler dorsal line.

34. *N. ABDOMINALIS*, *Fab.*

= *ventralis*, Htg., Thoms.; *nec* Pz.

Not uncommon. Imago in June. Larva July and August. Food plant—alder.

Clober, Bishopton, Glen Moriston.

Braemar, Altnaharra, Rannoch, Kingussie, Berwickshire.

The larva has the head brownish-yellow, with black eye-spots, and dark

mouth organs. The body flat, the segments sharply separated, yellowish-green, the back being darker, and on each segment are four rows of white tubercles.

35. *N. LUTEUS*, *Pz.*

Very common. Imago early in June. Larva from July to September. Food plant—alder.

Banks of Kelvin, Cart, Clyde, Carron, and Loch Lomond (nearly everywhere), Glen Moriston, Glenelg, Caledonian Canal (in several places).

Perth, Blair-Athole, Rannoch, Loch Tummel, Kingussie, Glen Feshie, Aberdeen, Braemar, Bonar Bridge, Berwickshire.

The larva has the head obscure greenish-yellow, with a brown mouth, blackish eye-spots, and two brown marks on the vertex; it is covered with short hairs. The legs are light-green, almost hidden by the overhanging folds of the body; the claws are brown. The body is flat, tapering towards the end, its colour green, like the green of the alder leaf; the skin marked with tubercles; the dorsal surface is of a darker bluish-green, and the anus greyish.

36. *N. BILINEATUS*, *Klug.*

Not uncommon. Imago in June. Larva in July and August. Food plant—alder.

Clober, banks of Allander.

Rannoch, Glen Feshie, Braemar, Strath-Glass.

The larva, according to Brischke and Zaddach, is of similar form to that of *luteus*, but is slightly larger and broader. The head is yellowish, with two round brown spots on the vertex, the eye-spots shining black, and brownish mouth. The colour of the body is grass-green throughout, and each segment carries three cross rows of white tubercles, each of which ends in a whitish hair, and these are found also on the overhanging sides.

37. *N. DORSATUS*, *Cam.\**

Not uncommon. Imago in June. Larva in June, July, and August. Double brooded (?) Food plant—birch.

Bishopton, Kintail.

Rannoch, Braemar, Strath-Glass, Kingussie, Bonar Bridge, Altnaharra.

Description of full-fed larva.—Head brownish-red; mouth black; eyes situated in a longish black splash, which extends from the vertex. Body, to the middle of the sides, brownish-red, obscured with black, the black tint being deeper on the sides than on the back; the lower part of the sides and anal segment reddish-brown, without any black markings; the last segment hairy. The skin is smooth and shining; the legs reddish-white.

\* Ent. M. M. xii., 129.

38. *N. RIBESII*, Scop.

= *ventricosus*, Kl.

Too common everywhere. Imago in April and May, and again in July. Larva in May, June, August, and September. Food plants—gooseberry and red currant; also *Ribes alpinum* (at Stonelaw).

All over Scotland, and very destructive. The best remedy is careful and systematic hand picking, the larvae being burned or destroyed with boiling water.

39. *N. ALBIPENNIS*, Htg.

Not common. Imago in June. Larva unknown.

Dalry (Dr Sharp).

40. *N. BETULAE*, Retz.

Seemingly rare. Imago in May. Larva in June. Food plant—birch.

I have not yet seen a British specimen of the imago, but the larva I found in June on the Shin, Sutherlandshire, above the falls. It has a shining black head, with a sea-green body; below the spiracles, on the sides, are orange-yellow marks, almost touching each other, the anal segments being free from them. The body is likewise dotted over with little black marks.

41. *N. PAVIDUS*, Lep.

= *Wttewaalli*, Voll.

Not uncommon. Imago in May and June. Larva July, August, and September. Food plant—various willows.

Cadder Wilderness, Bishopton, Houston.

Rannoch.

The larva has the head deep black, the mandibles brownish. Legs yellowish-white, with a black spot at the commencement of the tarsi; claws black; claspers glassy-green. Body green, except the second and last segments, which are orange-yellow. A black line runs down the centre of the back; on each side are two black lines, slightly broader than the central one; below these again, there is another line of dots, arranged thus: in front is a large roundish dot, then two smaller ones, and then a larger one, while directly over the legs are two dots, placed one above the other, one longish, the other roundish. The orange segments bear no markings.

There are, I think, two broods in a year—one in the summer, and another in the autumn. The larvae are most destructive creatures, and often strip willows and osiers almost completely of their leaves. When they do occur, two or three dozen at least will be found on a bush, and not unfrequently I have noticed seven or eight feeding in a row on a leaf of *Salix caprea*. Possibly the larvae of *pavidus* are referred to under the name of *N. caprea*, in some of the Natural History periodicals, as having done great damage to osiers.

42. *N. MELANOCEPHALUS*, *Htg.*

= *salicis*, Thoms.; *nec* L.

Seemingly rare. Imago in May and June. Larva in autumn. Food plant—willows.

Berwickshire (Mr James Hardy).

Larva: head deep black, narrower than the 2d segment. Legs shining green; claws a little blackish. Body bluish sea-green. On the back, commencing at the 2d segment, is a row of small black dots going across, and on each side of the following segments are four small dots: on the edge of the back is a row of large and small black dots; below these are four large square orange spots, close to the spiracles; going through these orange spots is a row of black dots, two on each orange mark; immediately beneath the orange marks, and touching them, is another line of larger black marks; in front of the first leg is a y-shaped mark, and on each foot is a black side-mark on the femur, with a larger one between; over each of the abdominal legs are two black dots. In all, there are four rows of black marks.

43. *N. CROCEUS*, *Fall.*

= *fulvus*, H. = *trimaculatus*, Voll.

Not uncommon. Imago in May, June, July. Larva July to September. Food plant—*Salix caprea*, and other willows.

Cadder Wilderness, Clober, Kintail.

Rannoch, Aberdeenshire, Sutherlandshire (an immaculate specimen).

The larva has the head black, the mouth paler. The three thoracic and the three anal segments are reddish-orange, the rest of the body pale-green. On this green part are three rows of black dots, the 1st row almost continuous, the 2d more widely separated, there being only four on each segment; the 3d is composed of a smaller dot in front, placed a little higher up, and two long ones following each other in a line. There is also a black line over the legs. These black marks are irregularly placed, and much fewer on the orange-coloured segments, there being, however, a line across the back, while there is a large oval mark over the anus, joined to the black cerci.

When young they are dark-green, and the markings are not distinctly placed.

44. *N. CADDERENSIS*, *Cam.\**

Apparently common. Imago in June. Larva June, July, August, and September. Food plants—birch and willows (*Salix cinerea*).

Cadder, Devol's Glen (Port-Glasgow).

Kingussie, Rannoch.

Larva: head smaller than the second segment, the colour intensely

\* Ent. M. M. xii., p. 127.

black, the surface covered with a slight microscopic down, and slightly punctured, the sides of the mouth somewhat greenish. Legs glassy greenish-white, with black claws; the abdominal legs light green. The body, above, is of a beautiful dark sea-green colour, the lower half being whitish. On the sides are ten large oval orange spots, each divided by the folds of the skin into two parts, which are, however, closely continuous. Below the orange marks is a row of roundish, irregular dots, and below these again, and directly over the legs, is a row of oblong longish black spots. Over the orange marks is a line of close, continuous black dots, of irregular shape, but somewhat oval. These marks proceed from the 2d to the 12th segment. On the back, at the termination of the segments, are two rather roundish black dots. Directly over the anal segment is a large black spot, much larger than any of the others, and this segment is also beset with a few longish hairs. The cerci are black, white at the base.

The flies which I bred from the willow were much smaller and darker coloured, and the willow larvae had also a much brighter green colour. This is a very peculiar species. In the perfect state, the female cannot be separated from *N. croceus*; while the male (as Prof. Zaddach informs me) agrees perfectly with that of *N. miniatus*, a very different insect as regards the female. The larva again very closely resembles that of *N. melanocephalus*.

#### 45. *N. PALLESCENS*, Htg.

Not uncommon. Imago end of June. Larva August. Food plant—*Salix cinerea*.

Caddis, Kintail.

Braemar.

Larva: head roundish, of a translucent whitish-gray colour, and covered with longish white hairs; the eye-spots black; the mouth brown; the tips of the mandibles black. Legs white, with the claws faintly brownish, claspers white; there is a line of black dots over the legs. Upper part of the body whitish, assuming a greenish tinge when the food canal is filled; the lower half is whiter than the upper, and the skin is covered with tubercles, each ending in a hair. The body is rather flattish.

#### 46. *N. MILIARIS*, Pz.

= *viridis*, Ste.; *virescens*, Htg.

Abundant everywhere. Imago in May, June, July, and August. Larva end of June and July, and August and September. Double brooded. Food plants—birch, alder, and various willows.

The larva is cylindrical, about 9 to 10 lines long. The head is shining, grass-green, thinly covered with hairs; the eyes are situated in a black line, which extends to the top and a little below them. The vertex is sparingly covered with minute dots; the mouth brownish; mandibles brown, black at the tips. Legs glassy yellowish-green, slightly hairy;

claws brown; over the legs is a curved black line. The body is grass-green, with a black line on each side at the top, and directly over the legs the folds of the skin are marked with black lines. The upper lines end, or become very faint, at the 10th segment. The anal segment is hairy, the tip often reddish, and bears two small cerci.

A variety is also found with a white side stripe, and another with a faint reddish dorsal line, and one is found on birch, with a double row (one on each side of the food canal) of red square marks.

A saw-fly, not distinguishable from *N. miliaris*, I have bred from a differently marked larva to the above, which agrees more or less with Van Vollenhoven's description. This larva had the head green, with a yellowish line; there was a blackish stripe on each side, at the end of which were the eyes; another line went down from the vertex to the middle of the face, and the upper part was covered with small brown dots; the mouth was brown. Legs grassy-green, with brownish claws. The body green. Over the legs was a black line; the skin much wrinkled, and marked with irregular black lines; at the sides the wrinkles are rather raised, and edged with black. The back is also marked with black, the centre being much lighter. Found during August and September (especially the latter), feeding on *Salix caprea*, in Cadder Wilderness.

#### 47. *N. PALLIATUS*, Thomson.

Not uncommon. Imago in June. Larva August. Food plants—*Salix vitellina* and *S. cinerea*.

Cadder, Possil Marsh, Bishopton, Loch Ranza, Arran.  
Kingussie.

The larva has the head pale orange, which is palest at the sides, and there is a pale ring in the centre of the face; eye-spots black, surrounded by a dark brown ring. Legs pale green; the claws of a paler green colour than the legs. Upper half of the body dark green, the lower half is paler; and directly over the legs is a dark line of scarcely continuous dots, or in most cases there is one large mark on each segment.

Another larva had the head light brown, the eyes situated in a black spot; there is a broad black spot on the vertex, touching the body; the mouth is dark brown. Legs white, the claws brown; at the base the legs are marked with black, and there is a black stripe in front of the 1st abdominal pair. The body is pale green, with a white line on the sides; below this white line the body is much paler.

#### 48. *N. LACTEUS*, Thoms.

Not common. Imago in June, August. Larva ——— ? Food plant—sallow (*teste* J. E. Fletcher).

Possil, Lambhill, Cadder.

Possibly *N. palliatus* and *N. lacteus* (as is certainly the case with *N. bergmanni*, *N. brevivalvis*, *N. microcerus*, *N. curtispinus*, and *N. virescens*

of Thomson) are only varieties of *N. miliaris*. The subject, however, requires further elucidation before a definite opinion can be given. The extreme variability of the larvae of *miliaris* is curious. The two varieties I have described appear to be mainly autumnal forms, although possibly they may also occur in the summer.

49. *N. XANTHOGASTER*, *Foerster*.

= *piliserra*, Thoms.

Rare. Imago on 7th July. Larva in the autumn. Food plants—*Salix cinerea*, *aurita*, *viminialis*.

Possil Marsh (one specimen).

The larva rolls down the edges of the willow leaves.

50. *N. SHARPI*, *Cam.\**

Rare. Imago in June. Larva unknown:

Taken in Scotland by Dr Sharp. Exact locality unknown.

51. *N. CRASSULUS*, *Dbm., Thoms.*

Common. Imago in June. Larva July to September. Food plants—*Salix vitellina*, etc.

Possil, Cadder, Milngavie, Kintail, Strath-Glass.

Braemar, Aberdeen, Sutherlandshire, Rannoch.

Like the last, this species is a leaf-roller in the larval state (see Proc. Nat. Hist. Soc. Glas. ii., 313).

52. *N. STRONGYLOGASTER*, *sp. n.*

Antennae longer than the body, black, bare, tapering towards the apex, the 3d joint longer than the 4th. Head narrower than the mesothorax, black, the eyes surrounded with a pale brown band; clypeus and labrum white; the tips of the mandibles piceous; vertex shining, coarsely punctured; the frontal area distinct; front broad; antennal fovea large, deep; antennae widely separated; clypeus deeply and broadly emarginated; palpi long, fuscous. Thorax black, shining; mesonotum with a few fine punctures; pronotum broadly edged with white; pleurae half-shining, punctured; the tegulae white. Wings ample, longer than the body, iridescent, hyaline, with a fuscous tinge; the costa and stigma testaceous; the 1st submarginal nervure is somewhat faint in the middle; the 2d recurrent nervure is received about the length of the 2d submarginal nervure in front of the same; the 3d submarginal cellule is longer than broad, widened at the apex. Legs long, testaceous; the coxae, trochanters, and base of femora white; apex of posterior tibiae and all the tarsi fuscous-black. The hinder tarsi are longer than the tibiae, which are deeply grooved. Abdomen not much longer than the head and thorax,

\* E. M. M. xii. 191.

broad, broadly rounded at the apex; cerci long, pale; the dorsum of the abdomen is black, the extreme apex, sides, and belly are testaceous; saw broad, the sheath black at apex, hairy, projecting.

Length  $2\frac{3}{4}$  lines.

In its general coloration *N. strongylogaster* closely resembles *leucotrochus*; but the antennae are longer in proportion to the length of the body; the eyes are broadly surrounded with brown; the clypeus white; the stigma and costa are of the same colour, the costa not being paler than the stigma, as in Hartig's species; the 2d recurrent nervure is received much farther from the 2d submarginal, while the abdomen is much shorter. It is also not unlike, at a first glance, some of the darker forms of *umbrinus*, but the abdomen is shorter, and not keeled, neither is it so sharply pointed at the apex; the costa and stigma are paler, and the incision in the clypeus is deeper and broader.

I forwarded this insect to Prof. Zaddach, who returned it with the remark, "Nahe an *viminalis* und *Einersbergensis*."

Seemingly rare. I have taken one specimen in Kilsyth Glen, and another near Cannisburn.

#### 53. *N. VESICATOR*, *Bremi*.

Not common. Very local. Imago in May. Larva in July. Food plant — *Salix laurina*.

Rannoch.

Forms large, oval, bladder-like galls, with a spacious internal cavity. Generally they are nearly of the same colour as the willow leaf, but occasionally specimens more or less marked with red are met with.

#### 54. *N. VOLLENHOVENI*, *Cam.\**

Common. Imago in May. Larva June to October. Forms smooth, green (with rosy cheeks) pea-shaped galls on *Salix purpurea*.

Banks of Clyde, Allander, Kelvin (upper reaches), and Cart, Bishopton, Loch Lomond.

Rannoch, Aberdeenshire.

I sent specimens of this species to Prof. Zaddach, without remark, beyond mentioning the form of the gall, asking if they were the species known on the Continent as *N. viminalis*. He has kindly replied that they differed much from typical specimens, and he could scarcely regard them as *viminalis*.

#### 55. *N. PEDUNCULI*, *Htg. (?)*

Common. Imago in June. Larva, in pale green hairy galls, on *Salix aurita*, from July to September.

\* "Scottish Naturalist," ii. 296.

Cannisburn, Cadder, Clober, Strathblane, Kilsyth, Carron Valley, Gleniffer, Dalry.

Glen Lyon, Rannoch, Braemar, Sutherlandshire.

In forming hairy pea-shaped galls, this species agrees with *N. pedunculi*, Htg., but does not agree quite with the description of that insect in the perfect state. Possibly it is a new species. Prof. Zaddach was unable to give me any definite information about it, beyond stating that it neither agreed with the description of Hartig's *pedunculi*, nor with Thomson's *cinereae*.

56. *N. FEMORALIS*, *Zad.*

Local. Imago in May. Larva in long, roundish, oblong, or oval galls, of a dark purple or pink above, and pale green colour beneath, placed in pairs on the leaves of *Salix laurina*. According to the plate in Brischke and Zaddach's work (pl. iii., f. 10), this is the same as *N. ichnocerus*, Thoms., but I am by no means sure about this.

Rannoch, Braemar.

57. *N. GALLICOLA*, *West.*

= *vallisnieri*, Htg.

Abundant everywhere. Imago in May. Larva in reddish bean-shaped galls, on *Salix fragilis*, *S. alba*, and *S. caprea*, from the end of June to October.

58. *N. BACCARUM*, *Cam.\**

Very rare. Imago in May. Larva in pale hairy galls, on *Salix aurita*, in the autumn.

Dunkeld.

59. *N. HERBACEAE*, *Cam.†*

Local. On mountain tops, from 2,000 to 3,800 feet elevation. Imago in June. Larva in roundish, oval, or oblong berry-shaped galls, of a green colour, often more or less marked with red, from the end of June to the middle of August, on *Salix herbacea*.

Ben Ledi, Ben Lawers, "Garyvel," Rannoch, Braemar, Ben Laoghal, Sutherlandshire, (?) Orkney (Reuter).

60. *N. VACCINIELLUS*, *Cam.‡*

Rare and local. Imago in May. Larva in July, in pale green berry-shaped galls, on *Vaccinium vitis-idaea*.

Rannoch.

\* Ent. M. M. xii. 189.

† Proc. Nat. Hist. Soc. Glas. ii., p. 307, *et seq.*

‡ Ent. M. M. xii. 190.

The gall-making saw-flies stand much in need of a thorough revision. In the present conflicting state of the descriptions and nomenclature, it is almost impossible to identify our species with any certainty. And a revision, to be of much use, must embrace all the North European species; not only a comparison of the various descriptions, but also an examination of large series of bred specimens from all parts of the Continent.

## CRYPTOCAMPUS, Hartig.

## 1. C. PENTANDRAE, Retz.

= *medullarius* and *populi*, Htg.

Common, but rather local. Imago in May. Larva in large, irregular, more or less globular galls, on the twigs of various willows.

Kilpatrick hills, Dalry, Dumfries (Dr Sharp).

## 2. C. SALICETI, Fall.; sec. Thoms.

= *mucronatus*, Htg.

Very common. Imago in May. Larva in the young twigs of various willows.

Cannisburn, Milngavie, Gleniffer, Dalry, Glen Moriston, Kintail.

Rannoch, Glen Lyon, Braemar, Kingussie, Strath-Glass, Sutherlandshire (Altnaharra and Bonar Bridge).

This species varies very much in the coloration of the legs, and also in the antennae and mouth. The form with the legs entirely pale, *i.e.*, without any black markings, is the rarest.

## 3. C. ANGUSTUS, Htg.

Not so common, but of similar habits to *saliceti*.

Rannoch.

## CIMBICINA.

## C I M B I C I D E S.

## CIMBEX, Oliver.

## 1. C. SYLVARUM, Fab.

= *betulae*, Zaddach.

Common in June. Larva from end of July to September, on birch.

Clober, Bishopton, Paisley.

Rannoch, Glen Lyon, Braemar, Kingussie, Strath-Glass, Lairg, Sutherlandshire.

## 2. C. FEMORATA, Fab.

Rare. Imago in June. Larva in the autumn, on *Salix*.

Rannoch.

## TRICHIOSOMA, Leach.

1. T. LUCORUM, *Lin.*

Very common. Imago in June. Larva from July to October, on birch. Cadder, Clober, Paisley, Bishopton, Kilsyth, Glenelg.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge, Altnaharra.

This species varies in having the sides of the abdomen and the belly more or less of a testaceous colour.

2. T. VITELLINAE, *Lin.*

= *lateralis*, Leach.

Not common. Imago early in June. Larva at end of July and in August, on *Salix aurita*, *S. caprea*, etc.

Clober.

Rannoch.

3. T. BETULETI, *Kl.*

= *crataegi*, *Zad.*

Not very common, and rather local. Imago in June. Larva in August, on *Crataegus*.

Cannisburn, Paisley.

Perth, Rannoch.

4. T. SORBI, *Htg.*

Rare. Imago in June. Larva in August and beginning of July, on *Pyrus aucuparia*.

Strath-Glass, Rannoch, Braemar.

## A B I I D E S.

## ABIA, Leach.

1. A. SERICEA, *L.*

Very common. Imago in June. Larva in August and September, on *Scabiosa succisa*.

Possil Marsh, Clober, Paisley, Bishopton, Glenelg.

Rannoch, Braemar, Kingussie, Strath-Glass, Bonar Bridge.

*Obs.* Thomson (Hymen. Scand. i., 27) has adopted the name of *nitens* for this insect, which, according to him, is the male of *L. sericea*. *Zad-dach*, on the other hand, retains the name of *sericea* for it, and applies *nitens* to another species—*A. splendida*, *Kl.* = *brevicornis*, *Leach.* Linne's description is ambiguous; but I scarcely think that he had *splendida* in view, because that insect is very rare, and is not, so far as I can ascertain (beyond the doubtful description of Linne's), a native of Sweden; is certainly a southern insect.

2. A. FASCIATA, *Lin.*

Rare. Imago in July. Larva in the autumn on *Lonicera*, *Viburnum*.  
Clobber Wood.

## HYLOTOMINA.

## HYLOTOMIDES.

HYLOTOMA, *Lat.*1. H. ENODIS, *L.*

= *atrata*, Kl. = *nec enodis*, Kl.

Rare. Imago end of May. Larva end of July, on *Rubus idaeus*.  
Cadder.

2. H. USTULATA, *L.*

Common. Imago in June. Larva in August, on birch.

Cadder.

Rannoch, Braemar, Kingussie, Strath-Glass, Lairg, Berwickshire.

3. H. CILIARIS, *Lin.*

= *caerulea*, Kl.

Imago in June. Larva unknown.

Dalry.

## SCHIZOCERIDES.

CYPHONA, *Dahlbom.*1. S. GEMINATA, *Gmel.*

Very rare. Imago in June, among *Rumex*. Larva unknown.  
Strath-Carron, about 4 miles from Bonar Bridge Station.

## LOPHYRINA.

## LOPHYRIDES.

LOPHYRUS, *Latr.*1. L. VIRENS, *Kl.*

Rare. Imago in June. Larva in the autumn, on Scots fir.  
Rannoch, Braemar.

2. L. PALLIDUS, *Kl.*

This species is said by Stephens (Ill. Brit. Ent. vii., p. 21) to have been bred  
by Dr Leach from larvae obtained at Oban; but the specimens in Stephens'

collection in the British Museum appear to me to be *rufus*. Possibly, however, these may not have been Leach's specimens, for Stephens records the insect from an English locality, and Mr C. W. Dale of Glanville's Wootton, tells me that he has specimens of *pallidus*, taken by Curtis in Scotland.

### 3. L. FRUTETORUM, Kl.

Rare. Imago in June. Larva on Scots fir.  
Rannoch<sup>†</sup>(Mr Hislop).

### 4. L. PINI, Lin.

Abundant. Imago early in June. Larva from end of July to end of September, on Scots fir.  
Cadder, Lambhill, Paisley, Bishopton, Houston.  
Perth, Rannoch, Braemar.

### 5. L. PALLIPES, Fall.

Acta Holm., 1808, 41, 4-5 = *elongatulus*, Kl.  
Rare. Imago in June. Larva on Scots fir.  
Rannoch, Braemar.

## L Y D I N A.

### LYDA, Fab.

#### 1. L. ERYTHROCEPHALA, Lin.

Rare. Imago in June. Larva in autumn, on Scots fir.  
Rannoch.

#### 2. L. NEMORALIS, Lin.

Syst. Nat. Ed. x., 558, 29 = *pratensis*, Fab.  
Common. Imago in June. Larva in autumn, on Scots fir.  
Paisley Moss.  
Rannoch, Braemar, Glen Feshie.

#### 3. L. SYLVATICA, Lin.

Rare. Imago in July. Larva on poplar and *Salix caprea*.  
Cadder.

#### 4. L. ARBUSTORUM, Fab.

Rare. Imago in June, on rose. Larva unknown.  
Rannoch, at Camachgouran (one individual).

5. *L. DEPRESSA*, *Schr.*

Common. Imago in June and July. Larva on alder and birch.  
Cadder, Clober, Kilsyth Glen.  
Loch Ranza, Arran, Rannoch, Braemar.

*X Y E L I N A*.

*X Y E L A*, Dalman.

1. *X. PUSILLA*, *Dal.*

Seemingly very rare. Imago in July. Larva in old willows.  
"South of Scotland." Stephens, Ill. vii. 109.

*C E P H I N A*.

*CEPHUS*, Latr.

1. *C. PALLIPES*, *Kl.*

= *cultrarius* Htg. = *immaculata*, Ste.

Rare. Imago in summer. Larva unknown.  
Berwickshire (Mr James Hardy).

## A D D E N D A.

At page 17, add—

6<sup>a</sup>. *D. PALMATUS*, *Kl.*

Very rare. Imago in June.  
Dalry (Dr Sharp).

At page 18, add—

8<sup>a</sup>. *D. CENCHRIS*, *Htg.*

Common. Imago in June. Larva on grasses, in July.  
Kenmuir, Cadder, Kintail.  
Rannoch, Braemar.

8<sup>b</sup>. *D. CARBONARIUS*, *Zad.*

Very rare. Imago in June.  
Braemar (Dr Sharp).

## E R R A T A.

At page 2, in table, for *LOPHYRIDINA*, read *LOPHYRINA*.

At page 11, for *TENTHREDRINA*, read *TENTHREDINA*.

At page 17, for *D. FULIGINOSUS*, read *D. ULIGINOSUS*.

At page 18, for *D. GIBBOSUS*, read *D. ELONGATUS*, *Thoms.*

At page 27, for *NEMATIDINA*, read *NEMATINA*.

D

COMPARATIVE TABLE OF THE DISTRIBUTION OF THE SCOTCH TENTHREDINIDAE.\*

GENERA.	Number of Western Species.	Number of Eastern Species.	Number of Species peculiar to the West.	Number of Species peculiar to the East.	Number of Clydesdale Species.	Number of Species common to East and West.
Tenthredo - - -	17	16	3	2	16	14
Perineura - - -	4	3	1	...	4	3
Synaerema - - -	1	...	1	...	1	...
Macrophya - - -	2	2	1	1	1	1
Pachyprotasis - - -	3	3	...	...	2	3
Allantus - - - -	2	1	1	...	2	1
Sciopteryx - - -	...	1	...	1	...	...
Athalia - - - -	3	3	1	1	3	2
Dolerus - - - -	12	10	4	2	11	7
Strongylogaster - -	4	3	1	...	4	3
Poecilosoma - - -	3	4	...	1	2	3
Taxonus - - - -	3	3	1	1	3	2
Emphytus - - - -	7	7	1	1	7	6
Phyllotoma - - - -	3	3	...	...	3	3
Fenusa - - - -	7	3	4	...	7	3
Coenoneura - - - -	1	...	1	...	1	...
Selandria - - - -	5	5	...	...	5	5
Eriocampa - - - -	2	4	...	2	2	2
Blennocampa - - -	12	? 11	4	3	12	8
Hoplocampa - - - -	3	1	2	...	3	1
Dineura - - - -	4	4	...	...	4	4
Hemichroa - - - -	2	2	...	...	2	2
Camponiscus - - -	1	1	...	...	1	1
Cryptocampus - - -	2	2	1	1	2	1
Nematus - - - -	39	50	10	21	27	29
Croesus - - - -	3	2	1	...	3	2
Cladius - - - -	4	5	1	2	4	3
Cimbex - - - -	1	2	...	1	1	1
Trichiosoma - - - -	3	4	...	1	3	3
Abia - - - -	1	1	...	...	1	1
Zaraca - - - -	1	...	1	...	1	...
Hylotoma - - - -	3	1	2	...	3	1
Cyphona - - - -	...	1	...	1	...	...
Lophyrus - - - -	2	4	1	3	1	1
Lyda - - - -	3	4	1	2	3	2
Xyela - - - -	...	? 1	...	? 1	...	...
Cephus - - - -	...	1	...	1	...	...
	163	168	44	49	146	119

\* Compare also the table on p. 10. Of course it only shows our present knowledge. Further investigation will, without doubt, lead to numerous discoveries of new localities, or of species new to Scotland. The watershed is made the basis of the separation of the east and west.

POSTSCRIPT.—Since the part of this Catalogue relating to *Perineura*, p. 14, has been put in type, I have looked into the nomenclature of this group, with the result that my conclusions do not coincide with those of Thomson, not indeed as to the distinctness of the species, but simply as to what names they should bear. According to my views the nomenclature should be as follows, taking the species as arranged at p. 14.

1. *P. dimidiata*, Fab., female = *coquebertii*, Klug; *varia*, Gmel.; *analis* Ste., *caliginosa*, Ste., *microcephala*, Ste.; *nassata*, Thoms.; *nec* Lin.

2. *P. scutellaris*, Fab. = *stigma*, Fab.; *ambigua*, Kl.; *neglecta*, Lep., *spretta*, Lep.; *pavida*, Fab.; *brevispina*, Thoms.

3. *P. nassata*, Lin. = *melanochroea*, Gmel.; *sordida*, Kl., (*forte*) Thoms.

4. *P. excisa*, Thoms. = *ornata*, Lep.

What Thomson regards as the male of *P. dimidiata* is, as I take it, in reality, the male of *T. nassata* Lin. (female), the real male of *dimidiata* being *T. coquebertii*, Kl. This seems to be also the opinion of St. Fargeau, Stephens, and others.

*P. nassata* is a puzzling form, and its synonymy is not easily traced with certainty, from the vagueness of most of the descriptions. The probability is, that there is more than one species of a yellowish colour. The form with a black stripe on the abdomen has generally the inner orbits of the eye only very faintly white and sometimes not at all, while the 2d recurrent nervure is received behind the 2d submarginal. Another variety occurs without any black on the body, with the 3d submarginal cellule shorter, the 2d recurrent interstitiate, the orbits of the eyes, too, having a broad white rim. A similarly marked aberration is met with having the neuriation as in the type.

I have taken a large form (nearly 7 lines in length), with the colour of a deeper red, no white round the eyes, the base of the antennae marked with black, and the apex of the 1st, nearly the whole of the 2d and the 3d abdominal segments black on the dorsal surface, the pleurae, too, being more punctured and opaque than in the smaller form; the 2d recurrent nervure is interstitiate. This is the rarest variety (if variety it be), and what I take to be its male, has a large semi-circular emargination on the last abdominal segment; the antennae are yellowish except the two basal joints, underside of the body yellowish, mesonotum black, with yellowish spots, while the head is yellow, except a large black mark on the vertex. The pleurae are whitish, as are also the apical joints of the posterior tarsi. Length  $6\frac{1}{4}$  lines. This appears to be what Thomson describes as the male of *dimidiata*, whose true male he does not seem to have noticed. His male *sordida* is, I think, only a light coloured aberration of *scutellaris*, whose male is very inconstant in coloration.

Klug's *sordida* has the stigma brown. This does not agree with the small form (length 5-6 lines) of *nassata*, which has it half fuscous, half white. As the Fabrician description is perfectly recognisable, I see no reason why Thomson's new name of *brevispina* should be adopted; to

do so would only further increase the confusion in which the species are placed already. If I mistake not, Thomson's *excisa* is the same as *ornata*, Lep. (Mon. 77, 228). I will conclude this note by giving a synopsis of our species:—

A. Clypeus truncated at the apex.

1. Body yellowish-brown without any red on abdomen and legs.

*nassata.*

2. Body black with red on abdomen and legs.

Apex of abdomen red (rarely black), calcaria long, male with abdomen red from the 2d segment; hind tibiae and femora black.

*dimidiata.*

Abdomen with a broad red band in the middle; calcaria short. Male with the last abdominal segment not emarginated.

*scutellaris.*

B. Clypeus with the apex incised, pleurae somewhat punctured; abdomen with the 2d to 7th segment red.

*excisa.*

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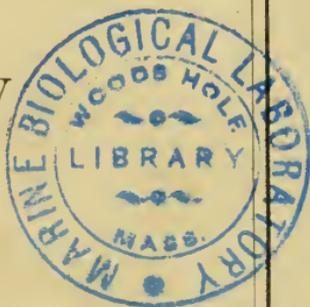
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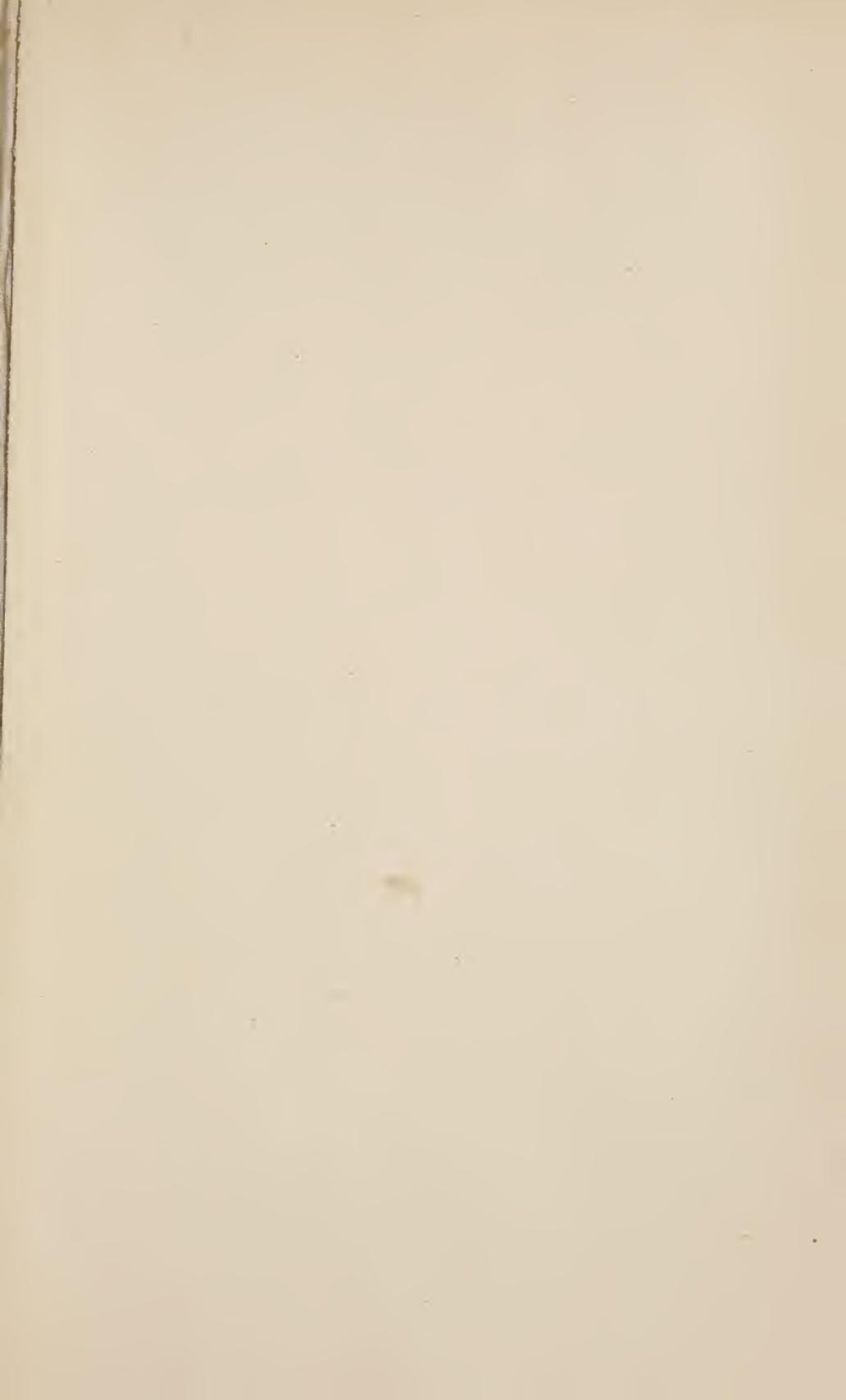
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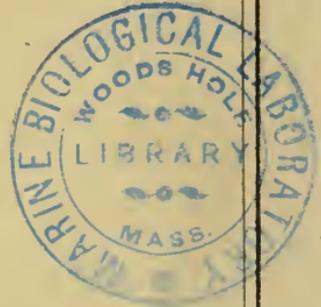
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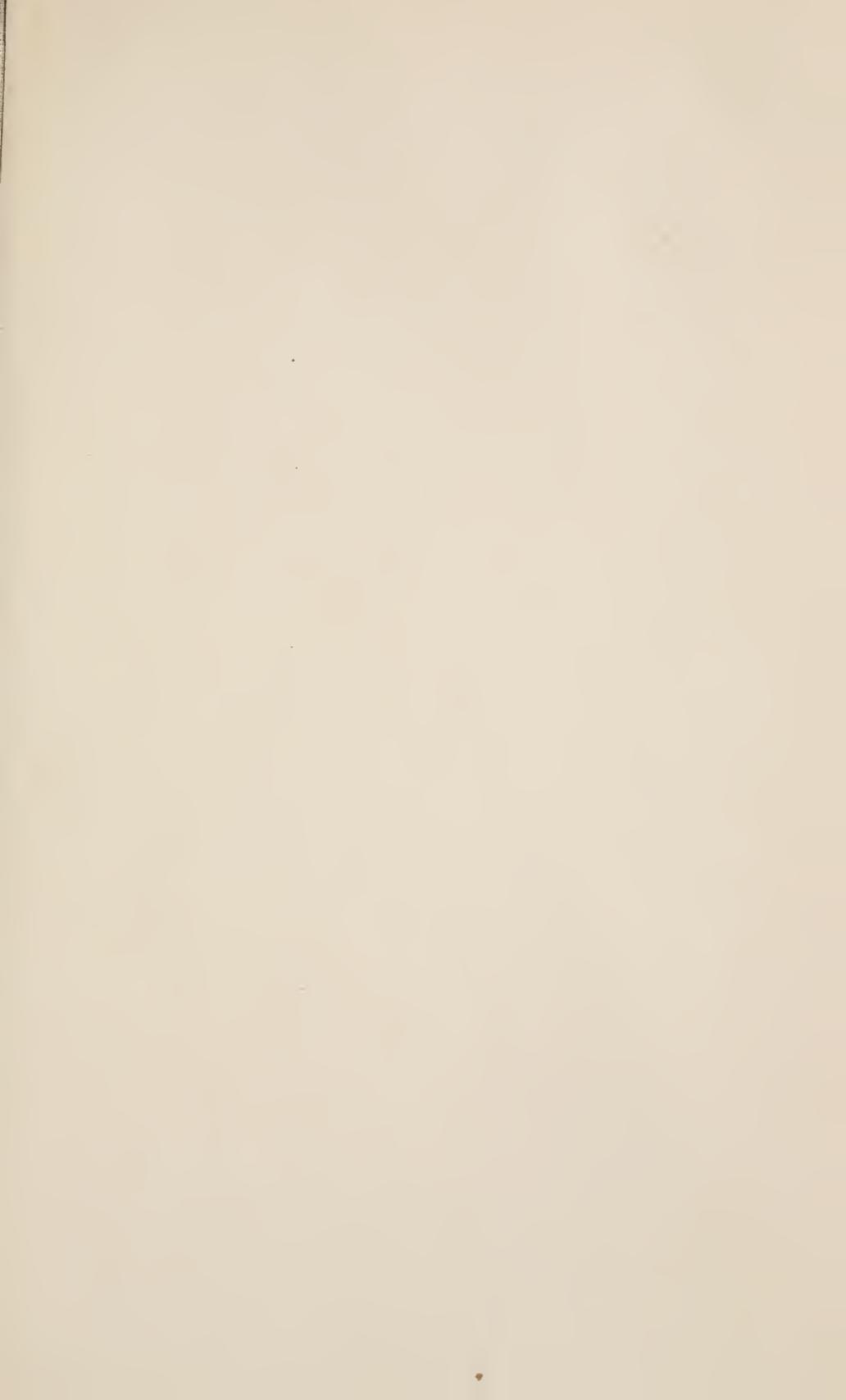
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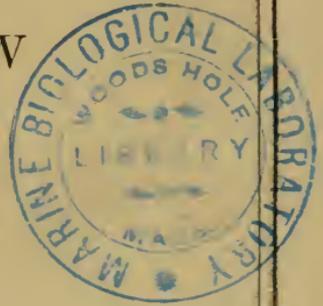
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