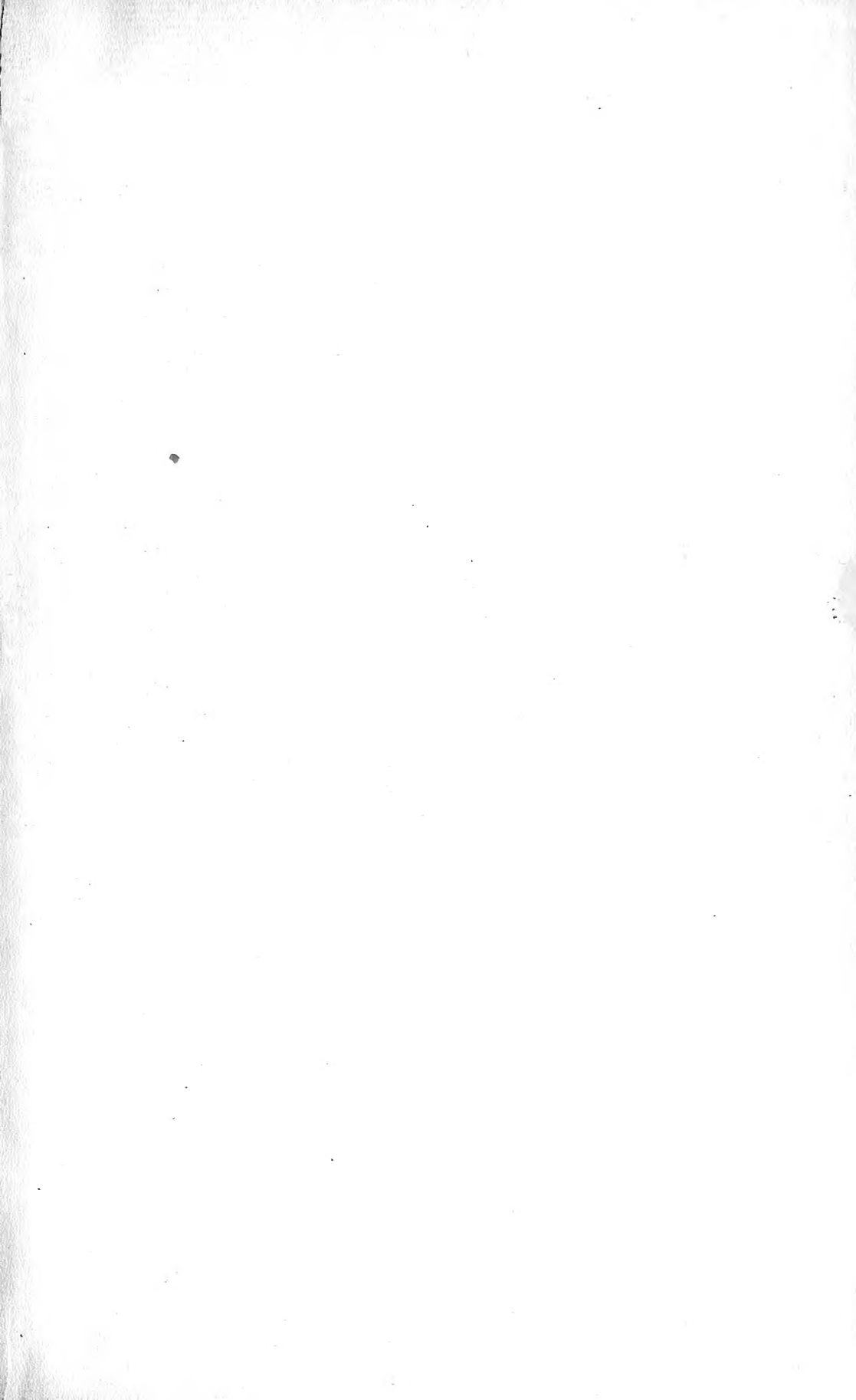




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# ROYAL IRISH ACADEMY

VOLUME XXXI

SECTION 2



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A BIOLOGICAL SURVEY  
OF  
**CLARE ISLAND**  
IN THE COUNTY OF MAYO, IRELAND  
AND OF THE ADJOINING DISTRICT

SECTION 2

(COMPRISING PARTS 17 TO 47)

ZOOLOGY (VERTEBRATA, MOLLUSCA, ARTHROPODA,  
POLYCHAETA).

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## ADDENDA AND CORRIGENDA TO SECTION 2.

### 19.—PISCES.

The following three species should be added to the list:—

**Aphia pellucida**, Nardo.—This species was taken in the trawl, in 2–3 fms., off Coastguard Bay, Ballynakill Harbour.

**Arnoglossus megastoma** (Donov.).—Taken in 17–18 fathoms, Clew Bay, by Holt (Survey of Fishing Grounds on West Coast, 1892).

**Raia microcellata** (Mont.).—Two specimens were taken in  $1\frac{1}{2}$ –2 fathoms, in Blacksod Bay, by Holt (*tom. cit.*).

G. P. FARRAN.

### 22.—MARINE MOLLUSCA.

The following four species are to be added:—

**Loligo Forbesi** Steenstrup.—Taken in the trawl in 16–19 fathoms, on a stony bottom, one mile east by south of Clare Island lighthouse.

**Archidoris testudinaria** Risso. (*Doris stellifera*), von. Jhering.—Dredged in 5 fathoms on stony ground just off the Harbour, Clare Island.

**Aegires punctilucens** (d'Orbigny).—Found on Laminaria roots taken in the trawl in 13–16 fathoms, three miles east by south of Clare Island lighthouse.

**Nucula tenuis** (Montagu).—Dredged in 1–4 fathoms in Inishgowla Harbour, Clew Bay.

### 23.—LAND AND FRESH-WATER MOLLUSCA.

page 33. Add *Acicula lineata* to list of mollusca of Inishturk.

page 34. ll. 8–9, delete 'and *Acicula lineata*.'

A. W. STELFOX.

### 24.—HYMENOPTERA.

The following seven additional species were obtained since the publication of Mr. Morley's report. The four marked with an asterisk appear to be new to Ireland. A reference is added relating to an interesting abnormal specimen of *Myrmeca rubra* which was also obtained.

#### HETEROGYNA.

**Leptothorax acervorum** Fab.—A nest of this ant was found under stones in the Mulranny district in September (Halbert).

**Myrmica rubra** ab.—See "Irish Naturalist," 1914, p. 94.

## ICHNEUMONIDAE.

## Ophioninae.

**Omorgus ensator** Grav.—Clare Island, a ♂ taken in June. Mainland, one specimen on dwarf willows, Curraun Achill (Johnson).

\* **O. borealis** Zett.—Mainland, Polranny (Johnson).

\* **Angitia apostata** Ratz.—Clare Island, a ♂, in June, 1911 (Johnson).

**Ephoropsis viennensis** Grav.—Clare Island, taken in September, 1910, and June, 1911 (Johnson). A very small form.

## Braconidae.

\* **Bracon triangularis** Nees.—Mainland, Achill Sound, taken in June, 1910 (Johnson).

\* **Rhogas circumflexus** Nees.—Clare Island, a ♀ taken in September, 1910 (Johnson).

W. F. JOHNSON.

## 28.—TERRESTRIAL COLEOPTERA.

Page 9, column 2, l. 5, *delete* "ater Mann—Cb." See note on page 18 under *Stenus Juno* f.

Page 10, column 2, l. 1, *for* *Enicmus read* *Corticaria*.

Page 11, column 2, l. 10 from bottom *for* *marginella L. read* *Hydrothassa marginella L.*

Page 13, column 1, l. 10 *for* *Lythri F. read* *Nanophyes Lythri F.*

W. F. JOHNSON.

The following seven species are to be added:—

**Oxygoda alternans** Grav.—Mulranny, in fungi.

**Leptusa fumida** Er.—Achill, in moss.

**Alianta plumbea** Waterh.—Found on the sea-shore at Mulranny in September.

This littoral species has not been previously recorded from Ireland.

**Syntomium aeneum** Müll.—Achill, in moss.

**Homalium vile** Er.—Achill and Mulranny.

**Choleva tristis** Panz.—Mulranny.

**Bythinus puncticollis** Denny.—Achill, in moss.

J. N. HALBERT.

## 33.—CHILOPODA AND DIPLOPODA.

p. 4, l. 10 from bottom, *for* Wicklow (The Dargle) *read* Kerry (Dingle).

p. 5, l. 3, *to* Berehaven *add* Glengarriff.

By an accident, a tube of material collected by Dr. Scharff, Mr. Welch, Mr. Foster, and Mr. Southern was not sent to me from the National Museum. Its contents were worked out by Mr. Selbie, and are given below. The species marked † are additions to the previous list.

## CHILOPODA.

**Lithobius variegatus** Leach.—Achill and Curraun (R.F.S.). Louisburgh (N.H.F.).

**Lamyctes fulvicornis** Meinert.—Near Mweelrea (R.W.).

†**Geophilus truncorum** Meinert.—Achill.

†**G. electricus** Linné.—Westport (N.H.F.).

## DIPLOPODA.

**Glomeris marginata** Villers.—Westport and Louisburgh (N.H.F.). Achill (R.W.).

**Brachydesmus superus** Latzel.—Louisburgh (N.H.F.).

†**Polydesmus coriaceus** Porat.—Clare Island.

†**Blaniulus venustus** Meinert.—Westport.

**Iulus luscus** Meinert.—Louisburgh (N.H.F.). Achill (R.F.S.). Blacksod Bay (R. Southern).

†**I. fallax** Meinert.—Louisburgh (N.H.F.).

**I. punctatus** Leach.—Achill (R.W.).

†**I. pusillus** Leach.—Louisburgh (N.H.F.).

W. F. JOHNSON.

## 40.—DECAPODA.

The following ten species should be added to the list:—

**Leander adpersus** (Rathke).—Common in the Prawn Pool, Bunnamullen, Inishbofin. (*Vide* Kemp, Fisheries, Ireland, Sci. Invest., 1908, I. [1910], p. 131.)

**Philocheras sculptus** (Bell).—Three specimens were found in Ballynakill Harbour. (*Vide* Kemp, *tom. cit.*, p. 150.)

**Philocheras fasciatus** (Risso).—Dredged in 2-4 fathoms, in Inishlyre Harbour. Also occurs in Blacksod Bay, Ballynakill Harbour, and Bofin Harbour. (*Vide* Kemp, *tom. cit.*, p. 151.)

**Nephrops norvegicus**, L.—Apparently the only record of this species is one by Holt (Survey of the Fishing Grounds on the West Coast, 1892), who found specimens in Killary Bay.

**Axius stirhynchus**, Leach.—A single specimen of this burrowing prawn was obtained in Ballynakill Harbour. (*Vide* Selbie, Fisheries, Ireland, Sci. Invest., 1914, I. [1914], p. 89.)

- Callianassa Stebbingi**, Borradaile.—This burrowing prawn was twice obtained by digging in sand at low-water mark, in Ballynakill Harbour. (*Vide Selbie, tom. cit.*, p. 100.)
- Upogebia deltaura** Leach.—A specimen of this burrowing prawn was obtained by digging in coarse sand in Ballynakill Harbour, and a second specimen was taken in a surface tow-net near Bofin Harbour. (*Vide Selbie, tom. cit.*, p. 103.)
- Achaeus Cranchi** Leach.—A specimen of this rather rare crab was taken in the entrance to Ballynakill Harbour.
- Ebalia tuberosa** (Pennant).—This species was dredged in 15–19 fathoms, off the mouth of Bofin Harbour; also in 19 fathoms, one mile north by east of Cleggan Head.
- Nautilograpsus minutus** (L.).—This floating crab was taken near Inishbofin, on a log covered with barnacles. It is in no sense a member of the local fauna.

G. P. FARRAN.

## 41.—MYSIDACEA, &amp;c.

- p. 5, l. 21 from top, *for Anchialus read Anchialina.*
- p. 7, l. 13 from bottom, *for Anchialus read Anchialina.*
- p. 10, l. 10 from top, *for Anchialus read Anchialina.*

W. M. TATTERSALL.

## 42.—AMPHIPODA.

- p. 9, l. 11 from top, *for Lilljeborgiidae read Liljeborgiidae.*
- p. 23, l. 12 in table, *for Lilljeborgiidae read Liljeborgiidae.*
- p. 9, l. 12 from top, *for Lilljeborgia read Liljeborgia.*
- p. 16, l. 3 from top, *for danmoniensis read damnoniensis.*
- p. 22, l. 13 from top, *for danmoniensis read damnoniensis.*
- p. 22, l. 4 from bottom, *for danmoniensis read damnoniensis.*
- p. 22, l. 2 from bottom, *for danmoniensis read damnoniensis.*
- p. 16, l. 9 from top, *for Coremepas read Coremapus.*
- p. 22, l. 22 from top, *for Coremepas read Coremapus.*

W. M. TATTERSALL.

## 45.—MARINE ENTOMOSTRACA.

## COPEPODA.

*Add:—*

- Nitocra typica** (Boeck).—In weeds from the shore of Clare Island.

The following species, by an error in labelling, were wrongly recorded from 18 fms., in Clew Bay, August, 1910. They were in reality taken on the shore of Clare I. on the same date:—

Ectinosoma melaniceps.	Diosaccus tenuicornis.
E. gothiceps.	Amphiaseus obscurus.
Harpacticus chelifer.	A. longirostris.
Alteutha depressa.	Laophonte cornuta.
Idyaea tenera.	L. similis.
Microthalestris littoralis.	L. strömi.
Dactylopusia vulgaris.	L. serrata.
Westwoodia nobilis.	L. littoralis.

CIRRIPEDIA.

*Add:—*

**Pyrgoma anglicum** Leach.—Several specimens attached to dead *Caryophyllia Smithii*, in 10 fms. off Lighthouse Cove, Clare Island, July, 1910. A southern species, recorded by Darwin in his monograph of the Cirripedia for “South Coast of England and Ireland, 12–45 fms., Forbes and Mac Andrew.” Frequently found on corals.



MAMMALIA.

BY G. E. H. BARRETT-HAMILTON, B.A., F.Z.S.

Read JUNE 24. Published SEPTEMBER 4, 1912.

THE present report deals with the Mammalian fauna of Clare Island, the Cetacea being excluded. The Mammals of Clare Island do not appear to have been investigated until 1904, when R. H. Bunting was sent to make a collection there, as well as on Inishmore (Aran). His specimens are now in the British Museum, and are included in the material on which this paper is based. During the course of the recent Survey I visited the island in April, 1909, and several other observers have favoured me with notes.

1. PYGMY SHREW. *Sorex minutus*, Linnaeus.—Found all over the island. I examined a nest which was placed under a flat slab of stone in a grass field. There was a ball of cut, dried grass in a hollow nearly under the centre of the stone, from which a passage led to the edge. Close by was a short hole about two inches deep containing woodlice and a slug. This nest did not appear to have been occupied since 1st March, on which date a man accidentally lifted up the stone, when a number of shrews ran out. He thought the number at least eight or nine, but there were too many to count them accurately. The Pygmy Shrew is found also in Achill Island, whence Alexander Williams sent specimens to the Dublin Museum.

2. BAT, sp.? Probably Pipistrelle, *Pipistrellus pipistrellus* (Schreber) or Long-eared Bat, *Plecotus auritus* (Linnaeus).—I was informed that four bats have been observed during the last ten or twelve years.

3. RABBIT. *Oryctolagus cuniculus* (Linnaeus).—Has been introduced and appears to be now established, the numbers having been computed at between fifty and one hundred. Some attempts at introduction appear to have failed, but the present stock owes its presence to J. J. McCabe, who, in 1907, turned out, near the lighthouse, six obtained from Murrisk, Co. Mayo. The animal exists in small (and apparently shifting) colonies in various parts of the

island, and the crows and hawks are said to kill many of the young. It is common "everywhere" on the mainland.

No specimens were obtained, though some were seen.

4. IRISH HARE, *Lepus hibernicus*, Bell.—Owes its presence on Clare Island to J. J. McCabe, who turned down six, obtained at Murrisk, Co. Mayo, in 1906. The stock is said to now number about one hundred. Hares are reported to be plentiful on the neighbouring mainland and on Achill Island.

No specimens were obtained, but many were seen.

5. WOOD MOUSE. *Apodemus sylvaticus* (Linnaeus).—Found throughout the island. I caught a male in breeding condition at about 600 feet elevation on Knockaveen; the dimensions are given below, together with those of Bunting's specimens. This mouse also occurs on Inishmore (Bunting). The numbers following the particulars of each specimen in the subjoined tables indicate reference-numbers in the British Museum collection.

*Apodemus sylvaticus.*

Dimensions in millimetres:—

	Head and Body.	Tail.	Hind foot.	Ear.
Male, Clare Island. 6th June, 1904. (11. 1. 2. 132.)	98	99	24	16.5
Male, ditto. 29th June, 1904. (11. 1. 2. 133.)	99	89	23	16
Male, ditto. 29th June, 1904. (11. 1. 2. 134.)	95.5	93	23	15
Male, Knockaveen, Clare Island. G. E. H. B.-H.	97	77	22	15
Female, Clare Island. 24th June 1904. (11. 1. 2. 135.)	92	96	22	17
Female, ditto. 25th June, 1904. (11. 1. 2. 136.)	93	86	22	15
Female, ditto. 29th June, 1904. (11. 1. 2. 137.)	93	92	23	15.5
Male, Inishmore. 6th July, 1904. (11. 1. 2. 138.)	81	85	22.5	14.5
Male, ditto. 7th July, 1904. (11. 1. 2. 139.)	92	97	23	16
Female, ditto. 6th July, 1904. (11. 1. 2. 140.)	87	86	23	14
Female, ditto. 7th July, 1904. (11. 1. 2. 141.)	91.5	89	22	15



6. BROWN RAT. *Epinmys norvegicus* (Erxleben).—Is found numerously about the harbour.

The dimensions (in millimetres) of Bunting's specimens are as follows :—

*Epinmys norvegicus.*

—	Head and Body.	Tail.	Hind foot.	Ear.
<i>Male</i> , Clare Island. 25th June, 1904. } (11. 1. 2. 142.)	188	170	40	16
<i>Female</i> , ditto. (11. 1. 2. 143.)	183	162	38	16
<i>Male</i> , Inishmore. 6th July, 1904. } (11. 1. 2. 144.)	193	154	38	20
<i>Female</i> , ditto. 7th July, 1904. } (11. 1. 2. 145.)	192	167	35	18

7. HOUSE MOUSE. *Mus musculus* (Linnaeus).—Found about the harbour.

The dimensions of Bunting's specimens are as follows :—

*Mus musculus.*

—	Head and Body.	Tail.	Hind foot.	Ear.
<i>Male</i> , Clare Island. 25th June, 1904. } (11. 1. 2. 146.)	72	73	21	12
<i>Male</i> , ditto. 26th June, 1904. } (11. 1. 2. 147.)	80	77	17·5	12
<i>Female</i> , ditto. (11. 1. 2. 148.)	84	79	18	12·5
<i>Male</i> , Clifden, Connemara. July, } 1904. (11. 1. 2. 149.)	75	74	22	15
<i>Female</i> , ditto. 3rd July, 1904. } (11. 1. 2. 150.)	75	73	17·5	12

8. OTTER. *Lutra lutra*, Linnaeus.—Otters are plentiful on the coast, and in winter travel up the streams.

9. GREY SEAL. *Halichoerus grypus* (Fabricius).—Is abundant on the Atlantic side of the island; the young are born in September or October, usually in caves, but sometimes on open beaches.

10. COMMON SEAL. *Phoca vitulina*, Linnaeus.—Scharff informs me that there is a specimen from Clare Island in the National Museum, Dublin.

In accordance with the spirit of the Clare Island Survey it is expected that something should be said in this paper as to the origin of the Mammal-fauna and its age on the island. An attempt has here been made to do so; but it must be regarded as merely of a provisional nature. The serious problems of the British fauna are now in commencement of being worked out, and our ultimate view must depend on the results of investigations still in progress. Further, these remarks must be regarded as based purely on zoological data and without regard to geological conditions, other than as required by a zoologist. I merely place on paper the geological conditions which I conceive necessary in order to explain our Mammal-fauna. It is for geologists to say if such conditions are possible.

Summarizing the above list, it will be seen that the island claims a fauna of ten species, which may be arranged as follows:—

One volant species:—an unidentified Bat.

One aquatic species:—Otter.

Two marine species:—Grey and Common Seal.

Three introduced terrestrial species:—Rabbit, Irish Hare, Brown Rat.

One probably introduced terrestrial species:—House Mouse.

Two terrestrial species not known to have been introduced:—Pygmy Shrew and Wood Mouse. Total, 10.

For the purposes of the present inquiry all the species, except the two last, may be neglected, since the aquatic and marine mammals are, apart from the influence of man, found everywhere on the neighbouring coasts, and are not known to differ from the forms inhabiting Great Britain and continental Europe.

The Pygmy Shrew and Wood Mouse are the only small mammals undoubtedly native to Ireland, so that if any other small mammals were present, they could only be of a species not represented in the Irish, perhaps not even in the British fauna. There is no trace of any larger member of the Irish Mammal-fauna having ever been found on Clare Island. If any species was so, it has been exterminated and has left no trace behind it.

The Pygmy Shrew and the Wood Mouse are exactly the species which one would expect to find on a small islet, since they are probably the most widely distributed of the smaller British mammals.

The Pygmy Shrew is found on Rathlin and Achill, and is the only shrew of the Orkneys, Outer Hebrides, Isle of Man, and Lundy Island. In the Inner Hebrides it is accompanied by the Common Shrew, and it is present also on Anglesey, the Isle of Wight, and the Scilly Islands.

In spite of its wide distribution, comparatively few subspecies or local forms have been described, so that it appears to be a form of low plasticity—so lacking in plasticity in fact that it is represented in North America by a very closely allied form, *S. personatus*.

Its wide distribution, its lack of plasticity, and the fact that the adult wears a pelage corresponding to that of the juvenile Common Shrew point to an ancient and primitive species. Its comparative rarity on the mainland of Great Britain might be accounted for by its having been displaced by the larger Common Shrew; but this latter suggestion can only be regarded as supposition, and is not borne out by the facts at present available regarding its history in past geological times; for it is known as a fossil in Britain only from the latest pleistocene deposits (Ightham fissures). All other remains of shrews belong to distinct species.

A fact which points to its having been a comparatively recent immigrant to western Europe is that, although present in Skandinavia, it is not found in Spain, having apparently not had time to cross the barrier formed by the Pyrenees.

This fact, together with its smaller size, makes it necessary to note that it is just the kind of mammal that might most easily have been introduced to the numerous islets where it is now found. On the other hand, it is extremely hardy, and capable of standing considerable quantities of frost and snow, and, although it is very voracious, its minute size and unfastidious appetite enable it to subsist in cold countries where larger animals would starve.

There is, then, nothing to prevent this species having been one of the oldest members of the Irish fauna, but there is no evidence to show in the slightest degree how long it may have been so. But had it survived the Glacial Period<sup>1</sup> in Clare Island, such long isolation in the narrow confines of a small island might have been expected to have caused local differentiation of at least subspecific value, even in an animal of admittedly low plasticity.

Wood Mice (genus *Apodemus*), although just the mammals that one would expect to find accompanying the Pygmy Shrew on Clare Island, present some totally different characteristics. In the first place, they are even more widely distributed, being found in Spain, north Africa, and on many of the islands of the Mediterranean, such as Corsica and Sicily. In the north they are common in southern and central Skandinavia, and in Britain they have

---

<sup>1</sup> The term "Glacial Period" is not here used in its older sense as indicating a long period of variable frigidity removed from the present epoch by an immense gap of time. It is here applied merely to a period of glaciation which occurred in quite recent geological times somewhere about the end, if not at the actual termination, of the pleistocene Period.

reached almost every islet, even the distant Shetlands and St. Kilda, where shrews are unknown. They are represented in Iceland, but are absent from America.

In the second place, they are much more plastic than the Pygmy Shrew. They occur on the British mainland in two forms, and their representatives in the Outer Hebrides, Fair Island, St. Kilda, the Shetlands and Iceland are all distinguishable. The last is little known and the least differentiated, so it may owe its position to introduction, as may also the Shetland stock, which cannot be distinguished from that of the mainland. The three former are more primitive in pelage than their representatives of the mainland, and may be indigenous and are certainly of ancient standing.

In the third place, Wood Mice, except perhaps in tooth-structure, are less primitive mammals than shrews; in other respects they represent a higher grade of specialization and evolution, particularly in pelage, the ancestral type of coat being relegated to the juvenile stages, and being completely cast off by the adult.

The Wood Mice, then, are probably older in Britain than the Pygmy Shrew. Like it, they are animals that one might suppose readily capable of introduction. But, even if it could be demonstrated that they owe their presence in St. Kilda and the Outer Hebrides to introduction, the differentiation which they show in these localities must place the introductions at a very distant date in the past.

They are hardy animals, but not so hardy as the Pygmy Shrew; their diet is more restricted, being preponderatingly, though not exclusively, vegetable, so that they would not so easily survive glacial conditions.

The supposition that Wood Mice are of ancient standing in Britain is supported by the fact that their bones occur numerously in pleistocene deposits, and even in the pliocene Forest Bed (West Runton). In Ireland their bones were first found in Ballinamintra Cave, Co. Waterford (where they were at first thought to be those of frogs), and, later, numerously in the caves at Kesh, Co. Sligo, and in those of Co. Clare. In the last they occur in all the strata; at Kesh they were in association with Arctic Lemmings (*Dicrostonyx*). The Irish remains have never been critically examined, but in England the bones of late pleistocene Wood Mice have been referred to two forms. One of these resembles *A. sylvaticus* of the present period. The other is a supposed extinct species named *A. lewisi*; it bears a close resemblance, perhaps amounting to identity, to the Yellow-necked Mouse, *A. flavicollis*, a subspecies of which, *A. f. wintoni*, still exists sporadically in England.

Applying the above facts to the Wood Mice of Clare Island, it is remark-

able that these specimens should be indistinguishable from the typical *A. sylvaticus* of Ireland generally, and of Great Britain. This indicates that Clare Island cannot have received its Wood Mice at a very remote period, or, in other words, that the island has only recently been severed from the mainland. Further, there is no evidence that the Irish stock of Wood Mice are ancient. Had they existed in Ireland for any great length of time, they would surely have exhibited marked local distinctions, which they do not. One can only suppose, then, that the Wood Mouse of Ireland is of about the same age in that country as that of England, and that in both cases the period of entry was subsequent to the period of entry into the Outer Hebrides,<sup>1</sup> St. Kilda, and Fair Island. It is to be noted that the *flavicolis* stock is not represented in Ireland, where is found only the smaller and more widely distributed *sylvaticus*. If my argument be correct that the Wood Mice are older in Britain than the Pygmy Shrew, and that the former are comparatively recent immigrants to Ireland (and southern England), it follows that the Pygmy Shrew must be even more recent. Neither can have survived the Glacial Period in Ireland. Neither can have been long isolated in Clare Island. The mammals of that island point to its having been quite recently severed from the mainland, or else they owe their presence there to introduction.

An objection may be raised that, the Wood Mice having been undoubted members of the Irish late pleistocene fauna,<sup>2</sup> as shown by excavations in Irish caves, there is no reason why they should not have survived in the country down to the present time, so that a few words on the

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<sup>1</sup> Even allowing for the fact that complete isolation in a small island might give rise to more rapid differentiation.

<sup>2</sup> This fauna is usually considered and called 'arctic.' I do not use that word, as I do not recognize a purely arctic Mammal-fauna. There is no evidence that the late pleistocene fauna was of arctic origin; it was formerly widespread and characteristic of its own period in northern Europe, and its first connexion with arctic conditions was the purely incidental one of extermination or expulsion thereby. On the termination of the Glacial Period, the shattered remnant of the so-called 'arctic' fauna encountered a new trial in the shape of the influx of a number of newer and more vigorous mammals, which treated it even less gently than had the ice. The remnant again retired or was driven out, in this case mainly northwards, where it has become popularly associated with arctic conditions. The mammals of the arctic regions are of two kinds, viz., outlying members of strong, dominant groups, such as wolves, bears, and stoats, which are vigorous enough to exist in any known climate, and members of weak groups surviving in the Arctic because of the lack of competition there with stronger forms, which, for one reason or other, have not penetrated to the Arctic. Such are the Arctic Fox, the Varying Hares, the Lemmings, Reindeer, and Musk Ox. Eventually such animals, after long sojourning in an atmosphere free from bacteria, become delicate, and many, when transported south, find it difficult to resist the attacks of the organisms of such diseases as pneumonia; they may also become highly specialized to arctic conditions, an example of which process is shown by the Greenland Hare, *Boreolepus groenlandicus*.

above fauna may not be out of place. The fauna consists of only a few species, viz. :—

Mammoth,	.	.	.	<i>Elephas primigenius.</i>
Reindeer,	.	.	.	<i>Rangifer.</i>
Gigantic Irish Deer,	.	.	.	<i>Alce giganteus.</i> <sup>1</sup>
Bear,	.	.	.	<i>Ursus.</i>
Spotted Hyaena,	.	.	.	<i>Hyaena crocuta.</i>
Fox,	.	.	.	<i>Vulpes.</i>
Arctic Fox,	.	.	.	<i>Vulpes alopec.</i>
Wolf,	.	.	.	<i>Canis.</i>
Irish Hare (or similar form),	.	.	.	<i>Lepus.</i>
Lemming,	.	.	.	<i>Lemmus.</i>
Arctic Lemming,	.	.	.	<i>Dicrostonyx</i> , usually <i>D. henseli</i> , but Hinton informs me that <i>D. gulielmi</i> probably occurs in the Edenvale Cave of Co. Clare.
Wood Mouse,	.	.	.	<i>Apodemus</i> ; and possibly one or two living species also. <sup>2</sup>

This was a very poor fauna as compared with that of England in similar times, as represented in Ightham fissure, and there seems little doubt that further discoveries are before us when other deposits have been investigated. The main point to note is that the ranges of all its constituents, except the Bear, Wolf (still successful types where not exterminated by man), Fox, and Wood Mouse have in recent times become very much restricted. The Mammoth and the Irish Deer<sup>3</sup> are extinct, the Reindeer, the Arctic Fox, and the two Lemmings have retired to the polar lands; the Varying Hares ought also to be placed in the latter category, although they have managed to maintain isolated colonies in mountainous regions such as Scotland or the Alps, or in islands such as Ireland. The Spotted Hyaena has retreated to Africa, and only the Wood Mice remain widespread throughout Europe.

<sup>1</sup> *Alce*, Blumenbach, 1799; *Megaloceros*, Brookes, 1828; *Megaceros*, Owen, 1844.

<sup>2</sup> Bones of cats occur in recent strata of Irish caves, and have been identified by Scharff with the North African *Felis ocreata*. But as the latter is only a sub-species of the European Wild Cat, *F. sylvestris*, I cannot accept this identification, nor do I know how the bones of the North African form of Wild Cat can be distinguished. I have unfortunately been, as yet, unable to examine the Irish feline bones described by Scharff, and cannot, therefore, give any detailed opinion on them. If they are not the bones of domestic animals, they probably represent a distinct Irish Cat, to which no more appropriate name could be given than that of *Felis scharffii*.

<sup>3</sup> The influence of man, who was undoubtedly a contemporary of at least the Irish Deer, Reindeer, and Bear, and, by inference, of the whole fauna, must also be taken into account; but there is a strong probability that man too became extinct with the other animals, as shown by the gap between British neolithic and palaeolithic records.

If one may hazard a conjecture as to the cause of the misfortunes which have overtaken the late pleistocene mammalia, it seems hardly possible to escape from the conclusion that they found the Glacial Period an insurmountable catastrophe.<sup>1</sup> The larger species—the Mammoth and the Irish Deer—would starve first, their necessarily enormous supply of daily food being cut off by the cold; the Hyaena must needs succumb to the same fate as its victims. The remainder of the fauna was probably driven south. On the retirement of the ice the various species would naturally have re-occupied their lost territory, but were faced by the competition of more modern and more vigorous forms—the Arctic Fox by the Red Fox; the Reindeer by the Red Deer; the Varying Hares by the Brown Hares; the Lemmings by numerous other smaller rodents. An additional factor in the extermination of the Lemmings may have been the absence of the snow-drifts, which must have been a great protection to them from carnivorous foes.

The constituents of the Irish Mammal-fauna afford another argument in favour of the extermination wrought by the Glacial Period, for it is in Ireland, of all countries, that, the modern fauna being poor and competition not keen, we should expect survivals from the Glacial Age. In Ireland, if anywhere, should still be found the Lemmings, of which *Dicrostonyx* actually appears in the upper strata of more than one cave; the Bear should have lingered on at least into historical times; yet there is no trace of either. It seems impossible to escape the conclusion that the whole Mammal-fauna perished, or was driven south, and that there was no unglaciated land south of Ireland to which it could retire, and from which it would issue to re-occupy Ireland.

The case of the Wood Mice has already been fully discussed. It may be as well to examine a little more closely, from an all-Ireland point of view,

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<sup>1</sup> The possibility of mammals surviving the Glacial Period does not depend directly on climate or even on a regular food-supply, but purely on the presence of vegetation. Vegetation implies an area of snowless land exposed to sunshine during a summer, however brief; it lies safe from frost under the snows of winter. Small rodents, such as Lemmings, can exist wherever there is vegetation. They do not even find it necessary to hibernate in winter, but burrow safely beneath the snow in search of their food. Wherever the rodents are fairly numerous, a small carnivore, *e.g.*, a Stoat or Weasel, can find a subsistence on them; and if the vegetation be robust enough, another pair of linked rodent and carnivore, hare and fox, becomes possible. They are still sheltered by the snow; but being unable to burrow for their food, the rodents must scratch for it in places where the snow is not too thick—an essential condition; and the carnivore obtains in summer a rich diet of berries and of birds and their eggs. A further linked pair, in this case a ruminant and carnivore, is the Reindeer (or Musk Ox) and the Wolf; but the greater size of the ruminant now requires more specialized conditions of vegetation. Cold water maintains a teeming population of fish and vertebrates, and marine carnivores are possible as long as any open water (or access to it) exists, and a large terrestrial carnivore (Bear) to prey on them, with, in summer also, a mixed diet of fish and vegetables, hibernating in winter becomes at once possible. Thus far is easy and intelligible, and these conditions may be seen in modern Greenland; but the presence of an Elephant, requiring large quantities of food, would not be possible under strict arctic conditions, and necessitates a forest or other source of ample food-supply; but here again the laying on of much superfluous fat in summer would lessen the difficulties of winter.

the other member of our present fauna which had representatives in the Pleistocene *viz.*, the Irish Hare. This Hare and the Irish Stoat (which is not proved to have been of pleistocene age, though it probably is so) are our sole peculiar mammals, and these two of all pleistocene species are the most likely to have survived the Glacial Epoch, and undoubtedly appear to be the oldest members of our fauna. Of the two, the Irish Stoat is absolutely peculiar, and represents a stock of long-standing existence in the country. The Hare, while also peculiar, is closely allied to the extinct pleistocene hare of south England, Hinton's Hare (*Lepus anglicus*), rather than to the true *L. timidus* of Norway, or its Scottish representative, *L. timidus scoticus*.

The Irish Stoat is the most mysterious of all our mammals, because, although it is a peculiar species, and therefore necessarily of considerable age in Ireland (as stated above), a stoat has not been definitely proved to be a member of the Irish pleistocene fauna. Remembering that stoats are very plastic animals, it may be well not to particularize too much about its history, and to be content to regard it as with the Hare one of our oldest Mammals.

The close resemblance between the Irish Hare and Hinton's Hare suggests a recent connexion between Ireland and England; and it is along this connexion that our post-Glacial mammals may be supposed to have reached the country. All these (except the stoat) are identical with the corresponding forms found in England, and therefore date from the same period as the English forms, and came to us from England. They must have come to us very recently, or they would have had time to have become distinct; and the restricted distribution of some of them, such as Natterer's, Daubenton's, and the Whiskered Bats (which may, however, have arrived since the bridge was cut off), if it does not merely indicate our ignorance, suggests that these may have not yet had time to occupy the whole country. Before or soon after the termination of the connexion the climate must have been at least as mild as at present—at any rate, at the time of immigration of such southern forms as the Lesser Horseshoe Bat and Leisler's Bat, the restricted distribution of the former of which, and probably also of the latter, may be regarded as due to delicacy of constitution. The connexion of Ireland with England seems to have been more recent than that of England with the Continent, since all our Irish mammals, with the one exception mentioned above, are identical with those of England, whereas many English mammals are distinguishable from those of the neighbouring Continent. There may have been a second and more recent connexion between England and the Continent, whereby some of the English species, not known in Ireland, such as the Brown Hare, Harvest Mouse, and Dormouse, reached that country.



That Ireland is, with the exception of its Hare and Stoat, faunistically more recent than Great Britain, is shown by the absence of peculiar isolated local forms, such as are found in several parts of Great Britain, more especially in the north. I may cite particularly the Skomer Mouse, the Hebridean and Fair Island Wood Mice, the Jura and Islay Stoat, the two species of St. Kilda Mice, and the Orkney Mice. There is nothing in the least approaching the position of these isolated forms in Ireland. The Skomer Mouse is peculiarly interesting for our present purposes, because it has a near relative (*E. caesarius*) in the Channel Islands, suggesting that its ancestors formerly inhabited a continuous tract of country stretching from Pembroke-shire to France. Remains of another member of the same group have been found in the Ightham fissures in Kent, and it was one of the late pleistocene mammals of Britain. It is to the area bounded or roughly marked out by Skomer Island, Ightham, and Jersey, rather than to any region lying south of Ireland, that we may look for the survival of our pre-glacial mammals. This is both a far more extensive and more southern region than any portion of peripheral Ireland within the 50-fathom line; it requires less elevation to bring it into existence; it affords easy connexions with continental Europe at an elevation of less than 300 feet, at which elevation the south of Ireland would still be isolated from England; and it lies well clear of the southern limit of the maximum English glaciation, which did not overrun the Thames valley, whereas Ireland was heavily glaciated right down to the limits of its present southern and south-western coast-line.

If at the same time as dry land stretched from Skomer to the coast of France, there was also, as there would be with a similar elevation, a bridge across the shallowest part of the Irish Sea between Bardsey Island and Wicklow, with a wide expanse of marshes and forest bordering a central narrow strait a few miles wide running thence south to the Atlantic through the present St. George's Channel, then the extreme narrowness, and marshy nature of the connexion, would account for the fact that many of the English mammals failed to reach Ireland. Those that did reach Ireland—the Fox, Wolf, Badger, Marten, and Otter, the Red Deer (and, perhaps, Wild Boar)—are amongst the hardest and widest-ranging species known to us, and it is easier to account for their presence than their absence. Of the numerous forms which did not reach Ireland, besides those which were impeded by the forests and marshes, others must have only recently crossed to England; and the narrow bridge was finally closed before the latest arrivals had time to find it. If a similar bridge existed contemporaneously between Malin Head and Islay, it must have been impassable, as there are no close relationships between the Irish mammal-fauna and that of Scotland. On the other hand, the

various peculiar Scottish forms of archaic or Norwegian relationship which are found isolated in islands in several parts of the area suggest a wide expanse of land of ancient duration stretching from the outer Hebrides to Skandinavia, but not including Shetland; in fact, they form the oldest part of the British fauna. Here, if at any place north of the Thames valley, survivals of the pre-glacial fauna seem to have been possible, and may thus account for the presence of the Orkney Mice, the ancestor of which, *M. corneri*, accompanied those of the Skomer Mouse in the late Pleistocene of Ightham, and are represented to-day by *M. sarnius* in the Channel Islands. It may possibly account for the "Exiled" Vole-mouse of the Outer Hebrides, *M. agrestis exsul*, which has its nearest ally in Skandinavia, as well as for the close relationship of *Lepus timidus* of Skandinavia with *L. timidus scoticus* of Scotland.<sup>1</sup>

A study of the late English pleistocene mammals shows that the process of extinction was not confined to Ireland. For instance, of eight microtines found fossil at Ightham, not a single form is now living on the same ground. More than one are quite extinct, and the remainder are dispersed far and wide, a striking testimony to the severity of the Glacial Epoch, and also a reminder to us that the fact of a species having been found in any particular deposit within the area of its modern distribution is no proof that it has existed on those grounds throughout the intervening period. Nothing is more certain than that with the changing of environments species and whole faunas must have waxed, waned, and vanished, to reappear in new forms and conditions on the return of more favourable environments.

#### SUMMARY.

There are no indications that the Mammal-fauna of Clare Island is ancient as compared with that of Ireland, or that the island itself has long been severed from the mainland.

The earliest known Irish mammals belong to a late pleistocene horizon corresponding to that of Ightham fissure, Kent, but much poorer. This poverty probably indicates imperfect knowledge.

The members of this fauna became extinct in Ireland, probably in consequence of a recent Glacial Period.

The present fauna is, with the exception of the peculiar Stoat, an impoverished edition of that of southern England from which it was derived, and not from that of continental Europe or Scotland. It could not therefore, as a whole, have survived the Glacial Period in Ireland, and it is suggested

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<sup>1</sup> There may also be in Norway a second form of *L. timidus*, the relationships and status of which have not yet been made clear.

that even the peculiar Irish Hare, which is, with the Irish Stoat, the oldest member of our fauna, existed during the glaciation in a region now occupied by the present English Channel.

The Irish Stoat, Irish Hare, and other Mammals probably made their entry into Ireland from England across a narrow land-bridge lying between Bardsey Island and Wicklow at some time subsequent to their arrival in England from the Continent.

This bridge was of short duration, and was not discovered by all the English mammals, some of which reached the south of England, perhaps by a second continental land-bridge, in such a recent period as not yet to have had time to spread over the whole country.

There may have been a region of survival in the north and west of Scotland with a greatly increased land area extending to continental Europe somewhere north of the Dogger Bank. This area may have been cut off for a time from parts of England, as shown by the fact that in some cases the mammals inhabiting it are subspecifically distinct from those of southern England (e.g. the genus *Microtus*). A barrier appears to have cut off Scotland also from Ireland, with which its fauna has no connexion. Thus Scotland may have been an important centre of survival, and, having regard to its greater proximity to the sea, its climate must certainly have been milder than that of Skandinavia, so that the suggestion that the movement of mammals was from Scotland to Skandinavia and not in the reverse direction is quite worthy of serious consideration.

#### NOTE ON A SUPPOSED AMERICAN FACIES OF THE IRISH MAMMAL-FAUNA.

A number of indigenous Irish Mammals are represented in North America, the following thirteen living or extinct genera being certainly common to both countries:—*Sorex*, *Myotis*, *Pipistrellus*, *Lepus*, *Vulpes*, *Canis*, *Ursus*, *Martes*, *Mustela*, *Lutra*, *Cervus*, *Rangifer*, *Elephas*. Two Irish genera are, in addition, represented by closely allied genera in North America, e.g. *Plecotus* by *Corynorhinus* (very closely allied), and *Meles* by *Taxidea*. I have not put down the corresponding Irish and North American species, inasmuch as a detailed comparison of them has yet to be made. They undoubtedly vary in the closeness of their affinities; but one or two at least, e.g., *Sorex minutus* and the North American *S. richardsoni*, also *Myotis daubentonii* and the North American *M. carissima*, are very closely related indeed.

An attempt has sometimes been made to account for the relationships between the two faunas by a recent land-bridge across the Atlantic; but it

seems simpler to regard the common genera as widespread types formerly inhabiting the whole area between Ireland (eastwards) and New York, and intermingling in the New and Old Worlds by means of a bridge across the Pacific Ocean at or near Bering Sea. Such a bridge is easier to imagine than one across the Atlantic; and in fact we find on examination that all the above genera, excepting only *Elephas*, are of circumpolar distribution in the above area, and there is a strong probability that *Elephas* also will prove to be so. A point telling against the Atlantic land-bridge is that England has actually more mammals of American type than Ireland, and western Europe even more than England; also that some of our commonest types, e.g., all the true *Muridae*, have never reached America. *Apodemus* (Wood-Mouse) is found in many British deposits from pliocene to late pleistocene times (Forest Bed to Ightham), and would surely have been one of the first forms to utilize a land-bridge enabling it to reach North America. There seems no need, then, to suppose that our present Mammal-fauna owes any of its features to a recent land-bridge extending to America. The influence of earlier land-bridges, though they may still be evident in the distribution of invertebrates and plants, is no longer traceable in mammals.

REPTILIA AND AMPHIBIA.

BY R. F. SCHARFF, Ph. D., B. Sc.

Read JUNE 24; Published SEPTEMBER 4, 1912.

REPTILIA.

It is a well-known fact that only a single species of reptile is native to Ireland. No discoveries in that group of animals were therefore to be expected in Clare Island. All that could be hoped from the Survey was to definitely ascertain whether this solitary Irish reptile—the Common Lizard (*Lacerta vivipara*) inhabited Clare Island as well as the adjoining mainland. In recording the capture of three specimens on Clare Island it is satisfactory to note the Lizard's occurrence on this western outpost of Europe. The first specimen was taken by Mr. Praeger on high ground among heather on the slopes of Croaghmore about 500 feet above sea-level. The two others were discovered at Portlea, not far from the sea-shore—one by Dr. Chaster, the second by Dr. Patten.

Dr. Leighton's<sup>1</sup> statement that the Lizard is somewhat local and irregular in its Irish distribution is, I feel sure, incorrect. William Thompson's<sup>2</sup> verdict that it is common throughout Ireland in suitable localities is nearer the mark. It is undoubtedly indigenous to the country, and probably owes its survival from the past to the fact that it is a viviparous species, and is not dependent, like most reptiles, on the heat of the sun's rays to bring forth its young.

No one has ever suggested the possibility of the Lizard being a comparatively recent introduction. And yet, in spite of its being an old-established native, it is curious that there is no name in the Irish language for *Lizard*. If a Lizard is shown to a Gaelic speaker, he calls it an “εοιρε λυδκις,” but that is the name for the Newt; and it seems evident that the ancient Irish, as so many people do even nowadays, confounded these two animals, which, though externally somewhat similar in appearance, belong to entirely different classes of the Animal Kingdom.

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<sup>1</sup> Leighton, G. R.: “The life-history of the British Lizards.” Edinburgh. 1903.

<sup>2</sup> Thompson, W.: “Natural History of Ireland,” vol. iv. 1856.

In order to trace the existence of any minor structural differences between these three Clare Island Lizards and those of the mainland, I compared very carefully all the specimens contained in the Irish National Museum, and noticed that in many of them there was only a single loreal scale on the head

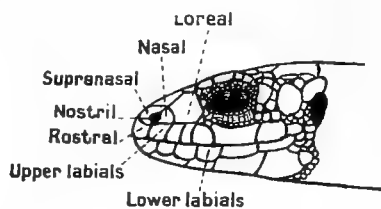


Fig. 1 ( $\times 2$ ).

(fig. 1). The normal condition in *Lacerta vivipara*, according to Dr. Boulenger,<sup>1</sup> is the presence of an anterior loreal in contact with the fronto-nasal scale as well as that of a posterior loreal.

Yet the scale-structure referred to is not constant in Irish Lizards. Out of twenty Irish specimens in the National Museum one-half possess but a single loreal scale. One of the Clare Island Lizards has two loreals, the other has only one. Thus it seems evident that no reliance can be placed on this feature as a peculiarly Irish character. There is, moreover, a Common Lizard from the Rigi Mountain in Switzerland in the Museum which exhibits the same scale-structure, while Dr. Boulenger was able to show me in the British Museum a number of other Continental specimens which had the same peculiarity. There seems to be no constant character by means of which Irish specimens of the Common Lizard can be discriminated from British or Continental ones. Throughout its vast range, from Saghalien, off the east coast of Siberia, across northern Asia, northern and central Europe, this Lizard remains perfectly constant in its specific characters, although exposed to the greatest diversity of climate.

As regards size, Irish specimens of this Lizard vary between 105 mm. and 154 mm. in length, that is to say, from 4 to 6 inches, the females being the largest. This sexual difference in size agrees with Dr. Boulenger's observation, whereas Dr. Bedriaga<sup>2</sup> gives the total length as varying between 109 mm. and 140 mm. Dr. Boulenger's measurements, on the other hand, considerably exceed those of the Irish specimens which I have seen.

The localities nearest Clare Island on the mainland from which the Lizard has been recorded are Belmullet and Roundstone ; but I have no doubt that it occurs all over Mayo in suitable places, including Achill Island.

<sup>1</sup> Boulenger, G. A.: "Catalogue of Lizards in the British Museum," vol. iii, p. 24. 1887.

<sup>2</sup> Bedriaga, J. von: Beitrage zur Kenntniss der Lacertilienfamilie. Abhandl. d. Senckenberg. Naturf. Gesellsch., vol. xiv. 1886.

As regards the problem which particularly concerns us here, namely, the manner in which the Lizard reached Clare Island, there are only two possible explanations. It may have been transported accidentally either by man or by means of a floating raft of turf, &c., or it may have colonized the island in the normal manner by slow progression on land at a time when Clare Island was still joined to the mainland.

Accidental dispersal through human intervention in this case seems very improbable, because, even if the extremely unlikely event should have happened once that a Lizard had secreted itself among household goods, and had thus been conveyed to the shore, it would probably have made its escape when the goods were being transferred to the boat. Accidental dispersal by wind is out of the question. Although the Lizard is said to be a good swimmer, taking readily to water, it is inconceivable that it should be able to swim across the channel of three miles which separates Clare Island from the mainland.

If the Lizard had reached the island by means of accidental causes, it must have done so with the aid of a raft. Rafts of turf and sods might be a possible means of conveyance. Yet, when we consider the problem in that light, we realize how such a floating island soaked in brine would be buffeted about and covered with salt spray long before being finally cast adrift, and ultimately conveyed by the receding tide to some cross-current flowing towards the island, where the difficulty of landing would have to be gone through. Moreover, a single Lizard thus transported would not populate the island unless it had been a gravid female.

Thus, although theoretically the accidental dispersal of a Lizard to Clare Island is not impossible, it is so extremely improbable that a former land-connexion is almost a necessity. We may even consider the presence of the Lizard on Clare Island as distinctly a point in favour of the theory that the fauna of the island owes its existence principally to the presence of a former land-connexion with the mainland.

### AMPHIBIA.

THREE different kinds of Amphibians are known to inhabit Ireland, namely, a Newt, a Toad, and a Frog. The Toad (*Bufo calamita*) has a very restricted range in the extreme south-west of Ireland. Only the two other species have a wide distribution, the Frog (*Rana temporaria*) occurring plentifully on Achill Island. Mr. Stelfox informs me that, when he visited Slievemore on Achill in August, he met with thousands of young frogs in a little lake at a height of 850 feet above sea-level. I merely mention this fact because it has

been alleged that the Frog is a comparatively recent introduction into Ireland, and that it has spread rapidly across the country from its new centre of dispersal. I have always maintained that it was a true native in the Irish fauna. Its remains occur in great abundance in the Irish caves mixed with those of extinct animals, while the story of its supposed introduction is by no means clear, as I have pointed out in the "Irish Naturalist."<sup>1</sup>

The fact that the Frog is absent from Clare Island as well as from Inishturk and Inishbofin might lend credence to the view of its recent introduction to the mainland. But the explanation of its absence is probably of quite a different nature.

The Frog abounds in the mainland district included in the Clare Island Survey, as it does everywhere in the western counties of Ireland; and it agrees with the Lizard in not possessing any distinctively Irish characters.

The Irish Newt (*Molge vulgaris*) has been recorded from almost everywhere in Ireland, except, strange to say, from the district of the Survey; but there can be no doubt of its occurrence there on the mainland, and probably also in Achill. It is absent, as I remarked above, from Clare Island, Inishturk, and Inishbofin.

The total absence of Amphibians from Clare Island and the other islands is significant. Why should the Frog inhabit Achill and not Clare Island? The theory of the recent introduction into Ireland of the Frog would supply us with an answer, but so would many other hypotheses. If we supposed, for instance, that the west coast had been submerged for a certain depth beneath sea-level, all the usual breeding haunts of Amphibians might have been destroyed on many of the islands, thus impoverishing the aquatic fauna in certain areas. Questions of that kind must be considered when the faunistic results, as a whole, can be taken into account.

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<sup>1</sup> Scharff, R. F.: "Is the Frog a native of Ireland?" *Irish Naturalist*, vol. ii.



19.

P I S C E S .

BY GEORGE P. FARRAN.

Read JUNE 24. Published SEPTEMBER 4, 1912.

THE following list of the fishes of Clare Island and Clew Bay is based, as regards shore-forms, on specimens collected by members of the various expeditions to the island, and, as regards the deeper water species, on the Fisheries records of the cruiser "Helga," which, at different times, made hauls of the trawl and dredge in the neighbourhood. Some notes on the fishes of the island, kindly supplied by Mr. McCabe of the Clare Island hotel, have also been incorporated in the list. No work was done at the fresh-water fishes of the mainland, which accounts for the absence from the list of some familiar species.

The shores of Clare Island, consisting mainly of rocks with a small proportion of boulder-beach and sand, have a rather scanty fish fauna; but the shores of the mainland and of the smaller islands, where they have been examined, as at Annagh Island near Westport, seem to harbour a larger number of species. The area which is available for trawling lies to the north and north-east of Clare Island, where a stretch of clean sand occupies nearly the whole of the north entrance to Clew Bay, extending eastwards as far as Mulranny. The rest of the bay, between Clare Island and the smaller islands, and the ground outside Clare Island, is rocky or beset with large stones, and unsuitable for trawling.

The present list is manifestly an incomplete one; and it is probable that a number of species would be added if the shallow water and *Zostera* beds amongst the islands were explored with fine-meshed nets. In order to make up for this deficiency, the names of common west-coast fishes which are found at Blacksod Bay, to the north, and at Ballynakill Harbour and Inishbofin, to the south, have been inserted in brackets when there is no reason for supposing them to be absent from Clew Bay. The list, however, must not be regarded as exhaustive as regards either Blacksod or Ballynakill and Bofin.

The list includes a few species of interest, among which may be mentioned *Gobius scorpioides* Collett, the smallest of British fishes, for which the only previous records were Falmouth (one specimen), off the Eddystone, Ballynakill, and off Cleggan Head in Galway, and *Nerophis ophidion*, a species which has, probably, often been mistaken for the much commoner *N. aequoreus*.

#### TELEOSTEI.

[*Cottus scorpius* L.—Occurs frequently at Ballynakill and Bofin, but not yet recorded from Clew Bay.]

*Cottus bubalis* Euph. FATHER LASHER.—Common on the shores of Clare I. and the smaller islands in Clew Bay, and sometimes dredged in shallow water.

*Trigla cuculus* L. RED GURNARD.—Occurs frequently on the trawling-grounds to the north-east of Clare Island.

*Trigla hirundo* L. SAPPHIRINE or TUB GURNARD.—Usually present in very small numbers on the trawling-grounds.

*Trigla gurnardus* L. GREY GURNARD, NOUD.—Abundant on the trawling-grounds.

*Agonus cataphractus* (L.). POGGE.—Only taken on a few occasions, but probably common throughout Clew Bay.

*Lophius piscatorius* L. ANGLER.—Once trawled in Clew Bay.

[*Trachinus vipera* Cuv. and Val. LESSER WEAVER, STING-FISH.—Frequent on sandy beaches at Ballynakill and Bofin, but not yet recorded from Clew Bay.]

*Scomber scomber* L. MACKEREL.—The large spawning or “spring” fish are caught in April and May, usually by means of trains of drift-nets fished some miles to seaward of Clare Island. The smaller “harvest” fish are fished for from June till the end of the year. They are taken either on hand-lines or in drift-nets, which are generally fished close to shore.

*Caranx trachurus* (L.). SCAD, HORSE MACKEREL.—Taken in large numbers in the herring and mackerel nets, and on lines.

*Zeus faber* L. JOHN DORY.—Frequently taken by the islanders when line-fishing. Small specimens are occasionally trawled in Clew Bay.

*Gobius niger* L. BLACK GOBY.—Inishgowla, one. Common at Ballynakill and Bofin.

*Gobius paganellus* Gm. ROCK GOBY.—Annagh I., one. Both this and the preceding species are plentiful at Ballynakill and Blacksod, and would probably be found to be common in Clew Bay if looked for between tide-marks in spring.

**Gobius pictus** Malm.—Common at Ballynakill and Bofin, but not yet recorded from Clew Bay.

**Gobius scorpioides** Collett.—A single specimen of this, the smallest of British fishes, was dredged in Inishlyre Harbour, Clew Bay, in May, 1909. This capture is of interest as being an extension of its little-known range in the British Isles, the previously recorded localities being Falmouth, one specimen; deep water off the Eddystone lighthouse, two specimens; 30 miles off Cleggan Head, Co. Galway, one specimen; and Ballynakill, Co. Galway, several specimens. It is also known from Norway and Finisterre. It was taken at a depth of 5 fathoms on a bottom covered with dead shells and small stones, very similar to the ground which it frequents at Ballynakill.

**Gobius minutus** L. COMMON GOBY, FRECKLED GOBY.—Taken occasionally in different parts of Clew Bay.

**Gobius Ruthensparri** Euphras. SPOTTED GOBY.—A few were dredged near Inishlyre, and one at Annagh I.

**Crystallogobius Nilssonii** (Düb. and Kor.).—Young specimens have been taken on a few occasions round Clare I. in mid-water nets. It is probably common.

**Callionymus lyra** L. DRAGONET.—Recorded from Inishlyre, and trawled a few times in Clew Bay. Though probably not uncommon, it appears to be much scarcer than on the east coast of Ireland.

[**Cyclopterus lumpus** L. LUMPSUCKER.—Not uncommon at Ballynakill, but not yet recorded from Clew Bay.]

**Liparis Montagu** (Donovan).—Once dredged off Clare I.

**Lepadogaster Gouani** Lacep.—Shore-collecting, Clare I., two specimens.

[**Lepadogaster Decandollii** Risso.—Ballynakill and Blacksod, scarce. Not yet recorded from Clew Bay.]

**Lepadogaster bimaculatus** (Donovan). TWO-SPOTTED SUCKER.—Several have been dredged amongst the islands of Clew Bay.

**Blennius gattorugine** Bloch.—A small specimen was dredged in Inishgowla Roads.

**Blennius galerita** L. (*Blennius Montagu* Flem.). MONTAGU'S BLENNY.—Shore-collecting, Clare I., one.

[**Blennius ocellaris** L. BUTTERFLY BLENNY.—Ballynakill and Blacksod, not uncommon. Not yet recorded from Clew Bay.]

**Blennius pholis** L. SHANNY.—Common amongst rocks and stones between tide-marks on the shores of Clare I.

**Centronotus gunnellus** (L.). GUNNEL, BUTTERFISH, PETER-NINE-EYES.—Common on the shores of Clare I. and the other islands in Clew Bay.

[**Atherina presbyter** Jen. ATHERINE, SMELT.—Ballynakill and Bofin, common. Not yet recorded from Clew Bay.]

- Mugil chelo** Cuv. GREY MULLET.—Said to be common.
- Gasterosteus spinachia** L. SEA-STICKLEBACK.—Only twice recorded, but is probably common.
- Labrus maculatus**, Bloch. BALLAN WRASSE, CONNER, BREAM.—Caught on lines in great numbers by the Clare Island men and split and dried for food. The local name is "Conner."
- [**Labrus mixtus** L.—Frequent on the west coast of Ireland, and, though not yet recorded from Clew Bay, probably occurs there.]
- Crenilabrus melops** (L.).—One dredged off Cloughcormick Buoy, Clew Bay. Probably common.
- [**Ctenolabrus rupestris** (L.).—Common at Ballynakill and Blacksod and, doubtless, also in Clew Bay.]
- Centrolabrus exoletus** (L.).—One dredged off Inishgort, 7–10 fms.
- Gadus morrhua** L. COD.—Frequent.
- Gadus aeglefinus** L. HADDOCK.—Only one specimen was taken by the "Helga" when trawling in Clew Bay. It is locally reported, however, to be common.
- [**Gadus luscus** (Willughby). BIB, POUT.—Occurs in small numbers at Ballynakill. Not yet recorded from Clew Bay.]
- [**Gadus minutus** L.—Taken occasionally at Ballynakill and Bofin. Not yet recorded from Clew Bay.]
- Gadus merlangus** L. WHITING.—Very common in Clew Bay.
- Gadus virens**. COAL-FISH, BLACK POLLACK; KILLIG (young).—Clew Bay, caught on lines. Young at Inishlyre (R.D.S. Survey).
- Gadus pollachius** L. POLLACK.—Clew Bay (R.D.S. Survey). Said locally to be common.
- Merluccius vulgaris** Cuv. HAKE.—Scarce.
- Molva molva** L. LING.—Common.
- [**Motella mustela** L. FIVE-BEARDED ROCKLING.—Common between tide-marks at Ballynakill and Blacksod, and probably also Clew Bay.]
- Motella tricirrata** Bloch. THREE-BEARDED ROCKLING.—Annagh I., one. Probably common.
- Ammodytes lanceolatus** Lesauv. LESSER SAND-EEL—
- Ammodytes tobianus** L. GREATER SAND-EEL.—
- } Sand-eels are some-  
} times caught in large  
} numbers, of all sizes, on Clare I. strand, but no specimen could be obtained  
} for examination. Probably both the above species are represented.
- Hippoglossus vulgaris** Flem. HALIBUT.—Scarce.
- Rhombus maximus** (L.). TURBOT.—Large specimens are frequently trawled in Clew Bay.
- Rhombus laevis** Rondel. BRILL.—Frequently trawled in Clew Bay.

- Zeugopterus punctatus** (Bloch).—Occurs at Ballynakill and Blacksod, but not yet recorded from Clew Bay.
- Arnoglossus laterna** (Walb.).—Occasionally trawled in Clew Bay.
- Arnoglossus Grohmanni** (Bonap.).—Once trawled in Clew Bay.
- Pleuronectes platessa** L. PLAICE.—Common in Clew Bay.
- Pleuronectes microcephalus** DONOV. LEMON DAB, LEMON SOLE.—Not common.
- Pleuronectes limanda** L. DAB.—Very common in Clew Bay.
- Pleuronectes flesus** L. FLOUNDER.—No specimens were obtained by the "Helga," but it probably occurs.
- Solea vulgaris** Quesn. BLACK SOLE.—Trawled in Clew Bay, but not common.
- Solea lascaris** (Risso).—Occasionally trawled in Clew Bay.
- Solea lutea** (Risso). SOLENETTE.—Found occasionally, but apparently not common.
- Salmo salar** L. SALMON.—The Burrishoole and Newport rivers, flowing into the north-east corner of Clew Bay, are well known as salmon rivers.
- Salmo trutta** L. WHITE TROUT.—Frequent in the rivers and lakes on the mainland.
- Salmo fario** L. BROWN TROUT.—Occurs in some of the streams on Clare I. Common on the mainland.
- Belone vulgaris** (Willughby). } Both these species are occasionally taken in the  
**Scombrosox saurus** (Walb.). } mackerel nets off Clare I.
- Clupea harengus** L. HERRING.—Often caught in large numbers at the end of September. Nets are stretched round the shoal in Clew Bay, and the fish are caught in a separate net let down across the circle then formed, which is shot and drawn until the whole shoal is captured.
- Clupea sprattus** L. SPRAT.—Common throughout the district.
- Anguilla vulgaris** Turton. COMMON EEL.—Small specimens may be taken in the streams on Clare I.
- Conger vulgaris** Cuv. CONGER-EEL.—Common; fished for by the Clare Islanders.
- [**Siphonostoma typhle** (L.).—Occurs in Ballynakill and Blacksod. Not yet recorded from Clew Bay.]
- Syngnathus acus** L. COMMON PIPE-FISH.—One on the shore of Clare Island. One at Inishlyre.
- Syngnathus rostellatus** Nilss. LESSER PIPE-FISH.—Ballynakill and Blacksod, frequent. Not yet recorded from Clew Bay.
- Nerophis aequoreus** (L.).—Shore-collecting, Clare I.
- [**Nerophis ophidion** (L.).—Occurs in Zostera beds at Ballynakill and Blacksod, and probably also in Clew Bay.]

- Nerophis lumbriciformis** (Yarrell). WORM PIPE-FISH.—Common on the shores of Clare I. and throughout Clew Bay.
- Orthogoriscus mola** (L.). SUNFISH.—Sometimes seen round Clare I. A specimen from Achill is in the National Museum, Dublin.

## ELASMOBRANCHI.

- Carcharias glaucus** (Rondel.). BLUE SHARK. } All these are occasionally taken  
**Galeus vulgaris** (Flem.). TOPE. } in the mackerel  
**Mustelus vulgaris** (Müll. and Henle). SMOOTH HOUND. } nets.  
**Lamna cornubica** (Gm.). PORBEAGLE. }
- Selache maxima** (Gunn). BASKING SHARK.—Frequently seen off Clare I. in autumn. Often locally termed “sunfish.”
- Scyllium canicula** (L.). ROUGH DOG, SPOTTED DOGFISH.—Common in Clew Bay.
- [**Scyllium catulus** (Cuv.). LESSER-SPOTTED DOGFISH.—Blacksod and Ballynakill scarce. Probably occurs also in Clew Bay.]
- Acanthias vulgaris** Risso. SPUR-DOG, PIKED DOGFISH.—Common. It is at times very abundant, and does considerable damage both to the mackerel nets and to the emmeshed fish.
- Rhina squatina** (L.). ANGEL FISH.—Taken occasionally in Clew Bay.
- Raia batis** L. COMMON SKATE.—Clew Bay (R.D.S. Survey); scarce.
- Raia clavata** L. ROUGH RAY.—Clew Bay; common. A variety with conspicuous spines on the underside sometimes occurs.
- Raia maculata** Montagu. SPOTTED RAY, HOMELYN RAY.—Clew Bay; very common.
- Raia blanda** Holt and Calderwood.—Clew Bay; common.
- Raia naevius** Müll. and Henle. CUCKOO RAY.—Clew Bay; occasionally taken.

AVES.

By R. J. USSHER.

PLATES I-V.

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I.—PREFACE.

IN this Report I write as one among several observers and as compiler of our joint observations, coupled with records from every available source. I was supplied by Professor C. J. Patten with voluminous field-notes of five visits to Clare Island, and with many skins and photographs taken there by him ; by Mr. N. H. Foster with tabulated lists of his observations, both on the island and mainland ; and by Mr. R. M. Barrington with observations and specimens, and schedules of light-keepers. I have, moreover, to thank the last-named for constant advice and assistance in the preparation and revision of the manuscript. Some of Mr. Welch's beautiful photographs, taken for the Survey Committee, enhance the value of the present report ; and I have to thank the several gentlemen named under the head of "Field-work" for filling up schedules at my request, and Mr. H. Blake Knox for his photograph of the Snowy Owl.

II.—INTRODUCTION.

AREA.

In dealing with the birds of the Clare Island district the problems of isolation presented by the more sedentary organisms do not arise. As the distance across the channel is only three miles, all birds can pass readily from Clare Island to the mainland, and *vice versa* ; and though a

few land-birds are resident on the former, their characteristics are those of a part or the whole of Ireland and not of the island, which is but a point in their range; its bird-life partakes in the seasonal movements and character of the west coast avifauna, which can only be understood by the study of an extended coast-line, such as that from Erris Head to Slyne Head. Even this will need comparison with the coasts of Donegal and Kerry, or other portions of the western littoral.

The west coast of Ireland has not been treated of separately by ornithologists, but it offers features of its own. It is out of the over-sea track of most passerine migrants, though some rare stragglers, like the Wood Wren and Crossbill, have reached Black Rock, Mayo; flocks of land-birds, however, visit the islands in winter, especially in frost and snow, and some summer migrants breed there.

The west coast, and especially the northern part of it, is the main Irish resort of winter visitors from countries north of the British Islands, which evidently arrive in Donegal or North Mayo, where some remain to winter, while others pass on to Kerry and its islands; a few linger until summer, like the Greenland Falcon, Scaup Duck, Purple Sandpiper, Sanderling, Northern Diver, and Slavonian Grebe. A few arctic-breeding birds have colonies, *e.g.* Red-necked Phalarope, Common Gull, and Fulmar. In common with Kerry, western Connaught has breeding resorts of two Petrels and the Manx Shearwater; and is touched by the wandering bands of Great and Sooty Shearwaters. Its marine and mountain cliffs have until recently been among the last strongholds of Eagles, and are still the homes of Peregrines, Ravens, and Choughs; and the Great Black-backed Gull is probably nowhere so numerous in Europe as it is on the west coast of Ireland, especially on the Bills of Achill. The natural features of this coast are varied by stupendous sea-cliffs (as are Clare Island and Achill), and lofty mountains, their slopes buried in peat; there are huge bays—Clew Bay and Blacksod Bay—with sands and mud-banks, and swampy lakes near the coast, as on the Mullet, which offer refuges and feeding-grounds to Swans, Geese, Ducks, and Waders. The sheltered country about Westport, holding timber, is inhabited by woodland birds not found on the exposed coast; while the islands and rocks are resorted to by Wheatears, Twites, Oyster-catchers, Arctic Terns, and Petrels for breeding purposes.

The shores of Clare Island are too stony to afford feeding for most Waders and Ducks; but Geese of at least two species pasture on the western end; and Golden Plover and Woodcocks seek its mountains and moors in winter, while the belt of small farms holds such birds as the three Buntings, Stonechats, Whitethroats, Cuckoos, and Corncrakes.



Inishturk is entirely mountainous ; but Inishbofin is lower, more extensive and undulating, with some cliffs, harbours, lakes, and sands. The Bills—two rocky islands, rising a little over 100 feet—are six miles south of Achill and eight north-west of Clare Island, in the full sweep of the ocean. They are densely colonized with birds, especially by Great Black-backed Gulls and Puffins, which nest among the huge bosses of thrift. Achill has two mountain groups over 2000 feet high, cliffs pierced with caverns, much moorland, some small lakes, sandy shores where the Waders of Blacksod Bay feed, and it is divided from the mainland by a long sound, with several sand-banks, and close by which are Glendarary plantations, that have attracted Tits, Sparrow-Hawks, and Woodpigeons. The Mullet, a low, bare, undulating peninsula, 15 miles long, possesses cliffs along its northern moorland part ; it is resorted to by the arctic visitors ; and it shelters the great expanse of Blacksod Bay, to the east of which extends for 20 miles the largest bog in Ireland, where Common Gulls, Curlews, Golden Plover, and Dunlins breed. West of the Mullet lie the Duvillauns, the Inishkeas, and other islands, the homes of Petrels, Terns, Gulls, Peregrines, and Ravens,

This coast is subject to the most violent storms and tremendous wave-action, and many migrating birds avoid the shoulder of Connaught by passing down the chain of lakes Conn, Mask, and Corrib ; projecting as it does, this shoulder seems to catch the fugitives from the north, offering them a resting-ground.

The climate of western Connaught is equable and moist, and the south-west winds sweep undiluted in temperature and force upon its islands from the ocean, which consequently are resorted to in winter by many passerine birds that do not breed there.

#### DISPERSAL OF SEEDS AND MIGRATION.

This subject is treated of in a previous part at considerable length, and it is stated<sup>1</sup> :—“ As regards purely local movements the ornithologists have little to tell us. We do not know what species of birds fly frequently to and fro between the island and the mainland, nor at what seasons.” The writer of the present report hopes he has supplied this want by showing that every year, chiefly in October and November, when seeds are ripe, there is a large migration into the island of land-birds of the Thrush family, Finches of different species, Starlings, Rooks, and Larks, all of which are seed- or berry-feeders ; so that as far as birds can convey seeds there are unlimited possibilities every autumn of their transmission to the western islands, and there are also lower forms of animal life which appear to be thus transportable.

<sup>1</sup> Clare Island Survey, Part 10, p. 85.

## FIELD-WORK.

No special work in the ornithology of Clare Island nor of the west coast had been done before our survey, except by the light-keepers for Mr. R. M. Barrington; their schedules have been tabulated and, being used with care under his correction, have yielded information as to winter visitors and migrations. Messrs. Williams & Son, who have for many years received specimens from all parts of the district, have placed their records at our disposal.

Many notices have been written in the *Zoologist*, *Irish Naturalist*, and *Field* about the birds of Achill and the Mullet, and these go to confirm our Clare Island observations and fill up gaps in our knowledge of the winter visitors and passing migrants, such as our limited work could not embrace. The visits of ornithologists in the Survey were as follows:—

G. E. H. Barrett-Hamilton—9th–13th April, 1909 (Clare Island).

R. M. Barrington—25th–29th March, 1911 (Clare Island).

N. H. Foster—15th–19th May, 1909 (Clare Island); 18th–21st May, 1909 (Louisburgh district).

.. 16th–23rd June, 1910 (Belclare district, Clew Bay islands).

C. Lindner—17th–20th June, 1910 (Clare Island); 20th–23rd June, 1910 (Belclare, Clew Bay).

.. 12th–26th July, 1911 (Mullet, Inishkea, Duvillaun, Clare Island, Inishturk, Inishbofin).

C. J. Patten—25th–30th March, 1st–14th July, 10th–29th September, 29th–31st December, 1910; 2nd–7th July, 1911 (Clare Island).

R. J. Ussher—Travelled with Lindner, and has repeatedly visited the Mullet, Achill, Inishbofin, and most of the islands from the Mullet and Inishkea to Slyne Head.

Barrington collected about thirty-two skins; Patten about fifty, with specimens in spirit, and he took many photographs of birds in their haunts and nesting-sites, and was the only ornithologist who visited the island in winter. He made the land-birds his special study.

R. Ll. Praeger has contributed various notes, especially on The Bills, visited with Welch on 21st June, 1910.

Use has been made of schedules kindly filled by G. Wallace for Belmullet, Alexander Williams for Achill Sound, R. B. Sheridan, assisted by his father, J. R. Sheridan, for Achill Island, J. J. McCabe for Clare Island, and W. H. Good for Westport; some of these have been compared with schedules filled by the same observers twenty years ago. Warren's life-long observations on the North Mayo coast have been consulted, as well as those of others, *e.g.*, Pike for Achill thirty years ago, Dr. Burkitt for Belmullet.

## FAUNA.

Special attention has been given to the resident land-birds. Barrington took all his Clare Island specimens to South Kensington, where all Patten's skins were also sent, and these were compared with the series in the Natural History Museum. The result of two and a half days' work was that none of the Clare Island birds showed any distinction from those from other parts of Ireland. The Hedge-Sparrow, Dipper, Wren, and House-Sparrow were gone into at great length. Patten took measurements of his specimens, and compared them with some English, Irish, and Continental skins.

## NOMENCLATURE.

The systematic names in this part are those in Howard Saunders's "Manual," 1899. While recognizing that many of these will be superseded under prevailing rules, when the new list shall have been prepared by the Committee appointed by the British Ornithologists' Union in 1911, the subject is in such a state of transition that this objection will probably affect any list yet published, and more than one important scheme has recently appeared. The nomenclature of Saunders is here used, not to maintain it against those who have pursued the subject more recently, but as a help to readers.

The list of species gives special observations of birds on Clare Island, then treats of Achill and the other islands, and then of the mainland from Erris Head to Slyne Head, and round the included bays, as well as the Westport district. The status of each species is shown by comparison with other portions of the west coast, chiefly Donegal and Kerry. Observations of the Survey party are always included, but no other sound information on the subject, old or recent, is excluded.

## LISTS.

In the comparative table of birds of the islands and mainland, separate columns are devoted to those species which breed and those which do not; but several names occur in both columns where some individuals of a species breed, while many more come to pass the winter. In the second column are included winter visitors, like Fieldfare, Geese, birds on passage as Whimbrel, land-birds which visit the islands after their breeding-season, *e.g.*, Rook, Black-headed Gull, and species which, like Turnstone and Curlew, are found all the year round more or less, chiefly in an immature state. In the third column, headed "Stragglers," are those birds which occur too seldom to class them as regular migrants, though further records may entitle some to be placed in the second column.

## III.—LIST OF SPECIES.

**Turdus viscivorus**, Linn. MISTLE-THRUSH.—A mere straggler to Clare Island, met with in May and October, but may yet settle there, owing to its continued spread throughout Ireland for more than a century. Up to 1860 it was unknown in Achill, but is now a resident and breeds there, as it does around Westport and on the Mullet. In North Mayo and West Donegal it has greatly increased, and breeds occasionally on the side of a rocky ravine on a ledge like a Ring Ouzel. Mistle-Thrushes were reported from Black Rock (Mayo) in March, and a specimen from Aranmore, 30th November (Barrington).

**Turdus musicus**, Linn. SONG-THRUSH.—Numbers visit Clare Island in winter. On 29th December, 1910, Patten noted "Song-Thrushes abundant on the beach, heather, bogs, and cultivated parts"; he shot two specimens. Light-keepers have noticed numbers at the end of October and during November and December. On the Mullet the species is practically absent in summer, but in winter numbers feed there on snails among the sand-dunes.

A few breed on Clare Island and many on Achill and the mainland round Clew Bay. In November, and through winter, when there is frost and snow, flocks of Song-Thrushes, Blackbirds, and others take refuge on all the outer islands off the west coast, but generally desert them in the breeding-season, a few remaining on extended points of the mainland, as the promontory west of Dingle.

**Turdus iliacus**, Linn. REDWING.—A specimen was shot on the island by Patten, 29th December, 1910. Others observed in November and March. The Redwing is a winter visitor to Westport and Achill, is scarce on the Mullet, but numerous about Ballina. Though not partial to bare coasts and islands, like the Fieldfare, this species, together with its congeners and Starlings, flies thither in times of snow, and perishes in great numbers.

**Turdus pilaris**, Linn. FIELDFARE.—Winter visitor in large numbers, Clare Island being better suited to its habits than to those of the last species. Patten saw flocks in December and got specimens. Barrington observed a flock in March, and in the schedules of Hammond, the principal light-keeper, there are nine entries of Fieldfares, usually in numbers, during October, November, and December, 1904 to 1907. The migration reports show that hosts of Fieldfares arrive by Inishtrahull and pass down both coasts, chiefly the western. From 18th to 23rd December, 1885, immense flocks of Fieldfares, Thrushes, and Starlings passed Rathlin O' Birne Island, going westward into the Atlantic (Migration Report).

**Turdus varius**, Pallas. WHITE'S THRUSH.—Specimen in Dublin Museum, shot 9th January, 1885, at the Colonel's Wood, near Westport. There are two other Irish records of this wanderer from Asia.

**Turdus merula**, Linn. BLACKBIRD.—Resident on Clare Island, breeding on the lowland holdings, sings on furze-tufts and walls; nest found in door-hole of a ruin (Barrett-Hamilton). Patten found another on a rock supported by the stem of a furze-bush on 3rd July (Plate V, fig. 4), and on 5th July another nest on a grass-covered turf fence surrounded with bracken. There is evidently an immigration to the island in October of Blackbirds which are seen there during winter months, as there is in Ireland generally. As a breeding-species this bird is reported to be a settler on Clare Island within the present century, which corresponds with what has taken place elsewhere along the western coast, where the Blackbird is common as a winter visitor, but has only extended its breeding-range there within recent times. On the Mullet, Achill, Inishbofin, the Dingle Peninsula, and further south this has been observed. In 1900 Lord Ventry said that these birds had commenced to breed of late years, but were previously winter visitors, their coming being then taken as a sign that the Woodcocks had arrived.

**Turdus torquatus**, Linn. RING-OUZEL.—Though not noticed by any of our Survey party, this bird is stated by McCabe, owner of the Granuaile Hotel, to be often seen on Croaghmore, a locality suited to its habits from which one sees those Achill mountains which are favourite breeding-haunts of the Ring-Ouzel. It also nests on other high mountains in Donegal, Sligo, Mayo, Connemara, and Kerry, so that Clare Island is within the circuit of its chosen abodes.

**Saxicola oenanthe** (Linn.). WHEATEAR.—Plentiful in summer, breeding on Clare Island in holes of stone walls and under stones. Hammond noticed on 7th March, 1907, "Wheatears all day on island," and many others were recorded later in that month. These early birds are probably coming to breed as they do on Achill, Black Rock, Tearaght, and all the islands of the west coast, where they are most characteristic land-birds, and are common, too, on the rocky, treeless margin of Ireland, especially in the west. Barrington shows that the spring migration is at its height the first ten days of April and lasts into May; but he believes that the later birds are going further north and leave Ireland to breed. The autumn migration, which is much less noticed, usually terminates early in October, though a specimen has been received, killed striking the Bull Rock, on 7th December, 1902.

**Pratincola rubicola** (Linn.). STONECHAT.—Resident in small numbers on the island; observed by our party at all seasons; specimens obtained in December and March. Patten saw a male building on 26th March. The Stonechat is found on the islands of Inishtrahull, Aranmore, Achill, Inishturk, Inishbofin, the Aran Islands, and Valencia, and breeds on most of them and on the adjacent peninsulas. Wallace notices a diminution of these birds in winter on the Mullet; but Good thinks they are then quite as common about Westport as in summer.

**Ruticilla phoenicurus** (Linn.). REDSTART.—Barrington records one shot on Black Rock (Mayo), 13th September, 1891, and another at Killybegs in the following November. This species rarely visits the west coast.

**Ruticilla titys** (Scop.). BLACK REDSTART.—One was obtained at Dugort, Achill (Sheridan). On 13th December, 1891, Jeremiah Trant observed on Black Rock a bird which, from his description, was plainly a Black Redstart. Barrington has evidence of other occurrences of this kind there, and perhaps from Slyne Head; while several specimens have been sent him from the Skelligs and the Tearaght. It is, however, on the north and west coasts of Ireland that this bird occurs most rarely, but it is an annual visitor to the south coast.

**Erithacus rubecula** (Linn.). REDBREAST.—Resident on Clare Island, where Patten found Robins "plentiful" in December. It is a resident everywhere on the neighbouring mainland, except on the barren wastes, and has been reported from twenty islands, including Aranmore, Rathlin O'Birne, Black Rock (Mayo), Achill, the Aran Islands, Tearaght, and Bull Rock, most of which it visits temporarily, and on others it breeds.

**Sylvia cinerea**, Bechst. WHITETHROAT.—Not infrequent during summer in the brakes and hedges of holdings on Clare Island; on Achill, where it breeds commonly, J. R. Sheridan says he did not find it when he was young. It is common about Westport and on the way to Clifden. This is the warbler most in evidence along the bare western fringe of Ireland. It is found on the western peninsula of Donegal, near Clifden and Roundstone in Connemara, on the Aran Islands, the Dingle district, and south of the Kenmare River.

**Sylvia atricapilla** (Linn.). BLACKCAP.—Barrington has a specimen obtained on Eagle Island, 31st October, 1886; another was reported October, 1911 (Wallace), two on Achill, October, 1882, and October, 1887 (Sheridan). Good finds the Blackcap a regular summer visitor to Westport and Castlebar district; it has bred near Ballina (Warren).

**Sylvia nisoria** (Bechst.). BARRED WARBLER.—An immature bird, in Dublin Museum, was obtained 24th September, 1884, at Belmullet, after a stormy night.

**Regulus cristatus**, R. L. Koch. GOLDEN-CRESTED WREN.—Though not observed on Clare Island, where the light-house is placed too high for birds to strike, this little bird must visit it on its migration, as no islet is too remote for it to visit. Barrington has received reports or specimens of the species in autumn from Inishtrahull, Black Rock (Mayo), the Aran Islands, Tearaght, and Skelligs, and in April it has been observed at the Aran Islands. It is resident on Achill, breeding in Glendarary wood, though Sheridan says it was unknown in 1860–1870; and about Ballina (where Warren spoke of it as scarce in 1896) it now breeds commonly in fir plantations (H. W. Scroope). Foster and Lindner identified it near Belclare in June, and Golderests have been found in the Dingle district (Lord Ventry). It occurs numerously on wooded islands in the great lakes of Mayo and Galway in winter (Good and Palmer).

**Phylloscopus rufus** (Bechst.). CHIFF-CHAFF.—Common in the wooded districts about Westport and in Donegal, Mayo, Galway, and Kerry, but only where plantings extend, as on the Dingle peninsula; before plantations grew up it was unknown there; it is absent from the bare coast districts and islands. No specimen has reached Barrington from western light-houses. A Chiff-chaff has been seen near Ballina on 24th January, 1878 (Scroope).

**Phylloscopus trochilus** (Linn.). WILLOW WREN.—Not observed on Clare Island by the Survey party, but common in woods round Westport and Belclare (Foster); a regular summer visitor to Glendarary and south Achill (A. Williams); numerous round Ballina (Warren). Lord Ventry knew it long since in the Dingle district; but it is generally absent from moors and coasts. Barrington has received specimens from Aranmore, Ross's Point (Sligo), Black Rock (Mayo), the Aran Islands, Tearaght, and Bull Rock.

**Phylloscopus sibilatrix** (Bechst.). WOOD WREN.—The first specimen received by Barrington from a light-house was shot on 27th May, 1890, on Black Rock, Mayo, 22 miles N.W. of Clare Island, and over 8 miles from the mainland. No other warbler except a Willow Wren has been sent from there. The Wood Wren is the rarest of the warblers that has bred in Ireland, but has been obtained and repeatedly noticed by Hart in Donegal; and only one other has been sent from a light-house (Rockabill, 4th May, 1912).

**Acrocephalus phragmitis** (Bechst.). **SEDGE WARBLER**.—Repeatedly identified in marshy ground near Clare Island harbour in June, 1910, and July, 1911; found on lakes south of Louisburgh, on Lake Moher and near Belclare; reported from Achill; specimen received from Belmullet (Ussher); common on Carrowmore Lough and about Ballina. H. F. Witherby, who visited Inishturk, 28th May, 1895, reported several among bushes on hill-side; met with near coast in Donegal, Connemara, and the Dingle district (Kerry). Barrington's specimens from Killybegs, the Aran Islands, and Oyster Island, Sligo, were all received in spring. Though thus well dispersed, it is not numerous along the west coast of Ireland.

**Accentor modularus** (Linn.). **HEDGE-SPARROW**.—Resident and frequent on Clare Island, specimens obtained in March and December. Nest with eggs in strong tuft of lady-fern (Ussher), another placed on the ground (Patten). Though nowhere numerous, there is no land-bird, except the Wren, so widely distributed as the Hedge-Sparrow, which not only inhabits the most bleak and treeless districts of the mainland, as the country west of Dingle, but is resident and breeds on Tory Island, Aranmore, Inishbofin, the Aran Islands, and even on the remote, precipitous Tearaght, whence eggs have been sent. A Hedge-Sparrow, killed striking North Aran light-house, 12th September, 1897, was sent to Barrington, who remarks that there is probably some intermigration between the island and the mainland.

**Cinclus aquaticus** Bechst. **DIPPER**.—A very few are resident on the mountain-rills of Clare Island. Several specimens, obtained there and elsewhere in Ireland, from time to time, were carefully compared by Barrington with the series at South Kensington; and he found nothing to distinguish the Clare Island birds from other Irish Dippers; but an Achill Island specimen in his collection has more chestnut on the breast than any Irish specimen examined.

The crown of the head, he writes, and the nape are a lighter brown in the English than in the Irish specimens, and the grey edges of the feathers on the back and upper tail-coverts are narrower and less numerous in the latter than in the English Dippers.

Patten remarked of a male bird shot on Clare Island, in January, that the chestnut on the breast was much more limited and duller than in many English birds, and even than in four from near Bray, Co. Wicklow; also that several male and female English specimens showed less stout beaks and feet.



Few streams in Co. Mayo are without the Dipper; and it seems as much at home on the edges of Loughs Mask and Carra as on the streams. Barrington found its nest on the north coast of the county, close to a cliff, in a ravine about 500 feet above the sea. It is resident in Achill, and breeds on the River Moy before the end of March; this species is probably resident in every county in Ireland.

**Acredula caudata** (Linn). LONG-TAILED TITMOUSE.—Found in summer and autumn (probably resident) in the wooded districts about Westport, and more rarely at Glendarary, Achill; resident about Ballina; believed by Lord Ventry to breed on the Dingle peninsula.

Though a woodland bird, its wandering habits have led a flock of seven to Inishtrahull (Barrington).

**Parus major**, Linn. GREAT TITMOUSE.—Not uncommon in the Westport, Belclare, and Louisburgh districts (Foster). Good never found this or the Blue Tit scarce at any season about Westport; observed about Glendarary, Achill (A. Williams); not elsewhere on islands.

**Parus ater**, Linn. (or its Irish form). COAL TITMOUSE.—Resident about Westport, and found at Glendarary; once obtained at Dugort, north Achill; observed by Lord Ventry on Dingle peninsula since plantations have grown up.

**Parus caeruleus**, Linn. BLUE TITMOUSE.—Common and resident all about Clew Bay; has become resident on Achill and the Dingle peninsula; though once identified on the Tearaght, it does not, as a rule, visit remote islands.

We have no evidence of any Tits on Clare Island.

**Troglodytes parvulus**, Koch. Wren.—Common resident on Clare Island, where on 27th September Patten noted: “shrubs abounded with Wrens”; and on 30th December, “Wrens very numerous”; nests found inside turf roof and under overhanging bank of stream. Resident on Achill, and common on mainland of Mayo; is found on the mountains among stones and heather, and on bare, rocky promontories, being at home both in sylvan scenery and on the most stupendous sea-cliffs and storm-swept islands. An increase in the number of Wrens has been reported there to Barrington, in winter, when notices of them from Black Rock (Mayo), Slyne Head, and the Aran Isles are more frequent, and Wrens probably resort to such islands regularly at that season. The same remarks apply to headlands and isles of Kerry; on the Little Skellig, Turle found twenty to thirty nests in rock-crevices, and on the Blaskets a nest, not domed, at the extremity of a Puffin’s burrow.

*Certhia familiaris*. Linn. TREE-CREEPER.—Resident and not uncommon about Westport, at Gleniarary, and wherever there are plantations in Donegal, Mayo, and Connemara: but Barrington has no evidence that it has occurred at any Irish light-station. At Kylemore a Creeper nested in a fold of a seal's skin hung up.<sup>1</sup>

*Motacilla lugubris*. Temm. PIED-WAGTAIL.—Observed about harbour roads, and holdings on Clare Island at all seasons, but specially noticed near the light-house as a migrant in October and November (Hammond). Generally distributed on the mainland, Achill, and Inishbofin. About Belmullet Richards observed it to appear in December, and Wallace reported flocks which arrived there in September and October. The autumn immigration of this species, treated of by Barrington, lasts thus in October, and is extended to the isles of Connaught.

*Motacilla alba*. Linn. WHITE WAGTAIL.—An immature bird, in company with others, was shot by Good near Westport in August, 1891, and examined by Dresser and Howard Saunders. The latter, too, identified an adult in the roadside near Glenanny bridge with a bit of cotton-rush in its bill, 9th June, 1898; therefore, the nest should be looked for in Mayo. Sheridan shot a male on Achill in May, 1895, and its skin was preserved by Barrington. Wallace reported five seen at Cross Strand on the Mullet, which arrived from the sea, at a considerable height. There is a migration up the west coast of Ireland at the end of April and in May. Barrington has received specimens at that season from the Aran Islands, Galway; from Aranmore and Inishtrahull, Donegal; while for many years Warren and Kirkwood have observed or recorded small flocks which visit the island of Barraugh on Killala Bay on their spring passage. In 1911, for the first time, their return in the last week in August was noticed there.<sup>2</sup> Hart observed five on Trawbreaga Bay in the far north of Donegal on 26th July, 1891, and W. C. Wright saw some in the same locality in 1903, and on a strand near Rossbeg (Naran district) in 1904, both early in August.<sup>3</sup> The White Wagtail doubtless passes Clare Island.

*Motacilla melanope*. Pallas. GRAY WAGTAIL.—On Clare Island a few may be found along the streams and the harbour at all seasons. They evidently breed, and have been obtained in winter. Foster saw the bird at Belclare in summer, and Good saw it at Westport through the winter. Achill specimens are preserved in the Slievemore Hotel. A few inhabit

<sup>1</sup> Humphreys *Ir. Irish Nat.*, vol. *xxi*, p. 46.

<sup>2</sup> *Zoologist*, 1911, p. 335.

<sup>3</sup> *Zoologist*, 1904, p. 375.

the river-sides through Connemara, Mayo, and Donegal, but they are not common on the actual sea-board; though in Kerry they are found near Valencia at all seasons. Barrington received a Grey Wagtail, killed striking North Aran light-house, 8th October, 1887, and another from Clare Island, 23rd November, 1904.

**Motacilla raii** (Bonap.). YELLOW WAGTAIL.—A single specimen (female) was shot by Sheridan on Achill Island, 15th May, 1892, as appears from a note of A. G. More. Warren once saw a male near Killala Bay, 15th April, 1875. Good thinks he has seen the Yellow Wagtail near Castlebar; he knows it on Loughs Carra, Mask, and Corrib, where it breeds. The nest was first found near Lough Corrib by Lord Lilford in 1854. J. Steele Elliott stated that he saw the species on the 15th May, 1891, on grass-land beside Lough Kiltorris in western Donegal; and the late John Chute Neligan, Recorder of Cork, knew it as a regular visitor near Tralee. There is, therefore, evidence that the Yellow Wagtail migrates up the west coast, and occasionally goes west of the line of Loughs Corrib and Mask.

**Anthus pratensis** (Linn.). MEADOW PIPIT.—The most generally distributed bird on Clare Island (Patten), being found almost to the mountain's top, and is present at all seasons. A Peregrine was observed mobbed by Pipits, and one was seen feeding a young Cuckoo on a boulder. Foster found a nest under a large stone deeply embedded in a bare grass slope—another instance of land birds breeding under cover on exposed islands.<sup>1</sup> The Meadow Pipit is common and resident in the several districts round Clew Bay and on Achill. Good has noticed it in large numbers in winter about Westport. It frequents the desolate moors of Mayo, as well as pastures and cultivated parts. Barrington's observations show that there is an immigration in spring and another in autumn; and it is doubtless the autumn immigrants that swell the numbers on the west coast. Warren on a September morning observed a flock of 200 on Bartragh Island, which took flight towards the mainland, evidently on migration.

**Anthus cervinus** (Linn.). RED-THROATED PIPIT.—A male was obtained by Coburn on Achill, 25th May, 1895 (Bull. B. O. C., lxxx, p. 15).

**Anthus obscurus** (Lath.). ROCK PIPIT.—Common resident on the shores of Clare Island, Achill, Inishturk, and Inishbofin, and is the only land-bird that breeds on The Bills. It is common on all the neighbouring coasts,

<sup>1</sup> Irish Nat., vol. xviii, p. 159.

including the awful cliffs of North Mayo. On the Dingle peninsula Patten found it both on the cliffs and mud-flats. Is not known to migrate.

**Muscicapa grisola**, Linn. SPOTTED FLYCATCHER.—Though not observed on Clare Island, this is a regular summer visitor to the Westport, Belclare, and Louisburgh districts, and to Glendarary plantations on Achill. It dispersed through Donegal, even near the coast, as at Horn Head House, and on elders near a lonely cottage on the moors near Loughros Bay. Specimens killed striking light-house lanterns have been sent to Barrington in October, 1887, from Black Rock (Mayo) and from the Tearaght (Kerry).

**Hirundo rustica**, Linn. SWALLOW.—Summer visitor to Clare Island in small numbers, chiefly seen about the port and settled parts, and sometimes at the light-house. The cow-houses are usually too low and closed-up for it to breed in; but Ussher discovered more than one pair nesting in the arch of a huge sea-cave open at both ends, south of Granuaile's Castle (Plate IV, fig. 1). This seems a very unusual site, though Swallows often nest in the roofs of inland caverns. In a house on Achill Sound a nest was built in a room, the Swallows entering by the hall-door (Patten). These birds are numerous about Westport, Belclare, Louisburgh; are found on Achill, Inishturk, and Inishbofin. On the coast and islands generally and about Belmullet they are scarce; but in the summer of 1884 Dr. Burkitt found them numerous there. On migration they visit the Skelligs, Black Rock (Mayo), and Rathlin O'Birne, chiefly in spring, less frequently in autumn.

**Chelidon urbica** (Linn.). MARTIN.—One was observed on Clare Island in June, 1910, by Pastor Lindner. A few were noticed about Louisburgh (Foster) and near Westport, where Good finds them fairly common breeding birds. The Martin is a summer visitor to Achill (Sheridan); but its occurrence at Belmullet is exceptional (Wallace), though it is common about Ballina (Warren). It has not been recorded as breeding in sea-caves or over-hanging cliffs on the west coast, as it does on the less wave-beaten coasts of Munster, Leinster, and Ulster; and it is remarkable that the Swallow, not the Martin, breeds in a sea-cave on Clare Island, though this is not exposed to the waves.

**Cotile riparia** (Linn.). SAND-MARTIN.—There is no record from Clare Island, but Sand-Martins were observed about Louisburgh (Foster) and breed freely near Westport (Good). This bird is not frequent on the coasts and islands, though one was seen on Inishbofin; but is found on the streams in Mayo and Donegal.

**Ligurinus chloris** (Linn.). GREENFINCH.—Winter visitor to Clare Island, whence Barrington got specimens in December and January, and another taken on Black Rock (Mayo) in November. Like the Chaffinch, this species resorts to western islands in company with others in very cold weather, though the notices of it are fewer than of the Chaffinch in the Migration Reports. Foster notices it from Louisburgh, and it is a common breeding bird near Westport (Good). Pike, of Achill, said, "Large flocks of various birds arrive about the first week in November, and remain until March . . . Green Linnets, Grey do., Chaffinches, &c." In 1891, Sheridan wrote: "It now remains and breeds." It is gregarious in winter at Killybegs (A. Brooke), and has been seen west of Dingle at that season (Patten).

**Coccothraustes vulgaris**, Pallas. HAWFINCH.—Rare straggler to the west coast. Was obtained on Achill by Pike in 1874, and by Sheridan in 1897. Wallace records it once from Belmullet, and Warren once from near Ballina in 1859. It has been obtained a very few times in Donegal, Galway, and Kerry.

**Carduelis elegans**, Steph. GOLDFINCH.—Occasional winter visitor in small numbers to Clare Island, Achill, and the Mullet; a resident breeding bird about Westport, where Good has repeatedly seen flocks of fifty or sixty. It is resident in many bare, remote districts near the western coasts, as in western Donegal, where in places it is the only breeding finch, nesting even in gooseberry-bushes and hedges of thorn and elder. Patten saw five on 29th December near Dingle. In his "Migration of Birds," p. 130, Barrington writes:—"On the west coast the records are comparatively numerous, but with few exceptions they are from islands where the Goldfinch breeds—Aranmore and Valencia."

**Passer domesticus** (Linn.). HOUSE SPARROW.—Common resident, nesting in the thatched roofs and Grania Uaile's Castle, Clare Island. Of a series of birds taken there Patten remarks that the feet are more slender and the beak not so heavy as in Sheffield Sparrows, the plumage-markings being very rich and distinct in the male. Sparrows are common about Louisburgh and on Achill, numerous about Westport, Ballina, and other towns, and around the thatched cottages of the western coasts and islands. A colony breed on the ivy-covered cliff over Inishturk harbour. They occur on Inishbofin, the Aran Islands, and Aranmore, west of Dingle, and on Durseys Island.

**Passer montanus** (Linn.). TREE-SPARROW.—Breeds at a few points on the coasts of Londonderry, Donegal, and North Mayo (where it now has

settlements on Killala Bay and at Belmullet). It is highly probable that it will be found further south, and one has been reported from Kerry, though this needs confirmation.

**Fringilla caelebs**, Linn. CHAFFINCH.—Winter visitor to Clare Island from October to March, as it is to most of the treeless coast districts and islands from Donegal to Kerry. It is common and breeds regularly on the mainland round Louisburgh and Westport, and throughout western Connaught and Donegal it is the commonest finch in summer. A few have bred of late years on Achill and the Mullet and about Dingle, though said formerly to be exclusively winter visitors to those districts, where flocks continue to pass the winter. Chaffinches have repeatedly arrived on Black Rock, Mayo, between 21st and 24th October (Barrington), and numbers visit the Tearaght and Skelligs, especially in hard frosts when there is a rush of birds to those islands and to the Isles of Aran. The preponderance of those in female plumage which arrive in autumn has been observed on Clare Island, the Mullet, and repeatedly on the Tearaght.

**Fringilla montifringilla**, Linn. BRAMBLING.—Irregular winter visitor to the coasts and islands of Mayo and Kerry, which appears to arrive generally on the eastern and south-eastern shores of Ireland, not always reaching the west. Many were seen on Achill by Ed. Williams in October and November, 1898. Specimens have been sent to Williams & Son from Achill, Castlebar, and Killala. Barrington has received one from the Skelligs, shot out of a flock of forty, and others from the Bull Rock, Tearaght, and Donegal. Light-keepers frequently fail to recognize this species, and it probably visits Clare Island unrecorded.

**Linota cannabina** (Linn.). LINNET.—Observed all over Clare Island in June and July and in flocks in September. It breeds on Tory Island, Aranmore and western Donegal, and commonly on Achill, north and west Mayo, and southward to Clare and Valencia; but we have no winter specimens as Barrington has from south-eastern lighthouses. It is quite possible that some of the flocks of "Grey Linnets," so often reported by light-keepers at that season on islands from Aranmore to the Bull Rock (including Clare Island), represent this species; but as light-keepers do not record Twites, which we know from specimens occur in winter on the west coast, most of the observations may include the latter. Barrington has dwelt on this in his "Migration of Birds," pp. 135-137; and he thinks that errors of identification are more numerous in the case of the Linnet than of any other species.

**Linota linaria** (Linn.). MEALY REDPOLL (*L. holboellii* (Breh.), *L. rostrata* (Coues)). A series has been obtained on Achill, including all three forms, chiefly in autumn, but once in February. In October, 1898, the late Ed. Williams saw Mealy Redpolls there each day from the 14th to the 21st, and obtained one.

Another series of the large race *rostrata* was received by Barrington in different years from the Tearaght, all in autumn, between 1889 and 1893, and one in January, 1898, from Inishtrahull. We may expect Mealy Redpolls, therefore, at any point on the west coast (including Clare Island) from Donegal to Kerry. All the winter specimens have come from islands.

**Linota rufescens** (Vieill.). LESSER REDPOLL.—The nest has been found in Achill, the Mullet, Killybegs, and Aranmore. The bird is common near Westport, Louisburgh, and most parts of Connaught and Ulster; resident near Ballina (Warren). Large flocks in winter lead a nomadic life; but there is no evidence from the Migration Reports of a transmarine migration.

**Linota flavirostris** (Linn.). TWITE.—Common resident on Clare Island, where the nest has been found, and many families seen forming into flocks: specimens obtained in December and March. Patten saw a flock mobbing a Peregrine. The rocky, mountainous coasts and islands of western Ireland are favourite homes of the Twite; on Achill it is resident and breeds; on Inishturk a huge pit in the bare top of the island, lined with luxuriant ferns, communicates with a sea-cave below: in this Praeger and Stelfox found a swarm of Twites roosting on 22nd July. They nest among heather on islands in the bog-lakes of Connemara (Leybourne Popham). In North Mayo they breed on the slopes of the higher hills; but a nest was found on a low-lying bog (H. Scroope). Twites are very common on Inishbofin and the Aran Islands, towards which flocks fly from Connemara on winter evenings (Teesdale); common, too, on the Dingle hills and Valencia. Barrington has received specimens from September to April from the Donegal lighthouses and from the Tearaght and Bull Rock, but from no other part of Ireland; and it is probable that the frequent flocks of "Linnets" reported in winter and spring from Clare Island and other western isles are largely composed of Twites, the latter name being generally unknown in Ireland.

**Pyrrhula europaea**, Vieill. BULLFINCH.—Breeds about Westport, where it is resident. Though not a bird of the coasts and islands, the Bullfinch's increase in Ireland has extended to those parts of western Donegal,

Mayo, Galway, and Kerry which are not devoid of trees; thus Lord Ventry stated in 1900 as a new and remarkable fact that Bullfinches had appeared in the central part of the Dingle peninsula. No specimen has ever been obtained by Barrington in support of reported occurrences of "Bullfinches" at the light-stations, and there is probably little or no over-sea migration.

***Loxia curvirostra*, Linn. CROSSBILL.**—On 14th July, 1911, Pastor Lindner and Ussher saw a Crossbill in splendid scarlet plumage flying from rock to rock on Black Rock, Mayo. It was alone on the remotest isle of Connaught.

Two specimens were sent for preservation from Achill by Sheridan, February and March, 1894, and many have since been seen there in August. A small flock was noticed at Drumbeg near Killybegs in spring, 1890 (W. Sinclair).

***Emberiza miliaria*, Linn. CORN BUNTING.**—Resident on Clare Island, where these birds may be heard singing on the briars and bushes. A specimen was shot by Patten, 31st December, 1910. "An odd pair everywhere" in the Westport district (Good). This bird is resident on Achill, where it was in full song on 2nd February, 1886 (Palmer). It is frequent on the holdings of coast districts all round Ireland, and breeds on Tory Island, Aranmore, Inishbofin, and the Aran Islands. Patten found it more numerous in winter west of Dingle. Wallace has observed the appearance of flocks, numbering up to thirty-six, which kept together, near Belmullet in March or early April. These are probably local migrations.

***Emberiza citrinella*, Linn. YELLOW BUNTING.**—One of our commonest resident birds. Observed all over Clare Island from March to September; and on the 27th of September Patten found the patches of scrub abounded in Reed and Yellow Buntings. The reverse is the case about Ballina and other districts, where Warren has remarked their absence in September. Good thinks this bird is more common about Westport in winter. Frequent in the bare coast districts from Donegal to Kerry, where we miss so many land-birds; it breeds on Tory Island, Aranmore, and Achill, and is found on Inishturk, Inishbofin, and the Aran Islands. It does not perform the great migrations of some Finches and Larks, but withdraws from certain exposed situations in winter and becomes gregarious.

[The Cirl Bunting has been reported from Dunfanaghy and Belmullet, but no specimen has been obtained.]



**Emberiza schoeniclus**, Linn. REED BUNTING.—On Clare Island Barrington saw many in March, and through the summer pairs were observed in a few places where they evidently bred, but we have no winter record. On the mainland, as about Westport, Good says this bird is common in winter. It is resident on Achill, and in summer is one of the very few widely distributed birds on the moorlands of Donegal and Erris, Co. Mayo. Eggs in Dublin Museum were taken by H. M. Wallis from a hole in the top of a stack off Aranmore. We observed it on Inishbofin; and in Connemara, as elsewhere, it nests on islands in the bog lakes. No Reed Bunting has been sent to Barrington from any western lighthouse, and the name of this bird is generally unknown in Ireland.

**Plectrophenax nivalis** (Linn.). SNOW-BUNTING.—Barrington obtained a specimen in October and Patten another in December on Clare Island. Hammond recorded the species there, twice in March, once in April, once 10th September (an early date), and twice in October. This is a frequent or regular winter visitor to the islands and coasts from Donegal to Kerry between October and April, remaining on Black Rock even when the spray is flying over it for days; and Snow-Buntings are sometimes seen later than April; thus Barrington has received specimens in May from Aranmore, Rathlin O'Birne, Slyne Head, and the Tearaght, and an adult male in full breeding-plumage from Aranmore shot on 25th July. These occurrences favour the hope that the bird may yet be found breeding in Ireland, possibly in Donegal.

**Sturnus vulgaris**, Linn. STARLING.—Winter visitor in flocks to Clare Island from October to March. Increasing and extending its breeding-range throughout Ireland, but much more numerous in winter; a few nest on Achill now (R. B. Sheridan), though none did so twenty years ago. Bred on the cliffs of Aranmore in 1886, on the Aran Islands before 1890, on the cliffs of Valencia in 1891; but these were only advanced posts. A new feature is the appearance of summer flocks, like the twenty Starlings seen around Waterville in July, 1891 (Dennehy), composed no doubt of Irish-bred Starlings, which now appear in so many districts. No winter migrant visits the western islands more largely, especially in times of snow. Witherby saw a pathetic sight on High Island and Cruagh (both uninhabited), a great number of dead birds, chiefly Starlings, the victims of hard weather.

**Pyrrhonorax graculus** (Linn.). CHOUGH.—Clare Island may happily be called a sanctuary of the Chough, where it is resident and common; and as far as the orders of the Lord Lieutenant can go, both birds and eggs are

protected. It breeds there both in the sea-cliffs and inland rocks, and in one place close to the Kestrel's home. Lindner and Ussher saw a flock of thirty performing evolutions and screaming high in the air. Patten saw a Chough chase a Peregrine; but Barrington received the remains of a Chough from a Peregrine's feeding-place on another island. Choughs are resident all along the cliffs of the west coast, but especially on the larger islands, though less numerous than formerly, *e.g.*, in Kerry where they have not been protected, except in Valencia. Barrington infers from reports of lighthouses that local movements of Choughs take place early in April and early in November. Some betake themselves to the Kerry isles in addition to the birds that breed there.

**Pica rustica** (Scop.). MAGPIE.—Not observed by our party on Clare Island, but is said to visit it in winter. It breeds on Achill, and increases there in winter. About Westport it is an increasing species. Barrington shows in a table<sup>1</sup> that Magpies visit island stations (on the west coast) during autumn more and more each month up to November. This bird, so plentiful in Ireland, becomes scarce in the bare western district; it has been found breeding on a steep bank in Donegal, and on ivy-covered rocks near Carna, and on the Aran Islands, districts devoid of trees.

**Corvus monedula**, Linn. JACKDAW.—Said to visit the island in winter. One seen on the castle by Patten, 30th December. It now breeds on Achill, but not on the other western islands, where its place is taken by the Chough. It has few colonies on the west coast, but breeds on Crohy Head and Dunmore Head, Donegal (as well as the Chough), also among the Bartragh sand-hills, Killala Bay; inland it becomes common, as at Louisburgh and Westport. Sixty per cent. of the light-keepers' records of Jackdaws relate to the west coast, and, as in the case of the Rook, are most frequent in November and March. Thus in spring, and still more in autumn, these birds resort to the islands of the west coast, where they do not breed.

**Corvus corax**, Linn. RAVEN.—Nests on Clare Island. Praeger has seen parents and young two years in succession, and Ravens have been observed in spring, summer, and autumn. They are also resident and breed on Achill (hitherto their special resort), on the north coast of Mullet, on High Island, and the Aran Islands, Claggan Head, and the

<sup>1</sup> "Migration of Birds," p. 160.

Twelve Pins; also on the Co. Clare cliffs, and the precipitous Kerry coasts, whence they visit the islands irregularly.

But it is in Donegal, including Aranmore and Tory Island, that this bird has most breeding-places. In 1891, H. C. Hart considered it strongly dominant and by no means decreasing in the county.

**Corvus cornix**, Linn. HOODED CROW.—A few are resident on the island. Praeger has seen two nests, which on the Irish coasts are always on cliffs. Clare Island light-keepers have observed small flocks in May, September, and December; and at Belmullet Wallace has noticed small flocks in September and October. Patten saw the Hooded Crow feed contentedly under a soaring Peregrine; and there is a record from the Tearaght, where these birds breed, that six pursued a Peregrine until it quitted the rock. The species seems to be increasing where not destroyed as vermin, and nests commonly on islands, as the Blaskets and Skelligs, where the Raven does not breed. In Connemara it builds on bushes of the islands in moorland lakes, one of which, "Lough Phenogee," is called after it.

**Corvus frugilegus**, Linn. ROOK.—Does not breed on Clare Island, but considerable numbers resort thither in the end of June and onwards until March. Praeger saw 100 together in July. They feed even on the mountain moors; and young Rooks can be seen on the island fed by their parents. Light-keepers' observations made there of the flocks of Rooks agree with Barrington's statistics of this species for the whole west coast. They show that the principal movement, as in the case of the Jackdaw, is in November, and that a lesser movement is observed in March. Great nomadic flights of Rooks, arriving fatigued from the Atlantic (chiefly observed at the Skelligs and Tearaght), were noticed on this coast at Black Rock and Slyne Head, in 1884, 1888, and 1890.<sup>1</sup> Though the Rook does not breed on any western island, it nests as far as trees extend on the mainland, even at Ballycroy; and there is a large rookery in Westport demesne. Warren has noticed a great increase of Rooks at Moyview, near Killala Bay.

**Alauda arvensis**, Linn. SKY-LARK.—Common. Breeds on Clare Island; heard singing in March and July; observed at altitudes of 1000 feet in September, in which month and October and November flocks of "larks" are noticed by the light-keepers. The Sky-Lark is found everywhere in summer through the west, even on the desolate, wet moors of Mayo and

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<sup>1</sup> Barrington's "Migration of Birds," pp. 153-156.

Connemara; and breeds on Tory Island, Rutland Island, the Aran Islands and the Blaskets.

In western Donegal, also about Westport and Dingle, and on Valencia Island, it is said to increase in winter, and joins other birds in the rush for life to the Blaskets when the mainland is covered with snow.

***Alauda brachydactyla*** (Leisler). **SHORT-TOED LARK.**—In the Barrington collection is an adult bird obtained at Black Rock (Mayo) on the 11th October, 1890. It is the only Irish specimen.

***Cypselus apus*** (Linn.). **SWIFT.**—On Clare Island a few Swifts were observed, and six together, in June and July; but whether they were breeding or not is uncertain. They are said to nest on Achill. The rarity of the Swift in the west of Ireland, spoken of by Thompson in 1849, is a strong contrast to its frequency now. It breeds commonly in Westport, and has of late become plentiful in Belmullet, and is nowhere more in evidence than in western towns and villages, whence it ranges over land and sea, occasionally visiting Owey Island in Donegal, Black Rock (Mayo), and the Skelligs (Kerry).

***Caprimulgus europæus***, Linn. **NIGHTJAR.**—Messrs. Williams & Son have received Nightjars shot near Mullaranny, Westport, and Clifden; moreover, the bird is stated to have been “heard and identified at Blacksod Bay” on 10th June, 1898.<sup>1</sup> It is found at Ballycastle and near the Pontoon Bridge on Lough Conn (H. Scroope), and has long been known close to the cliffs near Narau, Co. Donegal, whence specimens have been sent. This species has, like the Swift, extended its range to the west coast.

***Alcedo ispida***, Linn. **KINGFISHER.**—Kingfishers have been repeatedly shot in the neighbourhood of Westport and Newport in winter. Pike noticed the bird in his list for Achill: and it is occasionally seen near Ballina (H. Scroope). It has been obtained on the Aran Islands; but only two examples have been received by Barrington, and they were both from light-stations on the south-east coast. It is uncertain what “Kingfishers,” reported from the western islands, may have been—possibly Terns.

***Upupa epops***, Linn. **HOOPOE.**—The late Edward Williams received on 25th March, 1893, from Captain Boxer, a Hoopoe shot on Clare Island. Barrington received one shot on Eagle Island, Mayo, on 12th April, 1867, and another shot on Tory Island, 9th November, 1910. Seebohm

<sup>1</sup> R. M. Gilmore in “Irish Naturalist,” vol. vii., p. 200.

shot a Hoopoe during his stay on the Blaskets in September, 1876 ; and others have been obtained on or near the coasts of Donegal, Galway, Clare, and Kerry, though the west coast is visited less frequently than any other in Ireland.

**Cuculus canorus**, Linn. CUCKOO.—Common on Clare Island ; not shy ; alighting on walls, a young Cuckoo was seen on a boulder fed by a Pipit. First heard by Hammond on 20th April, an early date, though matched at Rathlin and Aranmore ; and it was seen at Killybegs on 11th April (A. Brooke). The Cuckoo is a common breeding-bird on the neighbouring mainland and on Achill ; it is much in evidence in the bare coast districts of western Ireland, as in Donegal, the barony of Erris, Connemara, and the Dingle peninsula in Kerry. It breeds commonly on Aranmore, Inishbofin, and the Aran Islands, visiting on migration the remoter rocks, such as the Skelligs and Blaskets.

**Strix flammea**, Linn. BARN OWL.—A few are resident at Westport ; but this species seems scarce and exceptional on the west coast. It has, however, been observed at Valencia ; and Patten saw one fly from the sea to a crevice in the cliffs of Dunmore on the Dingle peninsula, where it was caught.

**Asio otus** (Linn.). LONG-EARED OWL.—Breeds in Glendarary wood, Achill, where more than one has been shot (R. B. Sheridan). It becomes a common resident further east, about Ballina and Ballinrobe, also at Ballynahinch in Connemara, and a pair breed on Lough Doon, in western Donegal ; but though several other localities near the west coast, such as Dingle, could be named, they afford wooded retreats, and from bare coasts and islands this bird seems to be absent.

**Asio accipitrinus** (Pallas). SHORT-EARED OWL.—Winter visitor to Clare Island, Achill, the Mullet, and the bare moorland districts of the west coast in Donegal, Mayo, Connemara, Kerry, and west Cork ; and round Ireland generally it occurs more frequently in the mountainous, maritime counties. In some winters there seems to be a much greater immigration of those birds than in others.

**Nyctea scandiaca** (Linn.). SNOWY OWL.—McCabe states that this bird has once been seen under Croaghmore. It has been seen or obtained fourteen or fifteen times on the seaboard of Co. Mayo, that is on Achill, the Mullet, Blacksod Bay, and the north coasts ; Donegal has five occurrences, and other counties one or two each. This Owl has chiefly been met with from November to March ; but one was shot near Belmullet on 21st July, 1906. The specimen figured (Plate IV, fig. 2) is from western Mayo,

*Circus cyaneus* (Linn.). HEN-HARRIER.—On 3rd July, 1910, about the middle of Clare Island, Patten saw an adult male Hen-Harrier mobbed by Pipits; it soon disappeared down the slope towards the abbey. This bird, which has become scarcer in Ireland, is rare in Co. Mayo, though met with in Connemara, and more frequently in Kerry.

*Aquila chrysaëtus* (Linn.). GOLDEN EAGLE.—The great cliffs on the north-west side of Clare Island, which rise sheer to about 1000 feet, were the home of this majestic bird.

R. G. Symes, of the Geological Survey, who had been stationed in the district in 1867-1870, stated that the Eagles, generally a pair, used to be quite fearless, from the absence of guns, and that they did havoc among the young lambs, and lifted geese from the cottiers' very doors. T. Bourke Gaffney, who was a week on the island in 1878, and saw two Eagles, stated that there was an unbroken record of a pair occupying the same eyrie for the past century, which was never disturbed, being inaccessible. This is confirmed by the reports of light-keepers from 1882 to 1885, who speak of these birds having their nest in the highest cliffs; and say that in winter, when they had not sea-birds, they were often observed near the villages, and used to prey upon the grouse, then plentiful on Clare Island. Brownall, principal light-keeper, wrote: "On 4th April, 1884, a young speckled Eagle perched about 200 yards from the lighthouse. The two eagles are here still in their usual abode in the highest cliffs. Nov. 20. Large Eagle close to station." On the 14th October, 1887, a Golden Eagle was sent to the National Museum in Dublin, from Clare Island, by the late Captain Boxer (Plate I), and this seems to mark the time of the disappearance of those birds, which have ceased to breed there; though, as McCabe states, one is occasionally seen on Croaghmore.

Western Mayo contained many of the last strongholds of these birds, several of which inhabited Achill. The late Howard Saunders and Ussher were there in 1898, and found them both on the Dooega cliffs and Croaghaun; but they have now ceased to breed for some years, the last having been seen in the spring of 1911. Another pair bred regularly on the neighbouring Curraun Mountain, and others on Mweelrea, where the last is stated to have been seen in March, 1911.

The Nephinbeg and Corslieve range was also a home of these Eagles, as well as the north Mayo coast, where a solitary Golden Eagle survives, and there is another survivor in Donegal.

*Accipiter nisus* (Linn.). SPARROW-HAWK.—Very uncommon on Clare Island (McCabe); breeds regularly in Glendarary wood, Achill (A. Williams).

Wallace has seen one immature bird at Belmullet; resident and nearly as common as the Kestrel about Westport (Good); breeds wherever planting advances, as about Dingle, but seldom seen in the mountainous and treeless districts.

**Falco candicans**, J. F. Gmel. GREENLAND FALCON.—During the visitation of this species in 1905, on 10th March, a light-keeper on Clare Island saw “a White Hawk the size of a Sea-Gull eating a Curlew.”<sup>1</sup> Greenland Falcons have twice been obtained on Achill, and Black Rock has more than one such record. On the Mullet they have occurred so frequently as to be almost annual visitors, appearing oftenest in March and April, while in 1905 Wallace observed one, presumably the same, on the 11th, 13th, and 14th May. A series have been obtained on the Donegal coast, and again on the Blaskets and Skelligs in Kerry, the west coast and its islands being the part of Ireland most frequently visited. The Iceland Falcon is extremely rare.

**Falco peregrinus**, Tunstall. PEREGRINE FALCON.—Resident on Clare Island; one pair at least breed on the western cliffs. It breeds on Achill and Duvillaun, and along the north coast of Mayo there are several eyries, as well as on the inland cliffs. The same may be said of the precipitous coasts and isles of Donegal and Kerry; the Skelligs and Blaskets being favourite homes of this species, which loves the vicinity of large sea-bird colonies, and it frequently visits for plunder other rocks, like Black Rock (Mayo), where there is no suitable nesting-site. Patten found three pellets, one composed of the white breast-feathers of the Kittiwake, another of black Puffin’s feathers, and the third of hair and teeth of a rat; and Praeger got Cuckoo’s feathers at a Peregrine’s plucking-place. Wallace notices an increase of Peregrines on the Mullet during October.

**Falco aesalon**, Tunstall. MERLIN.—In September, 1910, Patten saw a Merlin on several dates capturing Pipits and Wagtails near the shore, and finally two of these Falcons chasing each other. The Merlin is resident and breeds on Achill and through all the mountainous parts of the western counties, being frequent in Donegal, Mayo, and Connemara, though nowhere numerous. In Connemara it lays habitually on islets in the bog-lakes (Leybourne Popham).

**Falco tinnunculus**, Linn. KESTREL.—Common and resident on Clare Island Achill, and all through the western littoral, and is found on the island

<sup>1</sup> “Irish Naturalist,” 1906, p. 201.

rocks, on many of which it breeds. It frequently uses the deserted nest of the Hooded Crow, both in cliffs and lake islands. Ussher has seen such a nest in Donegal built in a holly, not more than 5 or 6 feet from the ground.

On Clare Island Kestrels nest both in the sea-cliffs and on the mountain rocks; and Praeger observed the Kestrel and Chough nesting in proximity in the same cliff. This bird is called "Sparrow-Hawk" generally in Ireland.

**Phalacrocorax carbo** (Linn.). CORMORANT.—A few have been seen at Clare Island in spring, summer, and autumn, usually flying past, but were not found breeding. This is a common resident bird, seen on Achill Sound, Louisburgh, and throughout Clew Bay; but it does not seem to love the outer line of cliffs and islands, such as the north Mayo coast, where its place is taken by the Shag. Cormorants have indeed colonies near the Campbell at Horn Head, and towards Hag's Head, Cliffs of Moher; but, unlike the Shag, they avail themselves of islands in lakes, and nest on ivy-covered castles as on Loughs Corrib, Mask, and Carra, in trees and bushes on Loughs Tawnyard and Carrowmore, sometimes with Herons; not far from Westport they bred in a lake on the ground among rocks. They also use islands in lakes as roosting-places.

**Phalacrocorax graculus** (Linn.). SHAG.—Resident and abundant on Clare Island, where numbers of this species nest in cavities of the western cliffs and other places. West of the lighthouse a large colony breed up to at least 200 feet above the sea, along broken scarps interspersed with large stones, and in more open places than is usual with this cave-loving bird. Patten found nine nests built on 25th March, yet some were feeding young on 8th July. They breed on Achill, Duvillaun, The Bills, and along the most lofty cliff-bound coasts of Donegal, Mayo, and Kerry. The light, agile Shag is quite at home where tremendous seas break, and loves exposed coasts, but is seldom seen far up Clew Bay, and never inland, unless when storm-driven. Large flocks of Shags were met with swimming together at Inishbofin and Broadhaven; and Warren noted an immense congregation of them at the mouth of the Moy in December and January.

**Sula bassana** (Linn.). GANNET.—Commonly to be seen fishing at sea round Clare Island, as well as all along the west coast, occasionally in Clew Bay. Most frequent in summer and autumn; but from January to April, a great northward movement of Gannets is observed along the whole coast. In autumn there is little evidence of a return migration



(Barrington). Gannets do not breed on the stags of Broadhaven, nor anywhere in Ulster or Connaught, their only Irish colonies being on the Little Skellig and the Bull Rock.

**Ardea cinerea**, Linn. COMMON HERON.—Stragglng Herons frequently visit Clare Island after their breeding season, and seek food in the marshy spots. Hammond saw one chased by over fifty Gulls. Some breed in Glendarary wood, Achill, and there are heronries in trees at Newport House, Westport demesne, and Old Head House, all on Clew Bay. On the island in Lough Tawnyard, a mountain-lake, many Herons nest in the centre of the colony of Cormorants, and there is another colony of Herons and Cormorants on Lough Carrowmore, both in Mayo. Herons used to breed on cliffs on the coast of the Mullet (Moran) and the Dingle peninsula (Kane), and a pair were found nesting on Inishtooskert, Blasket Islands.<sup>1</sup> In western Donegal and Connemara Herons build on numerous islands in moorland lakes on any low trees or hollies; and Ussher has seen a nest on the ground on a stone crannog-island in Donegal.

**Botaurus stellaris** (Linn.). BITTERN.—A specimen was shot at Killybegs by Arthur Brooke about 1868. One is mentioned at Ballycroy,<sup>2</sup> and others in 1900 on the Mullet.<sup>3</sup> On 7th August, 1893, a Bittern was caught at Slyne Head among rocks and sent in the flesh to Barrington.

**Platalea leucorodia**, Linn. SPOONBILL.—One was shot near Westport in 1854.<sup>4</sup> Spoonbills have been obtained in most of the maritime counties of Ireland, including Donegal, Mayo, Galway, Clare, and several times in Kerry, being more frequent in the south, but rare in the west and in Ulster.

**Anser cinereus**, Meyer. GREY LAG-GOOSE.—Winter visitor to the mountains and bogs around Westport and in Achill and the Mullet according to Good, the Sheridans, and Wallace. Ussher has received from the latter wings of this species on an occasion when thirty-five were met with. Sheridan remarks that these birds remain until April, and Wallace speaks of them in May.

**Anser albifrons**, Scopoli. WHITE-FRONTED GOOSE.—All the light-keepers' reports speak of flocks of "Wild Geese and Bernacle" which frequent the western parts of Clare Island from October to April, especially the western end, where they feed. Barrington saw seven on the island in the end of March which he considered were White-fronted Geese. This,

<sup>1</sup> Turle in "Ibis," 1890, p. 7.

<sup>2</sup> Thompson, ii., p. 163.

<sup>3</sup> "Field," 26th November, 1904.

<sup>4</sup> Proc. Dublin N.-H. Soc., 1st February, 1861.

the most numerous species of Goose that visits Ireland in winter, has been sent repeatedly from Achill, and may be seen there and on the Mullet in large flocks every winter. Wallace has a large specimen in confinement, the length of which he gives as "31 inches and the wing 18; the white reaches as far as the eye, and extends to the throat, the black markings reaching almost to the tail." He finds that some of the White-fronted Geese that visit Mayo are of this large variety, but that the majority are much smaller.

**Anser segetum** (J. F. Gmel.). BEAN-GOOSE.—A winter visitor to the district according to Good and Sheridan; the latter says that small flocks of four or five may be seen on sand-points near the sea in Achill. In Connemara Caton-Haigh shot this and the last species, but found the Bean-Goose in decidedly smaller numbers and more shy than the White-fronted. Wallace does not give it as a visitor to the Mullet.

**Chen hyperboreus** (Pallas), *Chen nivalis* (Foster). SNOW-GOOSE.—Though not yet recorded from the Clew Bay district nor Achill, Snow-Geese have been twice taken on the Mullet, and occasionally observed on Killala Bay (Kirkwood, Knox).

**Bernicla leucopsis** (Bechst.). BERNACLE-GOOSE.—Common winter visitor in flocks to Clare Island, having been recorded there by Hammond in March and April and again in September, October, and November. On 18th February, 1912, McCabe reported that large flocks had been seen for a fortnight flying over towards Cahir Island; this is one of their feeding grounds, as well as Duvilaun, Frehill, and all the other grassy uninhabited islands off Donegal, Mayo, and Galway, also pastures near those coasts, at Lissadell near Sligo, Keel commons on Achill, lands near Rinvyle, Connemara; while specimens have been sent from Cahirciveen and Valencia. On Aranmore, Bernacle Geese are seen passing south in flocks during the latter half of October, and again in April going north, and some remain on that island all the winter.

**Bernicla brenta** (Pallas). BRENT-GOOSE.—Frequents during winter Blacksod Bay and Broadhaven in vast flocks, occurring on Achill shores, where Sheridan has shot Brent-Geese year by year, and Good has obtained them in the Westport district. They frequent Tralee Bay numerously, also Sligo and Drumcliff Bays, usually arriving in October, more rarely in September, and depart in April. They feed on the mud-banks, and not on the islands or pastures; this fact distinguishes them from Bernacles, with which they are generally confounded under the latter name in Ireland.

**Cygnus musicus**, Bechst. WHOOPER SWAN.—McCabe on Clare Island reports that Wild Swans are often seen passing. Among their chief resorts in Ireland are the lakes on the Mullet (whence they fly to Lough Carrowmore in rough weather), Keel Lake in Achill, Loughs Foyle and Swilly, also Lough Gill near Castlegregory, and others in Kerry. Though the great majority of the flocks are of Bewick's Swans, Whoopers also occur among them (Dr. Burkitt).

**Cygnus bewicki**, Yarrell. BEWICK'S SWAN.—By far the most numerous wild Swan, frequenting the lakes above-mentioned in moderate flocks, which, in exceptionally hard winters, are sometimes increased to thousands on the Mullet; while on Keel Lake, Achill, R. B. Sheridan has counted 175. The majority are immature birds. The Swans usually arrive about the end of November, and depart about the end of February, but sometimes occur earlier and later. Lough Gill, on the north coast of Kerry, is another long-established resort.

**Cygnus olor** (J. F. Gmel.). MUTE SWAN.—Nests on lakes south of Louisburgh, quite unprotected. This shows that the bird can establish itself near wild coasts. Stragglers visit Achill at times.

**Tadorna cornuta** (S. G. Gmel.). COMMON SHELD-DUCK.—Several pairs with their broods were seen in Clew Bay, and there is evidence of this bird from Achill. It visits the Mullet in summer, and the numbers that breed increasingly on Killala Bay are largely reinforced in winter, when flocks appear. It is generally increasing round Ireland, and has bred on an island so exposed as Roaninish, off western Donegal.

**Anas boscas**, Linn. MALLARD.—Praeger found a nest on a pool near Craigmere on Clare Island, and McCabe says it breeds regularly; the light-keepers there frequently recorded flocks of Wild Ducks towards the close of the year and in April. Foster found Mallards numerous in May on lakes south of Louisburgh. They are common and resident along the west coast generally, and breed on Achill and Deer Island off Connemara.

**Anas strepera**, Linn. GADWALL.—Frequent visitor in autumn and winter to Achill, the Mullet and Killala Bay. A female containing unripe eggs was obtained near Belmullet, 25th May, 1894. There are no records of the occurrence of the Gadwall between Achill and Kerry.

**Spatula clypeata** (Linn.). SHOVELER.—An occasional winter visitor to Achill. The extension of the Shoveler's breeding-range, which is taking place in Ireland, has reached the great lakes of Mayo, and an egg has been identified from Lough Carrowmore in 1905; while three immature birds have been shot in August near Belmullet (Wallace).

- Dafila acuta* (Linn.). PINTAIL.—Occasional autumn and spring visitor to Achill (R. B. Sheridan). Warren has remarked an increase of Pintails which visit Killala Bay in winter, amounting in 1902 to over 100; they are also winter visitors in flocks to lakes near the coasts of Kerry and Donegal, as well as to intermediate bays and estuaries.
- Nettion crecca* (Linn.). TEAL.—Common on Clare Island (McCabe), but not observed there in summer. In the Westport district, on Achill and the Mullet, and round Ballina the Teal is a resident, breeding bird, though much more numerous in winter.
- Querquedula cirica* (Linn.). GARGANEY.—Two are said to have been shot on Achill "Fowler in Ireland," p. 62.
- Mareca penelope* (Linn.). WIGEON.—Common winter visitor to Clare Island, Achill and Clew Bay, and occurs in enormous flocks on the bays and harbours further north in Mayo, where they sometimes remain until late in April. On a lake in Connemara Leybourne Popham observed a male Wigeon on several occasions in May.
- Fuligula ferina* (Linn.). POCHARD.—Common winter visitor to Achill and the districts round Clew Bay. Flocks assemble on the estuaries and the coastal lagoons, as on the Mullet; and on Lough Cullen near Castle-gregory 3000 have been reported with Scaups and Golden-eyes (Payne-Gallwey).
- Fuligula cristata* Leach. TUFTED DUCK.—Winter visitor in limited numbers to Achill and the Westport and Newport districts, resorting rather to inland waters. The remarkable extension of its breeding-range had reached Lough Conn in 1905 (S. Scroope) and Lough Mask in 1906 (Good).
- Fuligula marila* Linn.. SCAUP-DUCK.—Winter visitor to Clew Bay and Achill, where Sheridan has observed numbers of this species with Pochards and Golden-eyes in severe winters. A few Scaups have been observed there and on the lakes on the Mullet in June, when Ussher was shown them by Wallace. The late Dr. Geoffrey Scroope saw Scaups there on 3rd July. They often linger on Lough Swilly until May, and more rarely remain there all the summer (Professor Leebody).
- Clangula glaucion* (Linn.). GOLDEN-EYE.—Winter visitor to Clew Bay and Achill. Not so plentiful as the last species, but Warren has observed a flock of 50 on Killala Bay.

**Harelda glacialis** (Linn.). LONG-TAILED DUCK.—Less regular winter visitor than the foregoing ducks to Clew Bay, Achill, the Mullet, and Killala Bay; is more frequent on the north coasts of Connaught and Ulster than on the south coast, but it visits Dingle Bay and Kilkee.

Though marine in its habits, it has been shot on Lough Corrib and Lough Derg, and at Killarney.

**Somateria mollissima** (Linn.). EIDER DUCK.—Has occurred on Achill (R. B. Sheridan), and has been obtained a few times on the Mayo coast (Birds of Ireland, p. 212), also on the coasts or islands of Donegal, Galway, and Kerry; more frequent on the north coast.

**Somateria spectabilis** (Linn.). KING-EIDER.—An immature male was shot by J. R. Sheridan, on Achill, 12th December, 1892, and identified by the late Dr. R. B. Sharpe. This is the only record from our west coast.

**Oedemia nigra** (Linn.). COMMON SCOTER.—Winter visitor to Achill, Clew Bay, and Blacksod Bay, remaining on the latter sometimes until June. On Killala Bay, where it is a regular winter visitor, Warren has shot Scoters on 5th July, 1889, and 31st August, 1900.

As this bird has bred in Ulster, its nest should be looked for in Mayo. It is found as far south as Dingle Bay in winter, but is apparently more common on the coasts of Ulster and Leinster.

**Oedemia perspicillata** (Linn.). SURF SCOTER.—An immature female was shot at Dugort, Achill, by J. R. Sheridan, 25th October, 1890, and identified by A. G. More. An adult male and female, now in the National Museum, Dublin, were shot on Killala Bay by Robert Warren and the late A. C. Kirkwood in the winter of 1896–1897. These are the only records of this American species from the west of Ireland.

**Mergus merganser**, Linn. GOOSANDER.—Wallace, Belmullet, states that one was shot, 3rd November, 1911. Good, Westport, says that he has seen a few specimens on Lough Mask, but, except on the east coast of Kerry, the Goosander seems to be very rare along the western shores of Ireland.

**Mergus serrator**, Linn. RED-BREADED MERGANSER.—Breeds numerously on the great lakes of central Mayo, and some nest on Lough Carrowmore. Pike recorded a nest on Achill Sound, and H. M. Wallis another at Burton Port in Donegal, though few are found near salt water; but in summer Mergansers are seen among the islands up Clew Bay, and in winter flocks appear there and visit Achill Sound, Clare Island, Blacksod and Killala Bays. On the latter Warren has seen in June a hundred or more, chiefly immature, swimming in a pack, such as the late Major Trevelyan has described on Lough Erne in August.

**Columba palumbus.** Linn. RING-DOVE.—Not known on Clare Island, but resident in Glendarary wood, Achill, and fairly plentiful in wooded districts on the mainland. On the treeless Mullet Wallace says that flocks are sometimes seen passing, which do not stay there. Witherby found some wooded islands in the Connemara bog-lakes swarmed with Wood-Pigeons, and discovered a nest on the ground among tall heather. Patten saw a few birds about Dingle, but none at the bare west end of the peninsula. They spread with the increase of plantations.

**Columba livia.** J. F. Gmel. ROCK-DOVE.—Numbers breed and are resident on the cliffs of Clare Island and Achill; and the light-keepers on the former have repeatedly recorded flocks of "Pigeons" in April, May, June, and again from August to December; but as they fail to distinguish the species, we are not sure that some of these flocks may not be migrant Ring Doves. Sheridan (Achill) and Good (Westport) think that Rock-Doves are decreasing. They are resident on the precipitous parts of the west coast, frequenting the islands that afford caverns, such as Aranmore, High Island, Inishtooskert, and visit in flocks others where they do not breed, as Black Rock, Mayo, and the Tearaght, Kerry.

**Turtur communis.** Selby. TURTLE-DOVE.—Obtained on Black Rock, Mayo, 27th. June, 1887 (Barrington); another observed at Belmullet in June, 1903 (Wallace); three more at Moyview in May, July, and August (Warren). The Turtle-Dove visits the coasts of Donegal and the Connaught counties much less often than any other part of the Irish shores, Kerry more frequently; while on the south coast it is of almost annual occurrence.

**Syrhaptus paradoxus** (Pallas). PALLAS'S SAND-GROUSE.—Has been obtained in 1863 at two points on the west Donegal coast; and in 1888 several were seen and two shot near Belmullet, others at Carrigaholt, Co. Clare, near the Shannon's mouth, points north and south of our district.

**Lagopus scoticus** Lath. RED GROUSE.—In 1882 Brownell, then light-keeper on Clare Island, reported "large numbers of Grouse from August to January"; in June, 1884, he wrote: "Saw a number of young Grouse"; and in August, 1884, "large flocks seen on the mountainous parts of the island." Not long after that the Grouse and the Eagles which used to prey on them were exterminated as breeding species, though McCabe says one or two of the former are seen every year. They are resident on Achill and on the mountains of Mayo as they are on the higher ranges of Ireland generally, but Good thinks they are getting scarce. One has been taken on Black Rock, Mayo, nearly dead from exhaustion.

**Phasianus colchicus**, Linn. PHEASANT.—Resident in Westport demesne and Glendarary, Achill, but when not hand-fed is a mere straggler, as, for example, near Louisburgh.

**Perdix cinerea**, Lath. PARTRIDGE.—A few covies have been met with on Achill before 1890, but they are generally absent from the islands, and are getting scarce even in the Westport district and around Ballina as in most parts of Ireland.

**Coturnix communis**, Bonn. QUAIL.—One was killed at Dugort in 1910 (A. Williams). Good says it is years since he saw one in the Westport district, though before 1850 one might shoot six to ten brace in the day (T. J. Browne). Similar evidence has come from western Donegal and the Dingle peninsula, where they were common fifty or sixty years ago, but are now apparently extinct.

**Crex pratensis**, Bechst. CORN-CRAKE.—Very common on Clare Island where it breeds, and has been met with in winter (M'Cabe). Also common on Achill and the Mullet, around Westport and south of Clew Bay, on Inishbofin and the Aran Islands; indeed this bird is nowhere more in evidence than on the western islands and adjacent coasts. It has been noticed near Killybegs craking in the open. Inishtrahull, Rathlin O'Birne, Black Rock, Mayo, the Tearaght, Skelligs, and Bull Rock have all been visited, the last in November.

**Rallus aquaticus**, Linn. WATER-RAIL.—Resident on Clare Island, Achill, the Mullet, and round Westport, and breeds in every county in Ireland. Its migratory occurrences at lighthouses from September to January are discussed in Barrington's "Migration of Birds." He has up to 1911 received thirty-eight specimens from light-stations, more than of any other species that is not passerine; and he says that many of our Water-Rails evidently arrive in autumn by a route that tends to land them on the west coast, from which more than half the specimens sent him have come. Water-Rails have arrived along with Snow Buntings and Purple Sandpipers, and these facts suggest to him that they may have come when returning from N. Europe and Iceland. Three specimens from Clare Island were shot during the migration months, October, November, and December.

**Gallinula chloropus** (Linn.). WATER-HEN.—Some are resident and breed on the small lakes in Clare Island, Achill, Inishturk, Inishbofin, and the Aran Islands. Moor-hens are common on the mainland of Mayo; and stray birds have wandered to Inishtrahull, Black Rock (Mayo), and the

Aran Islands, and struck the lantern of Rathlin O'Birne, 28th October, 1886, "with tremendous force." Such occurrences are exceptional, and do not betoken a regular migration like that of the Water-Rail, but show that these birds wander forth in autumn, and are well able to sustain flight at sea.

**Fulica atra**, Linn. COOT.—In Achill J. R. Sheridan said in 1891 that it was fairly plentiful in winter; R. B. Sheridan now states that it is resident and breeds there. On the Mullet vast flocks often arrive in autumn (Wallace). Coots are known to betake themselves to salt water when lakes are frozen. They are fairly common on the mainland lakes, such as those south of Louisburgh. A Coot has struck the South Aran light, and others have been reported from Killybegs and Aranmore, all in autumn.

**Aegialitis hiaticola** (Linn.). RINGED PLOVER.—Breeds in small numbers on Clare Island, and flocks are seen there in September. A common resident on Achill, Clew Bay, and generally on the sandy or gravelly coasts and islands, breeding also on the inland lakes of Mayo. The eggs have been found on top of a rock on Deer Island, off Roundstone, and on Inishkea in shelter under a stone.

**Charadrius pluvialis** (Linn.). GOLDEN PLOVER.—Flocks visit Clare Island in March and April, and again from August to December, most numerous in October and November, as appears by Hammond's schedules; and this agrees with Barrington's summarized observations for the west coast. The Golden Plover breeds in Achill and through the vast flat bogs of Mayo and Connemara, as well as on the lower mountain slopes, sometimes near the sea. This species is specially numerous in western Connaught, where assemblages of hundreds or thousands are seen some winters on bays and estuaries (Warren).

**Squatarola helvetica** Linn.). GREY PLOVER.—Scarce winter visitor to Clare Island, Achill, the Mullet, and Killala Bay. On the sands inside Bartragh Island, Warren has seen this bird up to June. It is usually unrecognized, the last species being called "Grey Plover" in Ireland.

**Vanellus vulgaris**, Bechst. LAPWING.—A few observed on Clare Island in March and June, which probably breed; more numerous October to December. Nests on Achill, the Mullet, and in Mayo generally, as it does on many coastal tracts and marine islands round Ireland, as well as on islands in inland lakes. Lighthouse observations show a marked increase in March; but the great influx is from September to the end of the year.



**Streptilas interpres** (Linn.). TURNSTONE.—Patten saw a few on Clare Island, in March and July, and flocks in September. In June there were flocks in Clew Bay among the islands. Very large flocks occur in autumn on Achill; but Turnstones may be met with every month in the year, seldom in July, on these coasts and the adjacent rocks, though the nest has not yet been found in Ireland. Ussher has seen parties, chiefly of year-old birds, with some adults in full plumage, on islands off the coasts of Donegal and Connemara; and instances of this occur round Ireland, though much more frequently in the north and north-west.

**Haematopus ostralegus**, Linn. OYSTER-CATCHER.—Resident and breeds on Clare Island and Achill, keeping to the rocky Atlantic shore until September, when great flocks resort to bays and estuaries, and the numbers increase again in March and April. This is a most characteristic bird of the west coast, breeding commonly on the islands, even on stacks and reefs, where it nests on rock or turf, forsaking the shingly shores; and eggs are laid regularly on rock-ledges on the Skelligs and the Aran Islands. The west coast broods form the winter flocks, which are probably reinforced from the isles of Scotland.

**Phalaropus fulicarius** (Linn.). GREY PHALAROPE.—Obtained in October in different years on Achill, Black Rock (Mayo), at Belmullet, and on the Moy River, at Killybegs, and Rathlin O'Birne, Slyne Head (in different years), in Connemara, the Aran Islands, the north-west of Kerry, and the Skelligs. In the storms of October, 1891, many of these occurred, when Phalaropes and Petrels were driven inland in numbers.

**Phalaropus hyperboreus** (Linn.). RED-NECKED PHALAROPE.—A specimen in summer plumage was shot on Achill in May, 1902 (Sheridan). A very small colony, discovered in 1902, breed in the west, where they are protected, owing to raids of collectors.

**Scolopax rusticula** Linn. WOODCOCK.—Visits Clare Island and Achill most numerous from the end of October to the end of December, though some remain until March. It has not been established that they breed on the island; but Messrs. Williams say this bird has been obtained at Glendarary wood, Achill, in May, and is believed to breed there. In 1890, Good had found a nest on the mainland; though in 1881 it was said Woodcocks never bred in Mayo. Its woods have indeed been famous for cock-shooting; and forty brace have been shot in one day in

Brackloon Wood. Light-keepers' observations from the west coast are nearly half of those from all sides of Ireland; and the only September arrivals recorded in Barrington's book (1900) are one from the north and four from the west coast. Some of the earliest cock-shooting is stated by Major Rutledge Phair to be in Achill; and there is similar information as to Connemara, the Aran Islands, and the Kerry promontories. In short, the autumnal Woodcocks plainly arrive by the north of Donegal, and pass quickly down the whole west coast before they spread inland. In hard frosts they flee to the western shores and islands again; and Black Rock (Mayo), Slyne Head, Tearaght, and Skelligs, show such records. In April departing birds have still been found on Inishowen, the far north of Donegal, where some of the earliest are seen in autumn.

**Gallinago major** (J. F. Good). GREAT SNIPE.—Thompson gives a doubtful record for Achill; but a bird of the year was shot there, 24th September, 1888<sup>1</sup>; and E. Williams received a female shot near Ballycloy, 13th October, 1893.<sup>2</sup>

**Gallinago coelestis** (Frenzel). COMMON SNIPE.—Resident on Clare Island, where many breed; but there is a great influx in October, November and December, and again in March (Hammond). There is similar information from Achill and Westport, and Good (Westport) and H. W. Scroope (Ballina) think more Snipe now breed in Mayo than formerly. Wallace remarks that on the Mullet large wisps occur in late August, which leave in September or October, as Thompson observed near Belfast. These are probably bred in the country. The lighthouse observations are twice as numerous from the north and west coasts as from the south and east, and indicate that, like Woodcocks, the migrant Snipe arrive in the north and pass down the west coasts.

**Gallinago gallinula** (Linn.). JACK SNIPE.—Winter visitor to Clare Island, Achill, the districts round Clew Bay, and is common in Mayo generally.

**Tringa maculata**, Vieill. AMERICAN PECTORAL SANDPIPER.—Has been twice obtained at Belmullet—in October, 1900, and in September, 1901. There has been only one other occurrence in Ireland.

**Tringa alpina** (Linn.). DUNLIN.—Resident on Achill, and probably throughout our districts. Foster found the eggs up Clew Bay, where several pairs

<sup>1</sup> Field, 6th and 10th October, 1888.

<sup>2</sup> Zoologist, 1893, p. 434.

were nesting, in June. Ussher has seen many breeding on the Mullet, where Wallace notices the great increase in September. This bird breeds in many parts of Mayo and Donegal. The numbers are largely increased in winter.

**Tringa striata**, Linn. PURPLE SANDPIPER.—Barrington shot one on Clare Island, 31st March, 1911; and McCabe says it is often seen there in winter. This is a common winter visitor to Achill and the Mayo coast. Some remain until late in May; as Warren has found on Killala Bay, and Witherby observed a pair in full breeding-plumage on Inishturk on 28th May, 1895.<sup>1</sup> There are many other May records from Irish coasts.

**Tringa canutus**, Linn. KNOT.—Winter visitor to Achill, and is reported from Clare Island. Wallace says small flocks arrive on the Mullet in August or September. Warren found it very abundant on Killala Bay, sometimes remaining there all the summer. Barrington got specimens from Slyne Head.

**Calidris arenaria** (Linn.). SANDERLING.—Winter and spring visitor to Achill, Inishkea, Mullet, and Killala Bay, remaining in flocks until June (Ussher), and observed on Achill, Inishkea, and West Mayo coast in August (Williams, Ussher); some few are seen in July (Wallace), remaining, like Turnstones, through the summer.

**Machetes pugnax** (Linn.). RUFF.—Has been obtained on Achill, near Ballycloy, and on the Mullet and elsewhere in Mayo, each time in September (Williams & Sons).

**Totanus hypoleucus** (Linn.). COMMON SANDPIPER.—A few breed on Clare Island, Achill, and the Mullet; many throughout Mayo round lakes and on the margins of bogs; in Connemara nearly every lake seems to be frequented by a pair (Leybourne Popham), also the rivers and some of the islands, *e.g.*, Inishbofin, Deer Island; so also the bog-lakes in Donegal and the marine island Roaninish, from which eggs were received. Barrington has got specimens in May from Aranmore, Donegal, and Aran Island North, Galway, and in November from the Bull Rock.

**Totanus ochropus** (Linn.). GREEN SANDPIPER.—Ussher sent to Dublin Museum one shot near Belmullet, 29th August, 1901; others have been obtained near Ballina (Warren) and Killybegs, but the species is rare on the west coast.

<sup>1</sup> Irish Nat., 1896, p. 5.

**Totanus calidris** (Linn.). REDSHANK.—Met with on Clare Island in March (Barrington); in small parties along the shore in July; increased in September; and in numbers in the fields in December (Patten). On Achill it breeds, and is plentiful in winter (R. B. Sheridan); and this may be said of the Mullet, where flocks arrive in late August and in September (Wallace). Foster found it breeding on marshy ground beside Clew Bay, as it does on estuarine marshes on the north coast of Ulster; otherwise it seldom nests on the seaboard, though commonly on inland lakes and marshes, whence it betakes itself to the sea-shores, when the young can travel there.

**Totanus canescens** (J. F. Gmel.). GREENSHANK.—“On the sea-shore in the neighbourhood of Clew Bay Greenshanks are rather numerous” (“Fowler in Ireland,” p. 240). They are autumn and winter visitors to Achill, where A. Williams has heard the note as early as 26th July, and a few arrive on the Mullet in August. The Moy estuary is their favourite haunt, where Warren has seen fourteen as early as 19th June. He has shot both adults and young before the end of that month, and he dwells on the short time they are absent to breed. Greenshanks are not at all as numerous nor as frequent as the Redshanks with which they often associate. They are observed on the coasts of Kerry, Cork, &c., but not so commonly as on the northern shores.

**Limosa lapponica** Linn. . BAR-TAILED GODWIT.—Autumn and winter visitor to Achill and the Mullet, but not so numerous there as on Killala Bay, where Warren has seen flocks exceeding a hundred (five hundred in rare instances), and has found some, that did not breed, remain all the summer. On Ulster coasts, though common in autumn and spring, they usually leave in winter.<sup>1</sup>

**Limosa belgica** (J. F. Gmel. . BLACK-TAILED GODWIT.—In Dublin Museum is a bird in summer plumage received in August, 1863, from Blacksod Bay. Warren obtained several on the Moy and Killala Bay, but they are rare on the west coast.

**Numenius arquata** (Linn. . CURLEW.—Common all the year round on the coasts and islands above-mentioned, but not plentiful during the breeding-season, when the birds found there are probably adolescent; but as early as 18th July there was a flock of fifty Curlews on Clare Island. The light-keepers chiefly report them from August onwards,<sup>2</sup> and October

<sup>1</sup> Leebody in “*Iris. Nat.*,” 1892, pp. 176, 177.

<sup>2</sup> “*Migration of Birds*,” pp. 219, 220.

brings great flocks, which continue more or less until they leave in April for the great rushy bogs where they breed. Warren has found the winter flocks have increased enormously in north Mayo. Curlews stray to all the island-rocks in winter, and dense packs roost securely on certain flat islands, as on one in Achill Sound. Barrington gives statistics which go to prove that the Curlew, unlike the Whimbrel, chiefly passes up the east coast during the spring migration, whereas in autumn it is recorded more frequently from the west.

**Numenius phaeopus** (Linn.). WHIMBREL.—Appears on Clare Island about 26th April and leaves by 1st June (M'Cabe). During May it is numerous on the west coast, which it prefers on migration, also using the routes of the great Connaught lakes and of the Shannon. A few Whimbrels usually reappear in August on their return, but Williams and Patten heard the note on Achill Sound on 7th July.

**Hydrochelidon nigra** (Linn.). BLACK TERN.—An immature bird was shot by Sheridan on Achill, September, 1887,<sup>1</sup> others by Warren on Killala Bay, 12th October, 1859; and there have been similar cases near Ballyshannon and on the north Kerry coast, but this species is very rare in the west.

**Sterna cantiaca**, J. F. Gmel. SANDWICH TERN.—Warren discovered a colony many years ago on an island in Rathroeen Lake, near Ballina, which is strictly protected. Of late years other colonies have been established elsewhere in Mayo, but change their nesting-ground occasionally.

**Sterna dougalli**, Mont. ROSEATE TERN.—A specimen was obtained on Clew Bay, 3rd August, 1904. This bird has been rarely met with in Ireland during the last fifty years.

**Sterna fluviatilis**, Naum. COMMON TERN.—Nests in small numbers on islets up Clew Bay, on the Inch near Killala, and on Deer Island, Connemara, but prefers lake-islands, as on Lough Carrowmore in Erris, Loughs Conn, Mask, and Corrib, and resorts far less to exposed marine situations than the Arctic Tern. Both species are to be seen in late summer on Achill Sound, and between that and Clare Island; but this Tern is scarce along our west coast as compared to the next species.

**Sterna macrura**, Naum. ARCTIC TERN.—A small colony breed on the detached, rocky western end of Clare Island, and a few on Clew Bay; while all

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<sup>1</sup> More's List of Irish Birds.

round the coasts of Donegal and Connaught this species has numerous colonies on marine islands, some very large, the nesting-ground being occasionally shifted. Warren found that in 1904 the nests had increased to 800 or 1000 on the beach inside Bartragh on the Moy estuary. Arctic Terns breed also on the great lakes of Mask, Carra, and Corrib, where they probably outnumber the Common Terns, as they certainly do on the coasts.

***Sterna minuta*, Linn. LITTLE TERN.**—Foster and Ussher found two colonies on gravelly reefs in Clew Bay, twenty-five nests on one; on Inishkea several pairs were breeding. Many nest on Bartragh, and there are colonies on sandy shores in Donegal, Sligo, Connemara, and the Aran Islands, but this species is more local and far less numerous than the Common and Arctic Terns.

***Larus ridibundus*, Linn. BLACK-HEADED GULL.**—Arrives on Clare Island in very small numbers in June and July after breeding, when it becomes common on Clew Bay, Achill Sound, and generally on the coasts and estuaries. The only breeding-place recorded on a marine island is on Beginish, one of the Blaskets, now apparently abandoned (Praeger). This Gull nests on islands of fresh-water lakes near the coast of Donegal and near Killala Bay, and further inland is greatly increasing on lakes and bogs.

***Larus canus*, Linn. COMMON GULL.**—Another increasing species, which breeds on islets of lakes near the coasts of Donegal, Mayo, and Connemara, on one island off Kerry, on Inishkea, and near Inishbiggle in Achill Sound. After the breeding-time a few are to be seen about Clew Bay and the harbour of Clare Island.

***Larus argentatus*, J. F. Gmelin. HERRING-GULL.**—Common and resident, breeding in small colonies among the other sea-birds (for want of separate space) along the cliff-face of Clare Island. About a dozen pairs breed in company on The Bills, and on the cliffs of Achill there are other colonies, where Patten saw a flock precipitate themselves towards the sea for mere sport with closed wings, spreading them to stop their course just before immersion, and then rapidly reascending with spiral flight. They nest on Inishturk, Inishark, and probably on every rocky coast and many an island round Ireland.

***Larus fuscus*, Linn. LESSER BLACK-BACKED GULL.**—Occasionally seen on Achill Sound and about Belmullet. Wallace once saw there a flock of twenty-one. Three were seen among crowds of Herring Gulls at Inishkea whaling-station. Breeds on some marine islands off Donegal and Kerry,

but is not proved to do so in Mayo. Ussher found none on The Bills in June, 1890, neither did Praeger, who visited them in June, 1910, but these Gulls breed commonly on stony islets in Loughs Corrib and Mask.

**Larus marinus**, Linn. GREAT BLACK-BACKED GULL.—A most remarkable and increasing resident on the west coast. Breeds on the cliffs of Clare Island and on Kinatevquilla; on The Bills there is probably the largest colony in Europe, which was estimated in 1890 at over 100 birds; but in 1910 Praeger and Welch saw about 200 there. The nests are chiefly on the western rock, which is most difficult to land on, even in calm weather. There are breeding-places on a stack off Duvillaun, on the Stags, and many an isolated rock along the coast, such as the picturesque Doonbrista (Plate V, fig. 2), off Downpatrick Head; and this bird nested once on a low gravelly island near Killala (Warren). On the Mullet these birds are poisoned, as they are said to attack young lambs.

**Larus glaucus**, Fabricius. GLAUCOUS GULL.—Immature specimens occur almost every winter, singly or in pairs, on the north and west coasts of Ireland, most frequently on those of Mayo and Donegal, and extend their visits to the western shores of Munster. This Gull has been repeatedly obtained on Achill, the Mullet and Killala Bay, and Mr. H. B. Knox has a beautiful adult in spring plumage from Mayo. Like the next species, Glaucous Gulls are most frequent in December, January, and February.

**Larus leucopterus**, Fabr. ICELAND GULL.—Immature birds are obtained in winter; but this Gull is much less frequent than the last; Barrington thinks the ratio is about 1 to 6, and some winters no Iceland Gulls are reported. Has been repeatedly obtained on Achill and the Mullet, and also on the Moy estuary and Killala Bay. Like our northern visitors generally, these two Arctic Gulls affect the Atlantic shores from Donegal to Kerry.

**Rissa tridactyla** (Linn.). KITTIWAKE.—Breeds in great colonies along the cliff-face of Clare Island and on The Bills, where they occupy the steep eastern side of the outer rock. Light-keepers' reports notice their arrival and continued increase during March, and rarity in November, when there is but one record. In that month flocks have been seen on the ocean from 30 to 70 miles south-west of Munster coasts (Farran). The northward migration in April has been reported from Slyne Head, and the south-westward in autumn from Black Rock, Slyne Head, and the Skelligs.<sup>1</sup>

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<sup>1</sup> Barrington's "Migration of Birds."

Colonies of vast numbers nest on the north coast of Mayo, and on the cliffs and islands of Donegal, Clare, and Kerry. Unlike other Gulls, immature birds are never seen at breeding stations; they keep far out to sea.

**Pagophila eburnea**, Phipps. IVORY GULL.—A specimen observed by Wallace, 18th March, 1905, and afterwards found dead on the coast of the Mullet, is in the Dublin Museum. Only two others have been obtained in Ireland, one in Kerry and one on Bantry Bay; both over sixty years ago.

**Stercorarius pomatorhinus**, Temm. POMATORHINE SKUA.—Irregular visitor, chiefly in October and November; has been obtained on Achill, on the Mullet, and repeatedly on Killala Bay, the line of the Moy, and Lough Conn, which is the route taken by occasional flocks of these birds on their autumn migration towards Kerry,<sup>1</sup> where they have been several times taken.

**Stercorarius crepidatus** (J. F. Gmel.). RICHARDSON'S SKUA.—Frequent visitor in September and October, more rarely on its northward migration in May and June; has been obtained on Achill, where immature birds are oftener seen than adults; usually observed (occasionally in large flocks) in October passing south from Killala Bay, and afterwards (in 1862) on Tralee Bay (Warren).

**Stercorarius parasiticus**, Linn. BUFFON'S SKUA.—An adult bird, in Barrington's collection, was caught alive on a bog in Clare Island, 15th June, 1906. Another was shot on Achill, 29th September, 1902, others on the Mullet and on the several sections of the west coast, indicating the same line of migration as in the case of other Skuas, the Shannon being also used as a migration route.<sup>2</sup>

**Alca torda**, Linn. RAZORBILL.—There is no more remarkable colony in Ireland than on the great cliff of Clare Island, where the Razorbills breed up to 1000 feet; they also nest on The Bills and Inishturk. Patten saw the birds arriving in the end of March. There are extensive colonies along the north Mayo coast, and on all the great bird-cliffs round Ireland.

**Uria troile** (Linn.). GUILLEMOT.—The considerable colonies on Clare Island are much more condensed and lower down (under 400 feet), and are far less extensive than those of the Razorbill. Guillemots have been first noted there from 12th to 21st March. Numbers have been noticed on

<sup>1</sup> Warren in Irish Nat., 1896, p. 258.

<sup>2</sup> Proc. Dublin N. H. Soc., 7th February, 1862.



the water by light-keepers as late as 14th November. They lay on The Bills in moderate numbers, and in all directions along the cliffs of north Mayo, as well as in the great sea-bird colonies round Ireland.

**Uria grylle** (Linn.). BLACK GUILLEMOT.—A good many scattered birds observed, April-July, about the west and north shores of Clare Island, in Achill Sound, among the islands of Clew Bay, and round the Mullet, where they are often observed by Wallace in winter. Shores strewn with boulders offer cover for this bird to breed apart from other species. It is frequent in the inlets of the coast of north Mayo and Connemara, and many frequent High Island (Witherby), but not in colonies.

**Mergulus alle** (Linn.). LITTLE AUK.—Met with occasionally after fierce winter storms, when it is sometimes cast ashore on many parts of the Mayo coast, including Achill and Black Rock. Save as above, it is a bird of rare occurrence in Ireland, and occurs most frequently in the north and north-west.

**Fratercula arctica** (Linn.). PUFFIN.—Considerable colonies extend along the upper parts of the Clare Island cliffs among and above those of Razorbills. They have no rabbit-holes to occupy, so they must dig their own burrows. They sometimes fight beak to beak, as though one were trying to take fish from the other, without pulling out feathers (Patten). Barrington saw none the last week in March, but Barrett-Hamilton noticed some on 10th April. On the eastern island of The Bills (Plate III) the whole of the peaty surface is simply riddled with burrows of Puffins, which are exceedingly numerous (Praeger). On the north Mayo coast the speciality is the great colonies of Puffins which reach up to the cliff-tops, over 700 feet high in places, and the sloping grassy tops of the Stags and Moistha ("Illanmaster") have a dense, teeming population of these birds.

**Colymbus glacialis**, Linn. GREAT NORTHERN DIVER.—Haunts the coast and bays most of the year up to June, when there is a northward migration through Achill Sound; and Wallace has shown Ussher a bird on 4th June flying high from Blacksod Bay towards Broadhaven. McCabe has a specimen shot on Clare Island, where it is commonly seen. Good has seen this Diver on Lough Corrib and generally on Lough Mask. It has been obtained in Donegal more than once in July, and has been seen in Mayo as early as the first week in October (Good).

**Colymbus arcticus**, Linn. BLACK-THROATED DIVER.—Has been obtained at Achill (Sheridan), and identified on Killala Bay (Warren), but is exceedingly rare.

**Colymbus septentrionalis**, Linn. RED-THROATED DIVER.—Late autumn and winter visitor to Clare Island, Achill, and the Mullet, but not so well known as the Great Northern Diver. Warren has observed these birds congregate on Killala Bay before leaving in spring.

**Podiceps auritus** (Linn.). SCLAVONIAN GREBE.—Has been obtained on Achill, where it is known as a winter visitor, and is frequently found on Blacksod Bay; two in nuptial plumage, now in the Barrington collection, were obtained there out of a flock of six, 14th April, 1895; another adult brought to Wallace, and identified by Ussher, was taken near Belmullet, 17th April, 1907.

This bird is a pretty constant winter visitor to the bays and estuaries of Mayo and Donegal, and has been repeatedly taken in Kerry. Its habits contrast with those of the Great Crested Grebe, which is unknown on the west coast.

**Podiceps fluviatilis** (Tunstall). LITTLE GREBE.—Breeds on lakes, as in Westport demesne, also on Achill and the Mullet, where it is scarce; takes to the sea-water in Achill Sound in September; appears to wander round the coast in winter; one was shot near Killybegs in February, and another killed striking Slyne Head lighthouse in November.

**Procellaria pelagica**, Linn. STORM-PETREL.—Has been repeatedly caught at the Clare Island lighthouse in July and August, and probably breeds in escarpments west of it, as it does on Duvillaun, Black Rock, Inishkeeragh, Inishglora, and on the Mullet cliffs (Richards), also on Kid Island, the Stags, Pig Island, Moistha, and isles of Donegal, Connemara, and Kerry. The observations and specimens show that it frequents the west coast from April or May until November (Barrington's "Migration of Birds").

**Oceanodroma leucorhoa** Vieill. FORK-TAILED PETREL.—Barrington received specimens of this bird from Black Rock (Mayo), in November, 1887, and September, 1892; and on 13th August, 1899, a much incubated egg. Both birds and their eggs have been received from the Blaskets off Kerry in different years; and as the species has been proved to breed sparingly in Mayo and Kerry, it may have another breeding-place off Slyne Head.<sup>1</sup> This Petrel is very little known even on our west coast; but a good many, blown inland by storms, have been recorded from various counties. It has been shot on Achill in 1911.

<sup>1</sup> Thompson, vol. iii, p. 417.

**Puffinis gravis**, O'Reilly. GREAT SHEARWATER.—Not recorded from Co. Mayo except by Warren on Killala Bay and near Downpatrick Head; but repeatedly met with off that coast and off Achill by Rev. W. S. Green. Ussher has seen it off Slyne Head; and it roams over the ocean, often in flocks, north and south of Connaught from August to November. Its nesting-place was discovered for the first time in 1909 on Tristan d'Achuna (Bull. B. O. C., No. clxiv, p. 22).

**Puffinus griseus** (Gmel.). SOOTY SHEARWATER.—A specimen in Dublin Museum was shot between Achill and The Bills on 22nd May, 1901. Another was shot at Portmore Bay on the Mullet, 3rd August, 1910 (Wallace). On 17th August, 1911, the Duchess of Bedford saw a large number between Eagle Island and Black Rock.<sup>1</sup> Sooty and Great Shearwaters have been repeatedly seen off the land's ends of Cork and Kerry by Becher and Farran, chiefly in August and September, and sometimes in considerable numbers.

**Puffinus anglorum** (Temm.). MANX SHEARWATER.—Reported by light-keepers as heard on Clare Island in April (when Shearwaters are frequently observed); M'Cabe says, 'often seen.' Common in summer on the neighbouring sea; and Wallace says, "nests on various islands." G. E. Scroope got the egg on Kid Island, and Moistha is another breeding-place (Warren) Colonies exist on Aranmore and the Kerry isles.

**Fulmarus glacialis** (Linn.). FULMAR.—Seen on the wing inside Black Rock (Mayo), July, 1911, by Lindner and Ussher, who found a colony breeding on north Mayo coast same month; while others were found breeding in north Donegal in May, 1911, and had been observed in both localities the previous season. Not found on Clare Island cliffs; but should be looked for there, now that it has taken to nesting on the Irish coast, and spreading so fast among the isles of Scotland. Fulmars are met with at all seasons twenty miles and upwards west of Ireland.

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<sup>1</sup> "British Birds," vol. v, p. 141.

IV.—COMPARATIVE TABLE OF BIRDS OF CLARE ISLAND, ACHILL, NEIGHBOURING ISLANDS,  
AND ADJOINING MAINLAND.

&lt; increasing. &gt; decreasing. r, rare.

	CLARE I.			ACHILL.			OTHER ISLANDS.			MAINLAND.		
	Breeding.	Not breeding.	Strugglers.	Breeding.	Not breeding.	Strugglers.	Breeding.	Not breeding.	Strugglers.	Breeding.	Not breeding.	Strugglers.
Mistle-Thrush.	—	—	×	<×	—	—	—	—	×	<×	—	—
Song-Thrush.	×	×	—	<×	×	—	—	×	×	×	×	—
Redwing.	—	×	—	—	×	—	—	×	—	—	×	—
Fieldfare.	—	×	—	—	×	—	—	×	—	—	×	—
White's Thrush.	—	—	—	—	—	—	—	—	—	—	—	r ×
Blackbird.	<×	×	—	<×	×	—	×	×	—	<×	×	—
Ring Ouzel.	—	—	×	>×	—	—	—	—	—	×	—	—
Wheatear.	×	—	—	×	—	—	×	—	—	×	—	—
Stonechat.	×	—	—	×	—	—	×	—	—	×	—	—
Redstart.	—	—	—	—	—	—	—	—	r ×	—	—	—
Black Redstart.	—	—	—	—	—	r ×	—	—	r ×	—	—	—
Redbreast.	×	—	—	×	—	—	×	—	×	×	—	—
Whitethroat.	×	—	—	<×	—	—	—	—	—	×	—	—
Blackcap.	—	—	—	—	—	r ×	—	—	r ×	×	—	×
Barred Warbler.	—	—	—	—	—	—	—	—	—	—	—	r ×
Golden-crested Wren.	—	—	—	<×	—	—	—	—	×	×	×	—
Chiff-Chaff.	—	—	—	—	—	—	—	—	—	<×	—	—
Willow-Wren.	—	—	—	×	—	—	—	—	—	×	—	—
Wood-Wren.	—	—	—	—	—	—	—	—	r ×	—	—	—
Sedge-Warbler.	×	—	—	×	—	—	—	—	—	×	—	—
Hedge-Sparrow.	×	—	—	×	—	—	×	—	—	×	—	—
Dipper.	×	—	—	×	—	—	—	—	—	×	—	—
Long-tailed Titmouse.	—	—	—	?	—	—	—	—	—	×	—	—
Great Titmouse.	—	—	—	?	—	—	—	—	—	×	—	—
Coal Titmouse.	—	—	—	?	—	×	—	—	—	×	—	—
Blue Titmouse.	—	—	—	<×	—	—	—	—	—	×	—	—
Wren.	×	—	—	×	—	—	×	—	—	×	—	—
Tree-Creeper.	—	—	—	<?	—	—	—	—	—	×	—	—
Pied Wagtail.	×	×	—	×	—	—	×	—	—	×	×	—

COMPARATIVE TABLE OF BIRDS OF CLARE ISLAND, &c.—*continued.*

< increasing. > decreasing. r, rare.

—	CLARE I.			ACHILL.			OTHER ISLANDS.			MAINLAND.		
	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.
White Wagtail,	-	-	-	-	-	r X	-	-	-	..	r X	-
Grey Wagtail,	X	-	-	X	-	-	-	-	-	X	-	-
Yellow Wagtail,	-	-	-	-	-	r X	-	-	-	X	-	-
Meadow Pipit,	X	X	-	X	X	-	X	-	-	X	X	-
Red-throated Pipit,	-	-	-	-	-	r X	-	-	-	-	-	-
Rock Pipit,	X	-	-	X	-	-	X	-	-	X	-	-
Spotted Flycatcher,	-	-	-	X	-	-	-	-	-	X	-	-
Swallow,	X	-	-	X	-	-	X	-	-	X	-	-
Martin,	-	-	X	X	-	-	-	-	-	X	-	-
Sand-Martin,	-	-	-	-	-	-	-	-	-	X	-	-
Greenfinch,	-	X	-	X	X	-	-	-	-	X	-	-
Hawfinch,	-	-	-	-	-	r X	-	-	-	-	-	r X
Goldfinch,	-	X	-	-	X	-	-	-	-	X	X	-
House-Sparrow,	X	-	-	X	-	-	X	-	-	-	-	-
Tree-Sparrow,	-	-	-	-	-	-	-	-	-	r X	X	-
Chaffinch,	-	X	-	X	X	-	-	-	X	X	-	-
Brambling,	-	-	-	-	r X	-	-	-	-	-	r X	-
Linnet,	X	X	-	X	-	-	-	X	-	X	-	-
Mealy Redpoll,	-	-	-	-	X	X	-	-	-	-	-	-
Lesser Redpoll,	-	-	-	X	-	-	-	-	-	X	-	-
Twite,	X	-	-	X	-	-	X	-	-	X	-	-
Bullfinch,	-	-	-	-	-	-	-	-	-	> X	-	-
Crossbill,	-	-	-	-	-	r X	-	-	r X	-	-	-
Corn-Bunting,	X	-	-	X	-	-	X	-	-	X	-	-
Yellow Bunting,	X	-	-	X	-	-	X	-	-	X	-	-
Reed-Bunting,	X	-	-	X	-	-	X	-	-	X	-	-
Snow-Bunting,	-	X	-	-	X	-	-	X	-	-	X	-
Starling,	-	X	-	< X	X	-	-	X	-	> X	X	-
Chough,	X	-	-	X	-	-	X	-	-	> X	-	-



COMPARATIVE TABLE OF BIRDS OF CLARE ISLAND, &c.—*continued.*

< increasing. > decreasing. r, rare.

	CLARE I.			ACHILL.			OTHER ISLANDS.			MAINLAND.		
	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.
Greylag Goose,	—	—	—	—	×	—	—	—	—	—	×	—
White-fronted Goose,	—	×	—	—	×	—	—	×	—	—	×	—
Bean Goose,	—	—	—	—	×	—	—	—	—	—	×	—
Snow Goose,	—	—	—	—	—	—	—	—	—	—	—	×
Bernacle Goose,	—	×	—	—	×	—	—	×	—	—	×	—
Brent Goose,	—	—	—	—	×	—	—	—	—	—	×	—
Whooper Swan,	—	?	—	—	×	—	—	—	—	—	×	—
Bewick's Swan,	—	×	?	—	×	—	—	—	—	—	×	—
Mute Swan,	—	—	—	—	—	—	—	—	—	×	—	—
Sheld-Duck,	—	—	—	?	—	—	—	—	—	<×	×	—
Mallard,	×	×	—	×	×	—	—	×	?	×	×	—
Gadwall,	—	—	—	—	×	—	—	—	—	—	×	—
Shoveler,	—	—	—	—	×	—	—	—	—	×	—	—
Pintail,	—	—	—	—	×	—	—	—	—	—	×	—
Teal,	—	×	—	×	×	—	—	×	?	×	×	—
Garganey,	—	—	—	—	—	r	×	—	—	—	—	—
Pochard,	—	—	—	—	×	—	—	—	—	—	×	—
Tufted Duck,	—	—	—	—	×	—	—	—	—	—	×	—
Scaup Duck,	—	—	—	—	×	—	—	—	—	—	×	—
Golden-eye,	—	—	—	—	×	—	—	—	—	—	×	—
Long-tailed Duck,	—	—	—	—	×	—	—	—	—	—	×	—
Eider Duck,	—	—	—	—	—	r	×	?	—	—	—	r
King Eider,	—	—	—	—	—	r	×	—	—	—	—	—
Common Scoter,	—	—	—	—	—	×	—	—	—	—	—	×
Surf Scoter,	—	—	—	—	—	r	×	—	—	—	—	—
Goosander,	—	—	—	—	—	—	—	—	—	—	—	×
Red-breasted Mer- ganser,	—	—	—	×	×	—	—	—	—	×	×	—
Ring-Dove,	—	—	—	<×	—	—	—	—	—	×	—	—

COMPARATIVE TABLE OF BIRDS OF CLARE ISLAND, &c.—*continued.*

&lt; increasing. &gt; decreasing. r, rare.

	CLARE I.			ACHILL.			OTHER ISLANDS.			MAINLAND.		
	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.
Rock-Dove, . . .	x	—	—	>x	—	—	x	—	—	x	—	—
Turtle-Dove, . . .	—	—	—	—	—	—	—	—	r	x	—	—
Pallas's Sand-Grouse,	—	—	—	—	—	—	—	—	—	—	—	r
Red Grouse, . . .	—	—	>x	x	—	—	—	—	x	x	—	—
Pheasant, . . .	—	—	—	—	—	—	—	—	—	x	—	—
Partridge, . . .	—	—	—	>x	—	—	—	—	—	>x	—	—
Quail, . . .	—	—	—	—	—	>r	x	—	—	—	—	>r
Corn-Crake, . . .	x	—	—	x	—	—	x	—	x	x	—	—
Water-Rail, . . .	x	x	—	x	—	—	—	—	x	x	—	—
Water-Hen, . . .	x	—	—	x	—	—	x	—	x	x	—	—
Coot, . . .	—	—	—	x	x	—	—	—	—	x	x	—
Ringed Plover, . . .	x	x	—	x	x	—	x	x	—	x	x	—
Golden Plover, . . .	—	x	—	x	x	—	—	—	x	x	x	—
Grey Plover, . . .	—	x	—	—	x	—	—	—	—	—	x	—
Lapwing, . . .	x	x	—	x	x	—	—	—	x	x	x	—
Turnstone, . . .	—	x	—	—	x	—	—	x	x	—	x	—
Oyster-catcher, . . .	x	—	—	x	x	—	x	—	x	—	x	—
Grey Phalarope, . . .	—	—	—	—	—	x	—	—	x	—	—	x
Red-necked Phalarope	—	—	—	—	—	r	x	—	—	x	—	—
Woodcock, . . .	—	x	—	—	x	—	—	—	x	x	x	—
Great Snipe, . . .	—	—	—	—	—	r	x	—	—	—	—	r
Common Snipe, . . .	x	x	—	x	x	—	—	—	—	x	x	—
Jack Snipe, . . .	—	x	—	—	x	—	—	—	—	—	x	—
American Pectoral Sandpiper,	—	—	—	—	—	—	—	—	—	—	—	r
Dunlin, . . .	—	x	—	x	x	—	—	—	—	x	x	—
Purple Sandpiper, . . .	—	x	—	—	x	—	—	x	—	—	x	—
Knot, . . .	—	—	—	—	x	—	—	x	—	—	x	—
Sanderling, . . .	—	—	—	—	x	—	—	x	—	—	x	—



COMPARATIVE TABLE OF BIRDS OF CLARE ISLAND, &c.—*continued.*

< increasing. > decreasing. r, rare.

—	CLARE I.			ACHILL.			OTHER ISLANDS.			MAINLAND.		
	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.
Ruff, . . . .	—	—	—	—	—	r X	—	—	—	—	—	r X
Common Sandpiper,	X	—	—	X	—	—	X	—	—	X	—	—
Green Sandpiper, .	—	—	—	—	—	—	—	—	—	—	—	r X
Redshank, . . .	—	X	—	X	X	—	—	X	—	X	X	—
Greenshank, . . .	—	—	—	—	X	—	—	—	—	—	X	—
Bar-tailed Godwit, .	—	—	—	—	X	—	—	—	—	—	X	—
Black-tailed Godwit,	—	—	—	—	—	—	—	—	—	—	—	r X
Curlew, . . . .	—	X	—	—	X	—	—	X	—	X	> X	—
Whimbrel, . . . .	—	X	—	—	X	—	—	X	—	—	X	—
Black Tern, . . . .	—	—	—	—	—	r X	—	—	—	—	—	—
Sandwich Tern, . . .	—	—	—	—	—	—	—	—	—	> X	—	—
Roseate Tern, . . . .	—	—	—	—	—	—	—	—	r X	—	—	—
Common Tern, . . . .	—	X	—	—	X	—	X	—	—	—	X	—
Arctic Tern, . . . .	X	—	—	—	—	—	X	—	—	> X	—	—
Little Tern, . . . .	—	—	—	—	—	—	X	—	—	—	—	—
Black-headed Gull, .	—	X	—	—	X	—	—	X	—	> X	X	—
Common Gull, . . . .	—	X	—	—	X	—	X	X	—	> X	X	—
Herring-Gull, . . . .	X	—	—	X	—	—	X	—	—	—	—	—
Lesser Black-backed Gull,	—	—	—	—	X	—	—	X	—	—	X	—
Great Black-backed Gull,	X	—	—	—	X	—	> X	X	—	—	X	—
Glaucous Gull, . . . .	—	—	—	—	X	—	—	—	—	—	X	—
Iceland Gull, . . . .	—	—	—	—	X	—	—	—	—	—	X	—
Kittiwake, . . . .	X	—	—	—	—	—	—	X	—	—	—	—
Ivory Gull, . . . .	—	—	—	—	—	—	—	—	—	—	—	r X
Pomatorhine Skua, . .	—	—	—	—	—	X	—	—	—	—	—	X
Richardson's Skua, . .	—	X ?	—	—	X	—	—	—	—	—	X	—
Buffon's Skua, . . . .	—	—	X	—	—	X	—	—	—	—	—	X
Razorbill, . . . .	X	—	—	—	—	—	X	—	—	X	—	—

## COMPARATIVE TABLE OF BIRDS OF CLARE ISLAND, &amp;c.—continued.

&lt; increasing.      &gt; decreasing.      r, rare.

—	CLARE I.			ACHILL.			OTHER ISLANDS.			MAINLAND.		
	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.	Breeding.	Not breeding.	Stragglers.
Guillemot, . . .	×	—	—	—	—	—	×	—	—	×	—	—
Black Guillemot, . . .	×	—	—	×	—	—	×	—	—	×	—	—
Little Auk, . . .	—	—	—	—	—	×	—	—	×	—	—	×
Puffin, . . .	×	—	—	—	—	—	×	—	—	∧	×	—
Great Northern Diver,	—	×	—	—	×	—	—	—	—	—	×	—
Black-throated Diver.	—	—	—	—	—	r	×	—	—	—	—	—
Red-throated Diver,	—	×	—	—	×	—	—	—	—	—	×	—
Slavonian Grebe, . .	—	—	—	—	×	—	—	—	—	—	×	—
Little Grebe, . . .	—	—	—	×	×	—	—	×	—	×	—	—
Storm-Petrel, . . .	×	?	—	—	×	—	×	—	—	×	—	—
Fork-tailed Petrel, .	—	—	—	—	×	—	×	r	—	—	—	—
Great Shearwater, . .	—	—	—	—	×	?	—	—	×	?	—	—
Sooty Shearwater, . .	—	—	—	—	×	?	—	—	×	?	—	—
Manx Shearwater, . .	×	?	×	—	×	—	×	—	—	—	×	—
Fulmar, . . .	—	—	—	—	×	—	—	—	—	∧	×	—

V.—SUMMARY.

The avifauna of these islands thus presents the following features :—

1. Resident land-birds are of few species, including the Stonechat, Hedge Sparrow, Dipper, Wren, Twite, three Buntings, and the more characteristic Rock Pipit, Chough, Raven, Peregrine, and Rock-Dove, and formerly the Golden Eagle.

2. Summer land-birds that breed are still fewer :—the Wheatear, White-throat, Sedge-Warbler, Swallow, Cuckoo, Corn-crake.

3. There are colonies of Shags, cliff-breeding Gulls, Arctic and Little Terns, Auks and Petrels, and many Oyster-catchers nest.

The more special features are :—

4. The large immigration of passerine birds that resort to the islands and the Mullet in winter for a milder climate, as do the Thrush family, Finches, Starlings, Rooks, and Skylarks.

5. The winter visitation of species from northern countries, which resort to the western fringe of Ireland, especially the north-west, *e.g.*, the Snow-Bunting, Greenland Falcon, Wild Swans, and Arctic species of Gulls.

6. The late stay in spring of the above winter birds and such others as the Scaup Duck, Sanderling, Purple Sandpiper, Northern Diver, and Slavonian Grebe.

7. The stay throughout the summer of adolescent winter visitors, as the Turnstone, Bar-tailed Godwit.

8. The rarity or absence of those occasional visitors that come from the Continent, as the Black Redstart, the rarer Herons and Crakes.

9. The increase of the Blackbird and of several woodland species on the mainland and of the Great Black-backed Gull on the islands.

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} of various dates.



Golden Eagle. Clare Island, October, 1887.  
Preserved in the National Museum, Dublin.

R. Welch, *photo.*





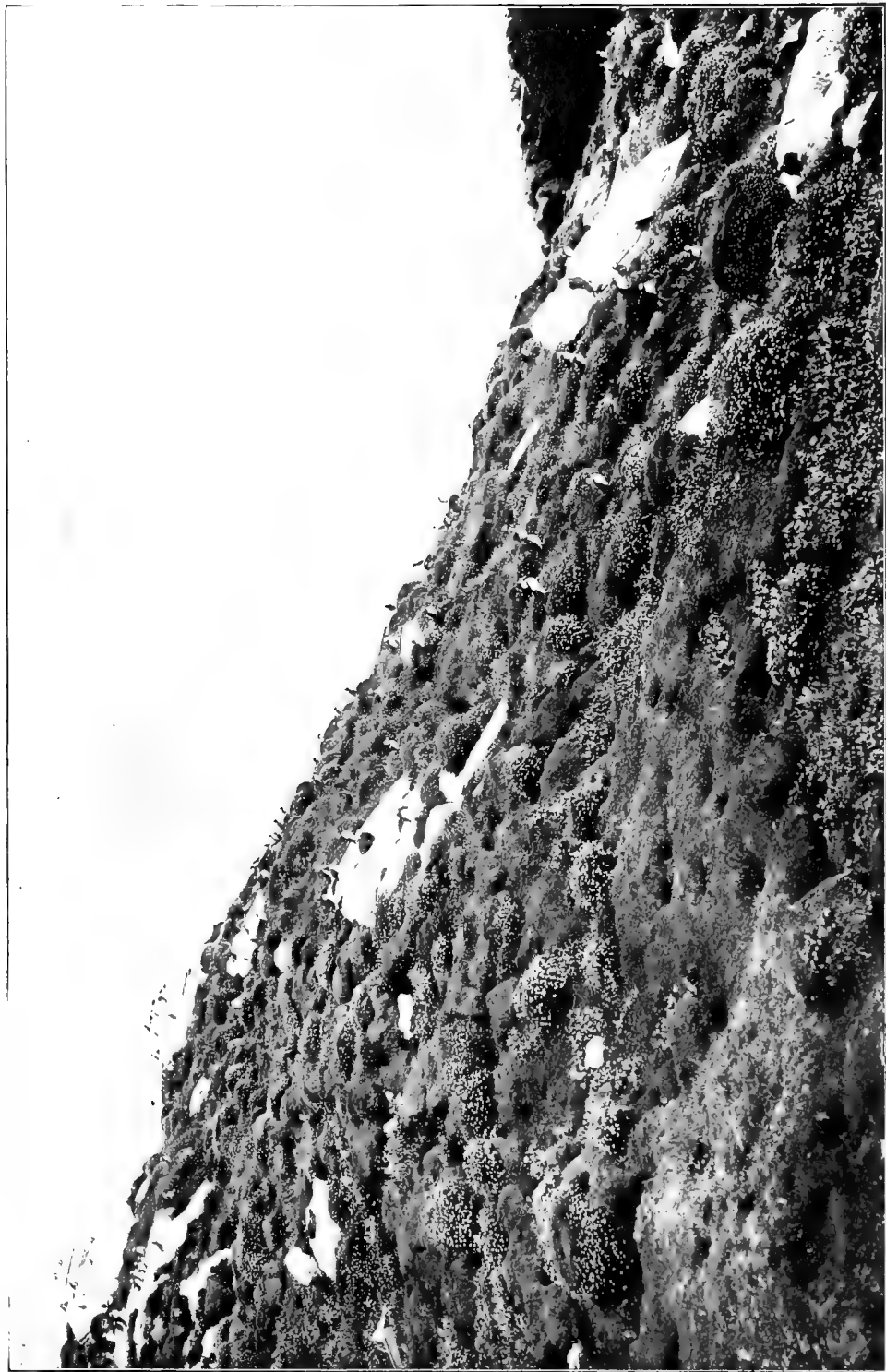
R. Welch, *photo.*

Bird-cliffs on north-west shore of Clare Island. Height 800 feet. Looking N.E.

CLARE ISLAND SURVEY.—USSHER: AVES.







Puffin colony on the Bills. Clare Island in the distance.

CLARE ISLAND SURVEY.—USSHER: AVES.

R. Welch, photo.



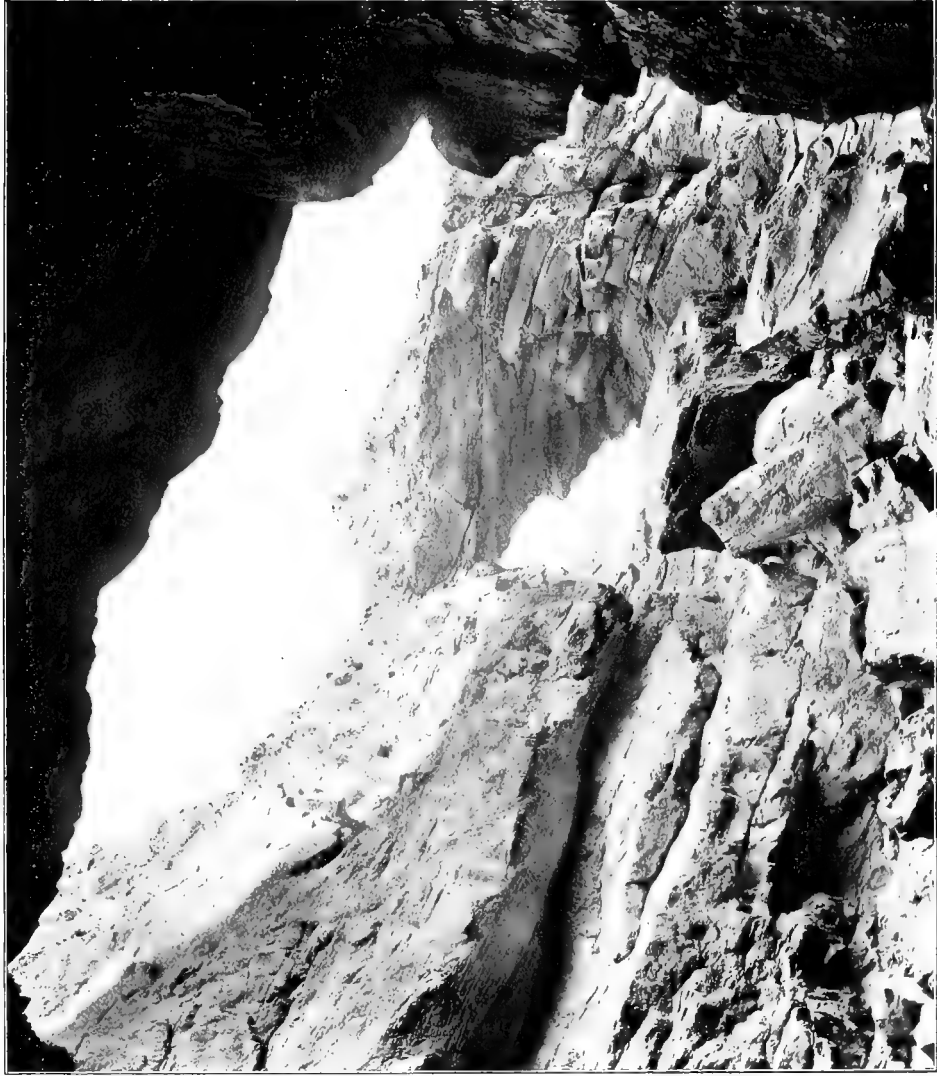


Fig. 1.—Sea-cave in the roof of which Swallows nest on Clare Island.

R. Welch, *photo.*



Fig. 2.—Snowy Owl shot near Belmullet.  
H. Blake Knox.



Fig. 3.—Choughs flying, Clare Island.

C. J. Patten, *photo.*





Fig. 1.—Portion of great north-western cliff,  
Clare Island,  
Razorbills and Puffins nesting.  
C. J. Patten, *photo.*

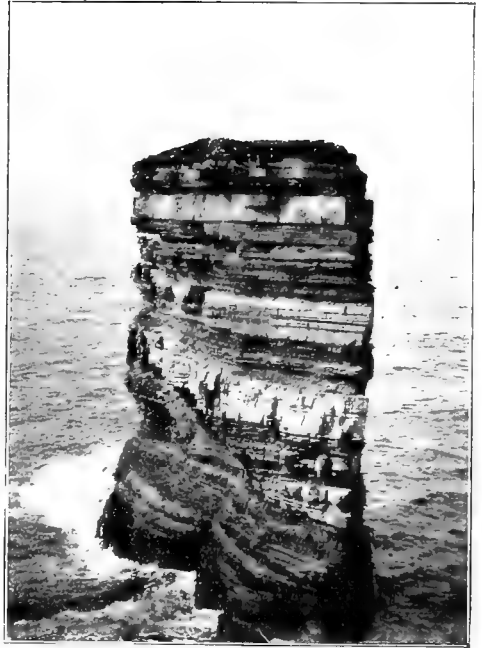


Fig. 2.—Doonbristy (the Broken Fort),  
North Mayo coast.  
Great Black-backed Gulls nest on top,  
Guillemots and Kittiwakes on the ledges.  
T. J. Westropp, *photo.*



Fig. 3.—Young Great Black-backed Gulls  
on the Bills.  
R. Welch, *photo.*



Fig. 4.—Blackbird's nest on a rock,  
Clare Island.  
C. J. Patten, *photo.*



TUNICATA AND HEMICHORDA.

BY G. P. FARRAN AND R. SOUTHERN.

Read APRIL 27. Published AUGUST 10, 1914.

IN the absence of any specialists in these groups from the naturalists engaged in the Clare Island Survey, it has fallen to our lot to summarize the available records. That so large a number of Tunicates appears in the list is due to Prof. Hartmeyer of Berlin, who is at present engaged in examining the Tunicate material belonging to the Fisheries Branch of the Department of Agriculture, and who kindly consented to furnish a preliminary account of the collections from Blacksod Bay. There is still a good deal of material, collected in Clew Bay and other parts of the district, awaiting examination.

TUNICATA.

APPENDICULARIAE.

**Oikopleura** sp.—Specimens of *Oikopleura* are very common in tow-nettings throughout the district, both in inshore gatherings and in the open sea. It is probable that most, if not all, of these are *O. dioica*, though they have not been identified with certainty.

THALIACEAE.

**Salpa fusiformis** Cuv.—An oceanic species, frequently drifted into the district.

**Salpa mucronata** Forsk.—A large shoal of this species was swept up the west coast of Ireland in August, 1903, and was found plentifully off Cleggan Head in that month.

**Salpa asymmetrica** Fowler.—An oceanic species taken occasionally off Cleggan in 1903. It probably occurs frequently at irregular intervals.

**Doliolum tritonis** Herdm.—An oceanic species, often drifted shorewards. It was taken to the east of Clare I. in August, 1901.

#### ASCIDIACEA.

As it is difficult to discover in most cases what species of Ascidians are indicated by the names given by early writers, it has seemed best to keep separate the few published records from the Clew Bay area.

The following species are recorded from within the limits of the district in Alder and Hancock's "British Tunicata" (Ray Society, 1905-12). The records are chiefly based on the work of Thompson:—

*Ascidia mentula* Müller.—Clew Bay.

*Ascidia venosa* Müller.—Killary Bay.

*Ascidia canina* Müller.—Clew Bay.

*Ascidia scabra* Müller.—Clew Bay, Killary Bay.

? *Ascidia vitrea* Van Ben.—Killary Bay (recorded by Forbes, "British Mollusca").

[*Stylopsis*] *sphaerica* Ald. Hanc.—Killary Bay.

*Amaroucium proliferum* M. Edw.—Clew Bay.

*Leptoclinum maculosum* M. Edw.—Clew Bay.

*L. durum* M. Edw.—Clew Bay.

*L. gelatinosum* M. Edw.—Clew Bay.

*Botryllus gemmeus* Sav.—Clew Bay.

*Botryllus bivittatus* M. Edw.—Clew Bay.

Professor Herdman in his Cruise of the "Argo" (Trans. Liverpool Biol. Soc., V) records the following:—

*Polycarpa argoensis* Herdman—Killary Bay, 20 fms., one specimen.

*Ascidella aspersa* Müller.—Killary Bay, 5-10 fms., abundant.

*Corella parallelogramma* Müller.—Killary Bay, 5-15 fms.



Prof. R. Hartmeyer of the Zoologisches Museum, Berlin, has recently examined a collection of Tunicates made by the Fisheries Branch of the Department of Agriculture in Blacksod Bay, chiefly on the west shore, and identifies the following species from that locality. For the synonymy and a fuller account of the species, reference should be made to Prof. Hartmeyer's paper which is about to appear in the Department's publication—"Fisheries, Ireland, Sci. Invest."

- Molgula citrina* Ald. Hanc.—One specimen.  
*Pyura squamulosa* (Ald.).—Not plentiful.  
*Pyura Savignyi* (Phil.).—Very plentiful.  
*Styela Lovenii* (Kor. Dan.).—One specimen.  
*Polycarpa singularis* (Gunn.).—Small specimens plentiful.  
*Dendrodoa grossularia* (Bened.).—Very abundant locally at entrance to Blacksod Bay.  
*Botryllus Schlosseri* (Pall.).—Plentiful.  
*Botrylloides rubrum* M.-E.—Plentiful.  
*Phallusia mentula* (Müll.).—Moderately plentiful.  
*Phallusia virginea* (Müll.).—Moderately plentiful.  
*Phallusia conchilega* (Müll.).—Very plentiful.  
*Asciodiella aspersa* (Müll.).—Very plentiful.  
*Ciona sociabilis* (Gunn.).—Fairly plentiful.  
*Clavelina lepadiformis* (Müll.).—A few specimens.  
*Trididemnum cereum* (Giard.).—Two colonies.  
*Didemnum* aff. *durum* (M.-E.).—A few small colonies.  
*Leptoclinum listerianum*, var. *gelatinosum* M.-E.—A few colonies.  
*Leptoclinum spongiforme* (Giard.).—Two small colonies, probably of this species.  
*Diplosomoides perforatum* (Giard.).—Two colonies.  
*Glossoforum sabulosum* (Giard.).—Very plentiful.  
*Amaroucium proliferum* M.-E.—Not very plentiful.  
*Amaroucium punctum* Giard.—Not plentiful.  
*Aplidium zostericola* Giard.—Not plentiful.  
*Morchellium argus* (M.-E.).—Plentiful.

#### ENTEROPNEUSTA.

**Dolichoglossus ruber** Tattersall.—A small red species, found not uncommonly in Ballynakill Harbour. It occurs in damp, muddy sand at low-water

spring tides. It is described in Ann. Rep. Fish., Ireland, 1902-3, Pt. II [1905], p. 213.

**Balanoglossus** sp.—A large specimen of *Balanoglossus*, of which the head end was missing, was found by Mr. E. W. L. Holt while digging in Bofin Harbour in 1900 (Tattersall *loc. cit.*).

#### PHORONIDEA.

**Phoronis** sp.—The adult stage of *Phoronis* has not yet been obtained in the district, but the larval form, *Actinotrocha*, has been found on several occasions in tow-nettings.

MARINE MOLLUSCA.

BY NATHANIEL COLGAN.

Read FEBRUARY 27. Published APRIL 14, 1911.

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I. THE AREA DEFINED AND DESCRIBED.

UNLIKE most marine areas, the area dealt with in the following list admits of very precise definition. It is included within a line drawn from the south-western extremity of Clare Island to the mainland at Emlagh Point and thence continued along the mainland coast by Old Head, Westport Quay, Newport, and Mulranny to the southern entrance of Achill Sound, whence it passes south-west to Clare Island Light-house and follows the eastern and southern coast-lines of the island to the starting-point. The area is, in short, the shores and waters of Clew Bay, having an extension east and west of some 15 miles and north and south of 8 miles. The coast-line, neglecting the minor sinuosities of the remarkably broken eastern shores, measures approximately 55 miles, a length which would be doubled by strictly following these sinuosities, and adding in the shore-lines of the crowded archipelago of drift islands which gives its peculiar character to the bay.

The whole area thus defined may be considered a shallow-water one. The deepest dredging made, between Clare Island Light and Achillbeg, hardly exceeded 25 fathoms, while amongst the creeks and channels of the eastern islands and islets the dredgings ranged from 2 to 5 fathoms. The physical character of the shores and of the sea-bottom, regarded as habitations for the various tribes of marine mollusca, is sufficiently varied. On the western side of the bay, the shores of Clare Island between tide-marks are almost exclusively rocky or boulder-strewn, the only sandy beach being

a stretch of a couple of hundred yards at the harbour. On the east of Clew Bay, the inner shores are in general muddy or marshy, interspersed with sandy beaches, usually of small extent, but occasionally, as off Annagh Island and Bartra towards the south, and east of Mulranny on the north, expanding into wide strands at low water. On the south, from Roonah Quay to Leckanvy, rock predominates, and towards the north-west, along the Curraun peninsula, narrow boulder-strewn beaches stretch along the foot of the lofty scarps of drift which here wall in the coast. Amongst the inner islands the bottom is in general muddy, gravelly, or weedy, and in some parts, especially off Inishlyre, is covered with beds of "coral," *Lithothamnion calcareum* Aresch., locally known as "Grooanock." In the open bay, the bottom is for the most part sandy, but patches of rough gravel or of mud occur, with occasional small areas of drifted shell-sand yielding dredgings rich in the smaller Gasteropods.

## II. EXPLORATION OF THE AREA.

### *a) Shore-collecting.*

The exploration of the marine molluscan fauna of the area just defined and described was allotted to me as my share of the Clare Island Survey. Though from a distributional point of view this branch of the survey is perhaps the least interesting and instructive, it proved by no means the least onerous; and had it not been for the cheerful aid given me by many skilled helpers, I should have despaired of carrying it out with any approach to completeness in the short time available.

Four visits, each of about a week's duration, were paid to the district during the thirteen months from July, 1909, to August, 1910; and on the whole quite as much attention was given to dredging as to shore-collecting. Clare Island itself was visited three times, July 16th-23rd, 1909; July 21st-26th, and August 16th-21st, 1910; and early in May of the latter year six days, 6th-11th, were spent on the shores of Westport Bay, with headquarters at Belclare, about two miles south-west of Westport Quay.

Almost daily during these visits shore-collecting was carried on at low water, with the result that the eastern and southern shores of Clare Island, the shores of Annagh Island, of Dorinish, of Inishimmel, and of the Scotch Bonnet, that curious grass-crowned fag-end of an island so conspicuous in the Westport channel, were fairly well explored. Some desultory shore-collecting was done, too, at Old Head on the 25th July, 1909; at Mulranny, on the 28th July, 1910; and at the south-western extremity of Curraun Achill on the 15th August of the same year. During the four visits to the district I had the good fortune to be associated with other workers either well versed in

this department of marine research or actually investigating other departments for the purposes of the survey, and their volunteer gatherings contributed not a little to the fullness of my collections. In this connexion I would specially mention Miss Jane Stephens and Mr. A. R. Nichols of our National Museum, Mr. A. D. Cotton of Kew Herbarium, and Mr. Praeger, the Carnot of our various survey campaigns.

It will be seen from this sketch of the shore-collecting operations that large tracts of the eastern division of the area were left untouched. It may be fairly assumed, however, that the two sections worked yielded collections representative of the littoral mollusca of the area, and that an extended survey of the complex network of creeks and islands stretching northward from Dorinish to Newport would have added little to the final result.

(b) *Dredging.*

Quite as important as the shore-collecting were the dredging operations carried on during the four visits referred to. These operations would in all probability have been confined to the inshore waters, and would consequently have been hopelessly incomplete, but for the courtesy of the directors of the Fisheries Branch of our Agricultural and Technical Instruction Department, who arranged for several visits of their steamship "Helga" to Clew Bay during her scientific cruises and while survey parties were at work on the island. At each visit the "Helga," fully equipped for such work, made numerous dredgings, especially in the off-shore and deeper parts of the bay. On her first visit, May 22nd-27th, 1909, 15 effective hauls were made in the bay in from 5 to 25½ fathoms, and one in Inishlyre Roads at 5 fathoms. The material taken in these dredgings (apparently the finer siftings were not preserved) was examined by Miss A. L. Massy of the Fisheries Branch, and yielded a list of 74 species, which was kindly placed at my disposal. On the second visit, August 23rd-26th, 1909, only four effective hauls were made, three in the bay in from 5½ to 14 fathoms, and one off Inishgowla in 4 fathoms. The material was handed over to me, and on examination proved rather productive, giving a yield of 106 species.

On the "Helga's" third visit, August 16th-18th, 1910, I enjoyed the privilege of taking part in the dredging operations conducted under the direction of Mr. G. P. Farran, and was thus enabled to select from the 8 effective hauls made, two in Inishlyre Roads at 2 f. and at 4 f. and six in the bay in from 10 to 19 f., the material likely to yield the best results. On careful examination this material gave me a total of 159 species. One dredging in from 10 to 12 f. about a mile and a half N.E. of Old Head gave 98 species, and another in 19 f. in mid-bay in a bed of shell drift

produced no less than 133 species. This last was the richest yield of any single haul made in the area, and has, I think, been rarely exceeded by any single haul made in Irish coastal waters. In a large proportion of the total of 28 effective hauls made by the "Helga" during her three visits the tow-net was used attached to the dredge, so as to secure samples of the finer material.

The inshore or shallow-water dredgings were made usually from a row-boat or small sailing-boat or from a *pookaun*, the stout lug-sailed craft by which communication is carried on between Clare Island and the mainland. A total of 24 productive dredgings were made, and in the majority of these I was assisted by Mr. Praeger. In July, 1909, five scrapes were made at Clare Island, one in about 12 fathoms off the Light-house Cove, and four in about 5 fathoms off the harbour or off Granuaile's Castle. On the 26th of the same month Mr. A. D. Cotton joined me in a dredging-trip by sailing-boat amongst the inner islands of the bay from Rossmindle by Sruhnamael (Maelstrom) round Inishlyre and Collon Beg, when four productive hauls were made in from 2 to 5 fathoms. In May, 1910, twelve hauls were made in the Westport Channel, nine of these off Scotch Bonnet and Inishimmel and three in Inishlyre Roads; and finally in July of the same year, three hauls were made at Clare Island, two of them off the Castle in about 5 fathoms, and the third within half a mile of Light-house Cove in about 10 fathoms. This last haul proved a rich one, yielding me a total of 104 species. All of these inshore dredgings were made with a close-meshed dredge-bag which retained much of the finer material.

Altogether 52 effective dredgings were made within the area, the "Helga's" 23 deep-water hauls being so distributed as to yield samples from all parts of the open bay, while the shallow-water dredgings, like the shore-gatherings, were almost confined to the Clare Island shores and the neighbourhood of Westport Bay and channel.

### III. THE MOLLUSCAN FAUNA.

#### (a) *Its Extent, Constitution, and Local Distribution.*

The survey operations just described, incomplete though they were, have yielded material sufficient to serve as foundation, not only for what is the first detailed list of the Marine Mollusca of Clew Bay, but also for a first attempt to estimate the relative frequency of the various species. The bay was visited and dredgings made there about the middle of the last century by many able and zealous workers, such as Edward Forbes, Robert Ball, William Thompson, and Dr. Farran. But the only published results of their labours in the district are a few scattered records in various works, yielding a total of no more than 19 species.

The number of species recorded in the following list as the fruit of the dredgings and shore-collections made in 1909 and 1910 is 243. Adding to this three species previously recorded, but not taken during the survey operations, *Eledone cirrhosa*, *Bulla hydatis*, and *Doto fragilis*, the total of known species for the district is increased to 246. No shallow-water area of the Irish west coast hitherto explored has yielded so rich a molluscan fauna as this. The closest approach to it is to be found in the List of the Molluscs of Ballinacill and Bofin Harbours, the joint work of Mr. G. P. Farran (Nudibranchs) and Mr. E. R. Sykes (Testaceous Mollusca), where a total of 191 species is recorded ("Reports of Sea and Island Fisheries of Ireland," published 1903 and 1905). It should be noted that the smaller forms were not specially sought for in collecting the material from which the second part of this list was drawn up. Next in importance to this Co. Galway list comes Miss Amy Warren's for Killala Bay, with a total of 186 species, the fruit of shore-collecting alone extending over a period of several years ("Journ. of Conchology," 1892). Of the 243 species included in the present list as the result of the survey operations, two, *Thecacera pennigera* and *Actæonia Cocksii*, are for the first time recorded as Irish. The first is an addition to the Irish marine fauna, the second may prove to be only the substitution of one species for another of the same genus. Five species, *Tonicella rubra*, *Circulus striatus*, *Odostomia conspicua*, *Pyrgulina scalaris*, and *Mytilus phaseolinus*, are additions to Marine Province V. of Mr. A. R. Nichols' "List of the Marine Mollusca of Ireland," the province stretching from Loop Head northward to Erris Head, and a sixth species, *Cylichnina nitidula*, is an addition to the shallow-water area of the same province. The occurrence of the elegant little *Circulus striatus* (*Trochus Duminyi*) in two dredgings in the bay makes a welcome addition to the existing small tale of Irish records for this rare species.

Amongst the species taken in the Clew Bay area which, though not new to Marine Province V., are yet generally rare in Irish waters, the following are worthy of mention:—

<i>Scalaria Trevelyana</i>	<i>Odostomia diaphana</i>	<i>Cadlina obvelata</i>
<i>Alvania carinata</i>	<i>Liostoma clavula</i>	<i>Rostanga coccinea</i>
<i>Manzonia zetlandica</i>	<i>Eulimella nitidissima</i>	<i>Triopa claviger</i>
<i>Ceratia proxima</i>	<i>Mangilia striolata</i>	<i>Aeolis glauca</i>
<i>Barleeia rubra</i>	<i>M. attenuata</i>	<i>Modiolus adriaticus</i>
<i>Jeffreysia diaphana</i>	<i>Tornatina mammillata</i>	<i>Lima Loscombi</i>
<i>Marginella laevis</i>	<i>Volvulella acuminata</i>	<i>Lepton nitidum</i>
<i>Jordaniella nivosa</i>	<i>Bulla Utriculus</i>	<i>L. squamosum</i>
<i>Eulima bilineata</i>	<i>Philine scabra</i>	<i>Tellina pusilla</i>
<i>Odostomia conoidea</i>	<i>Jorunna Johnstonei</i>	<i>Saxicavella plicata</i>

The molluscan fauna of the Clew Bay area is devoid of any very striking characteristic. Almost all of the principal groups and genera are well represented in its total of 246 species in which the Gasteropods stand to the Pelecypods as 147 to 86. Some of the leading genera, taking them in the wide Jeffreysonian sense, appear, indeed, to be more fully represented in Clew Bay than in other Irish West Coast areas. Thus, *Odostomia* has 20 species, *Trochus* 9, *Venus*, *Tellina*, and *Chiton* 7 each, while *Rissoa* with 16 species is equalled only in Miss Warren's list for Killala Bay. In one group, however, the Nudibranchs, the Clew Bay molluscan fauna with but 16 species compares very unfavourably with that of a neighbouring West Coast area, Ballinakill and Bofin Harbours, where the labours of a skilful observer, Mr. G. P. Farran, have resulted in the discovery of no less than 46 species ("Irish Fisheries Report," *loc. cit.*). There is good reason to believe that a further exploration of some of the outer islands along the Westport Channel, especially Inishimmel (locally known as Inishivvel), would add considerably to the Nudibranch fauna of Clew Bay.

Although considered as a section of the Irish West Coast, the Clew Bay area cannot be said to possess any very distinctive character in its molluscan fauna; the local distribution of the species presents some features of interest. Adopting a rough division of the area into western, middle, and eastern, we find that the total molluscan fauna of 246 species is thus distributed. The western division, including the shores of Clare Island and the waters immediately adjacent to a depth of 10 fathoms, yields 155 species, reduced to 105 if the seaward limit be drawn at the 5-fathom line, or to 51 species, or less than half that number, if its area be restricted to the shores of the island between tide-marks. The eastern division, including the shores of the bay from Old Head to Achill Sound, with the archipelago of drift islands and the shallow channels between them, has a fauna of 145 species, reduced to 53 if we limit the area to the shores between tide-marks; and the middle section, or the open waters of the bay lying between the eastern and western divisions, has a fauna of 178 species.

The middle or deeper-water area has the largest number (41) of peculiar species, that is to say, species not found in either of the other divisions; the western has the smallest number 17 of such species, and the eastern division stands intermediate, with 22 peculiar species. Common to all three divisions are 81 species, or slightly less than one-third of the total molluscan fauna.

A comparison of the littoral molluscan faunas of the eastern and western divisions, using the word "littoral" here, not in its strict sense, but as including all species actually found living between tide-marks during the course of the survey, shows the eastern fauna to be more austral in character than the



western. The eastern or mainland division, as already stated, has 53 littoral species to 51 in the western or Clare Island division. If we exclude from these totals the Nudibranchs and Ascoglossans, whose general range in Europe is hardly sufficiently well known to permit of their species being assigned to definite distributional groups, we find on analysis that the mainland or eastern littoral fauna thus reduced to 46, includes 6 austral species, or more than one-eighth of the total, while of the western or Clare Island littorals reduced to 38, only 2 species, or one-nineteenth of the total, belong to the austral group.

It may be well to state here the precise meaning attached to the terms austral and boreal in the comparisons already made, or about to be made. By austral species of mollusca, we mean such species as range from the British Isles south to the Mediterranean; by boreal species, such as range from the English Channel northward to within the Arctic Circle. It must be admitted that there is a considerable element of uncertainty in the constitution of these groups, since they are based on a mass of records often lacking in detail and of unequal value. They may, nevertheless, be accepted as useful guides to the general character of our local molluscan faunas.

The present contrast in the physical conditions of the eastern and western divisions of the Clew Bay area would appear to be sufficient explanation of the absence from the island of the following group of species, which is characteristic of the molluscan fauna of the opposite or eastern shores of the bay:—

<i>Gibbula magus</i>	<i>Modiolus barbatus</i>	<i>Tapes decussatus</i>
<i>Lunatia catena</i>	<i>Axinus flexuosus</i>	<i>T. aureus</i>
<i>Paludestrina stagnalis</i>	<i>Tellina balthica</i>	<i>Cardium exiguum</i>
<i>Tornatina obtusa</i>	<i>Scrobicularia piperata</i>	<i>Mya arenaria</i>
<i>Akera bullata</i>	<i>Mactra subtruncata</i>	<i>M. truncata</i>

The presence of these species in the east and their absence from the west merely show that each division exhibits in its marine fauna the defects of its physical qualities, and the whole group, or a large part of it, may at one time have inhabited the Clare Island shores, when the conditions there resembled those which now obtain on the opposite mainland shores. And it is not improbable that such conditions may have obtained on the island shores when the glacial deposits which at one time appear to have choked up the bay were in process of removal by erosion and denudation.

If these absences from the Clare Island fauna are just such as we might expect, it is quite otherwise in the case of a widespread west Irish species, *Trochoclea lineata* (*Trochus*). No vestige of this could be found on any part

of the carefully explored eastern or southern shores of the island, though it is frequent and well developed on the outer islands of the eastern coast of the bay some 8 miles distant.

Having touched on these negative characteristics of the Clare Island marine mollusca, attention may be drawn to what appears to be a positive distinctive feature in the fauna of its shores as compared with those of the mainland—the presence of two interesting Ascoglossans or close allies of the Nudibranchs, *Hermæa dendritica* and *Elysia viridis*. Both of these occur in profusion between tide-marks on the island; and their prominence in its marine fauna, if one may be permitted to associate the idea of prominence with such elusive, protectively coloured species, is perhaps conditioned by the abundance on the island shores of their food-plant, the green seaweed, *Codium tomentosum*. The absence of this weed from the greater part of the uncongenial eastern shores of the bay explains the absence therefrom of the two Ascoglossans. Yet it is not improbable that further research may prove that these species occur on the imperfectly explored rocky coast from Roonah to Old Head, where *Codium* is abundant.

Amongst the species found in the middle or deeper water division of the area, but not in either of the other divisions, the following are probably excluded by insufficient depth of water :—

<i>Calliostoma Montagu</i>	<i>Cylichnina nitidula</i>	<i>Astarte sulcata</i>
<i>Scalaria Trevelyana</i>	<i>Volvulella acuminata</i>	<i>Cyprina islandica</i>
<i>Rissoa cancellata</i>	<i>Dentalium entalis</i>	<i>Diplodonta rotundata</i>
<i>Odostomia conoidea</i>	<i>Lima Loscombi</i>	<i>Saxicavella plicata</i>

In this small group, though we find that mingling of northern and southern forms which occurs all round the Irish shores, the southern element in it is still perceptibly superior, as it is throughout the Irish shallow-water areas in general.

(b) *Comparison with the East Coast Mollusca.*

When the molluscan fauna of Clew Bay, as a whole, and so far as we know it at present, is compared with that of the shores and shallow waters of Co. Dublin on the east coast, we do not find the austral element directly preponderant in the western area, as we have found it in comparing one part of that area with another, and as we should find it in comparing the Irish west coast as a whole with the east coast. But we find the boreal element much stronger in the east than in the west; and it is in the relation of the boreal to the austral element in each of the faunas that we shall find the best standard of comparison. The western or Clew Bay area has 5 boreal species to 31 austral; the eastern or Dublin area has 12 boreals to 37 australs; so that

on the west the boreals are a little less than one-sixth of the australs, while in the east they are almost one-third. Dublin has the following 11 austral species not hitherto recorded for Clew Bay :—

<i>Calliostoma granulatum</i>	<i>Pleurobranchus mem-</i>	<i>Ceratisolen legumen</i>
<i>Lunatia sordida</i>	<i>branaceus</i>	<i>Pholas dactylus</i>
<i>Turbonilla pusilla</i>	<i>Solenocurtus candidus</i>	<i>P. candida</i>
<i>Bellardiella gracilis</i>	<i>S. antiquatus</i>	<i>P. parva</i>

Of these 11 Dublin australs, however, which are apparently absent from Clew Bay, all but one (*Pholas parva*) range round the south-west and west coasts of Ireland from Cork to Connemara, and 3 are known to extend even as far north as Donegal. It is not unreasonable, then, to assume that further research would reveal the presence of several of these species in Clew Bay. And although a century-long exploration of the Dublin marine area has yielded records for 11 austral species which two seasons' work has failed to detect in Clew Bay, it must be borne in mind that 5 of these 11 australs, those in italics in the above list, are extremely rare in Dublin.

On the other hand, the Clew Bay area has 4 austral species, *Circulus striatus*, *Modiolus barbatus*, *Modiolaria costulata* and *Diplodonta rotundata*, which are absent, not merely from Dublin, but from the whole Irish east coast, from Carnsore Point in Wexford to Fair Head in Antrim. And all of these 4 species, in their extra-Britannic range, are much more distinctly southern than the majority of the 11 Dublin australs which are apparently wanting in Clew Bay, though, with one exception, widespread on the Irish west coast. If, from the Irish austral species, as already defined, we select a sub-group of what may be called Pure Australs—that is to say, of species ranging from the British Isles to latitudes south of the Mediterranean, or ranging from the Mediterranean only so far north as southern England, then the Clew Bay area, in the present imperfect state of our knowledge, shows a total of 18 such distinctively southern species to but 17 in the very fully explored Dublin area.

The mere presence of a species or group of species in a given area is in itself an uncertain test of the character of the fauna of that area. We must consider the standing there of each species, whether it be assured or precarious; and looked at from this point of view the austral element in the Dublin marine molluscan fauna will be found to have much less weight than its numbers would seem to entitle it to. Of the 37 Dublin austral species six, *Trochochlea lineata*, *Gibbula magus*, *Scalaria clathratula*, *Alvania carinata*, *Caecum trachea*, and *Dentalium vulgare*, are quite rare there as compared with Clew Bay; and two others, *Alvania cancellata* and *Erato laevis*, though

undoubtedly present, if rare, in Clew Bay, rest their claim to a place in the Dublin fauna each on a single old record. And to counterbalance this there are only two of the Clew Bay austral species, *Calliostoma Montagu* and *Lunatia catena*, which appear to be rarer there than in Dublin.

Writers on our marine mollusca have more than once drawn attention to the great abundance of *Cerithium* on the west as compared with the east coasts of Ireland. The Clew Bay dredgings gave striking proof of this preponderance, not only in the commoner species, *C. reticulatum*, but also in the allied *C. perversum*. A day's dredging in Dublin waters has never yielded me more than half a dozen shells of either species; a single haul off Clare Island in July, 1909, gave me 160 perfect and 108 broken shells of the first species, and another haul off the island in July, 1910, gave me 132 perfect shells of the second. In Clew Bay, too, as in the west generally, *C. reticulatum* attains to a far finer development than in Dublin. Specimens dredged off Scotch Bonnet in 1910 were fully 16 mm. ( $\frac{5}{8}$  inch) in length, twice the size of my largest Dublin specimen.

#### IV. ARRANGEMENT OF THE LIST.

In the following detailed account of the Clew Bay species I have adopted, as the most convenient for students of Irish distribution, the nomenclature and sequence of Mr. A. R. Nichols' well-known List of the Marine Mollusca of Ireland (Proc. R.I.A., 3rd series, vol. v, 1900). Where the generic name of the list differs from that used in Jeffreys' "British Conchology," I have added Jeffreys' generic name in brackets, together with his specific name where that differs in more than grammatical form from the specific name in the List. In most cases it has not been thought necessary to give the depth of the various dredgings in which the species were taken. Only the number of dredgings and their range in depth are given. Thus, "taken in 10 dredgings, 2-19 f." indicates that a species was dredged in 2 f. and in 19 f., and in 8 other hauls at intermediate depths. As a help in estimating the relative frequency and degree of development of the various species within the area, details are given rather freely as to the number and maximum size of the specimens taken, the measurements being in millimetres of, say, 25 to the English inch. The capital letters, W., M., or E., affixed to the name of a species in the present list, indicate the divisions of the area in which that species was found to occur. The western division, W., includes the shores of Clare Island and the waters within half a mile of them, where several dredgings were made off the harbour and Granuaile's Castle in 5 f., and one off Light-house Cove in 10 f. The eastern division, E., includes all the shores of the mainland from Roonah Quay to the southern opening of Achill Sound,

as well as the shores of the drift islands and the channels between them. The middle division, M., includes the open waters of Clew Bay outside the limits of W. and E. In the list the word 'shell' means 'empty shell.'

In concluding this introduction I wish to make special acknowledgment to Mr. A. R. Nichols, of the National Museum, for the valuable assistance he has given me in the determination of many critical species, and for the courtesy with which he has at all times granted me access to the museum cabinets of Irish marine mollusca. I have also to thank Mr. G. P. Farran and Miss A. L. Massy, of the Irish Fisheries Branch, for the communication of several interesting notes on the "Helga's" Clew Bay dredgings.

#### V. LIST OF SPECIES.

##### Class CEPHALOPODA.

##### Order DIBRANCHIATA.

- Eledone cirrhosa** (Lamarck). M. E. Rare? Clew Bay (Dublin Museum) *Nichols* 1900; Westport (Miss M. Ball) *Thompson*, '56.
- Sepiola atlantica** d'Orbigny. M. Rare? Taken in 2 dredgings in the bay in from 13 to 20 f. '09, a total of 3 specimens.
- S. scandica** Steenstrup (*S. Rondeleti*). M. Rare: a single specimen taken in 18 f., '09.
- Loligo media** (Linné). M. Frequent: trawled 4 times in the bay, 1909 and 1910, in from 16–20 f., a total of 13 specimens.

##### Class AMPHINEURA.

##### Order POLYPLACOPHORA.

- Acanthochites fascicularis** Linné (*Chiton*). W. F. Rare: under stones in several places on the E. and S. of the island, '09 and '10, usually occurring singly, but 3 were taken in one gathering at Portarriv. One specimen at Blind Sound, Achillbeg, and 2 living specimens dredged in the bay, one in 8 f., the other in 10 f.
- Hanleya mendicaria** (Mighels). (*Chiton Hanleyi*.) E. One specimen on a dead shell in 5 f., Inishlyre Roads.
- Lepidopleurus cancellatus** (G. B. Sowerby, jun.). (*Chiton*.) W. One specimen 4.5 mm. long off Granuaile's Castle, '09, and another in the same station, '10.
- L. onyx** (Spengler). (*Chiton cinereus*.) W. M. E. Frequent on dead shells in dredgings in from 5–18 f.

- Trachydermon cinereus** (Linné). (*Chiton marginatus*.) W. E. Occasional under stones on the E. and S. shores of the island, also at Old Head, Dorinish, and Blind Sound.
- Callochiton laevis** (Montagu). (*Chiton*.) E. Rare: One specimen under a stone at low tide, outer shore of Dorinish, '10. Clew Bay (Thompson MS.), *Nichols*, 1900.
- Tonicella rubra** (Linné). (*Chiton*.) W. M. E. Rare. Valves in 5 f. off the Castle, Clare Is., '09; one living specimen in about 6 f. in the bay, '09, and another at low water, Dorinish, '10.

Class **GASTEROPODA.**

## Order PROSOBRANCHIATA.

- Acmaea virginea** (Müller). (*Tectura*.) W. M. E. Common. Living on stones at low water, Clare Island, and on the eastern shores of the bay, at Annagh Is., Dorinish, &c. Dead shells common in 18 dredgings, 4-19 f., as many as 95 having been taken in one haul off Mulranny.
- Patella vulgata** Linné. W. E. Common in all suitable stations on the shores of the island and the bay.
- Var. **depressa** Pennant. Frequent in rock-pools, Clare Island.
- Helcion pellucidum** (Linné). W. M. E. Occasional, living, between tide-marks on the island and on the eastern bay shores; shells frequent in dredgings 5-18 f., living in 10 f. and in 18 f.
- Var. **laevis** Pennant. Common and of large size on *Laminaria* roots. Specimens 29 mm. × 22 mm. were frequently seen round the kelp ovens on the southern shores of the island.
- Fissurella graeca** (Linné). W. M. E. Frequent, living, between tide-marks on the eastern shores at Dorinish, Inishimmel, and Annagh Is. A specimen from the last station measured 28.5 mm. × 19 mm. In 6 dredgings off the island and in the bay, 4-19 f.; living in 6 f.
- Emarginula fissura** (Linné). W. M. Frequent; in 4 dredgings 5-19 f.; 1 to 18 shells in a haul; living at 6 f.
- Cyclostrema serpuloides** (Montagu). M. E. Not infrequent. Dredged 5 times, 2-19 f.
- C. nitens** (Philippi). W. M. E. Rare? Taken in 4 dredgings, 4-19 f., a total of 12 specimens. Living in 4 f. off Inishlyre.
- Trochocochlea lineata** (Da Costa). (*Trochus*.) E. Abundant and well-grown near high-water mark on the shores of the outer islands and promontories of the east coast, as at Bartra, Scotch Bonnet, and Dorinish, also at the S. E. extremity of Curraun Achill. Specimens taken at

Dorinish were fully 25 mm. in length and breadth. Quite absent from the shores of the inner islands and from the muddy creeks and channels, the species apparently thriving only in pure open-sea water; yet no trace of it could be found on the shores of Clare Island, though carefully searched for.

- Gibbula magus** (Linné). (*Trochus*.) W. E. Abundant, living, and of large size, in the channels amongst the eastern islands in from 2-5 f. on muddy or "coral" bottoms. Especially fine in Inishlyre Roads, where examples up to 30 mm. in diameter were frequently dredged. Very rare in the deeper and purer waters of the open bay, where it was but once taken, a single shell in 10 f.
- G. cineraria** (Linné). (*Trochus*.) W. M. E. Common between tide-marks; frequent in dredgings, 2-12 f., but of small size in depths greater than 5 f.
- G. tumida** (Montagu). (*Trochus*.) W. M. E. Frequent. In 5 dredgings, 4-19 f.; rare in the shallower water, but abundant in the 19 f. haul.
- G. umbilicata** (Montagu). (*Trochus*.) W. E. Very common between tide-marks; absent from all dredgings.
- Circulus striatus** (Philippi). (*Trochus Duminyi*.) W. M. Rare. Twice dredged in 1910, 3 shells in 10 f. off Light-house Cove, July 26th, and 1 shell in 19 f. in mid-bay, August 17th. The largest of the 4 perfect shells taken measured almost 3.5 mm. in diameter. Clew Bay is but the fifth Irish station on record for this rare species.
- Calliostoma Montagni** (W. Wood). (*Trochus Montacuti*.) M. Rare: twice dredged, once in 15 f. and again in 19 f., a total of 8 shells.
- C. miliare** (Brocchi). (*Trochus millegranus*.) M. Rare: one juvenile shell taken in 10 f., and 2 others in 19 f.
- C. zizyphinum** (Linné). (*Trochus*.) W. M. E. Frequent, living, between tide-marks: occasional in dredgings, 10-19 f.
- Phasianella pullus** (Linné). W. M. E. Frequent in dredgings, 2-19 f. Living at low water, Clare Island, and in 5 f. off the Castle. A more brilliantly coloured shell there than on the Dublin coast.
- Scalaria clathratula** (G. Adams). W. M. Rare: 2 shells dredged in 10f., and 6 in 19 f.
- S. Trevelyana** Leach. M. Rare: a single shell taken in each of two dredgings, 1 in 16 f., the other in 19 f.
- S. communis** Lamarck. W. M. E. Frequent, living, at low tide amongst the inner islands, as at Annagh Island, Inishimmel, &c.; whole or broken shells in small numbers in dredgings off the island and in the bay in 5-19 f.

- Cioniscus unica** (Montagu). (*Aclis*). E. Rare: two shells in 5 f. off Inishlyre.
- Aclis ascaris** (Turton). M. Rare: 7 shells dredged in 10 f., and 6 in 19 f.
- A. supranitida** (S. V. Wood). M. Rare: 3 shells dredged, 1 in 16 f. and 2 in from 5½–11 f., the largest 5 mm. in length.
- Paludestrina stagnalis** (Basterot). (*Hydrobia ulvae* Pennant.) E. Swarming in still brackish waters amongst the inner islands, notably at Annagh Island, where hundreds were seen floating foot upwards and drifting before the wind on sunny pools. The dead shells form a conspicuous creamy band at high water along the beach at Mulranny. Abundant in dredgings off Inishlyre at 2 f. and at 4 f.
- Lunatia catena** (Da Costa). (*Natica*.) M. ? E. Rare? One shell on the beach at Annagh Island. Not identified in any of the 52 dredgings made, though some very small immature shells occurring at 10 f. may perhaps belong to this species.
- L. Alderi** (Forbes). (*Natica*.) W. M. E. Frequent, living and dead, in from 4–19 f.
- Lamellaria perspicua** (Linné). W. M. E. Occasional. One living at low water, Portlea, Clare Island, and another in 5 f. off Granuaile's Castle; 1 living in 4 f. off Inishlyre; 1 shell in 10 f. off Light-house Cove, and 2 in the bay, 1 in 11 f., the other in 14 f.
- Capulus hungaricus** Linné. W. M. Rare: in 3 dredgings, 2–19 f., a total of 4 immature shells.
- Homalogyra rota** (Forbes & Hanley). E. Rare: 2 shells in drift material from rock-pockets, Dorinish, 1910.
- Littorina obtusata** Linné. }  
**L. littorea** Linné. } W. E. Common in all suitable stations.
- L. neritoides** (Linné). W. Abundant in many stations on the E. and S. of the island on shaded rock-faces or in rock-clefts, associated with *L. rudis* and often several feet above high-water mark; also amongst *Lichina* with *Lasaea rubra* and *Turtonia minuta*. Specimens fully 6 mm. in length were taken on cliff-faces south of Granuaile's Castle. Not seen on the eastern bay shores.
- L. rudis** (Maton). W. M. E. Common in all suitable stations.  
 Var. **jugosa** Montagu. Frequent, living, at low water Portlea, Clare Island, also dredged in 19 f. in the bay, 14 shells.  
 Var. **tenebrosa** Montagu. Abundant in muddy creeks and channels, Annagh Island.
- Lacuna puteolus** (Turton). W. E. Rare: One shell at Annagh Island, another in 4 f. off Inishlyre, and a third in 10 f. off Light-house Cove.



- Lacuna pallidula** (Da Costa), var. **patula** Thorpe. W. M. Rare? A few shells in 19 f. in the bay, and 1 in 10 f. off Light-house Cove; living at low water, Portlea, Clare Island.
- L. divaricata** Fabricius. W. M. E. Swarming between tide-marks on the island and bay shores, especially on *Ulva latissima*. Frequent in dredgings, 2–19 f.
- Alvania carinata** (Da Costa). (*Rissoa striatula*.) W. M. Rare: taken in 4 dredgings in from 5 f., off the Castle, to 19 f., in mid-bay, a total of 10 perfect and 9 broken shells.
- A. cancellata** Da Costa. (*Rissoa*.) M. Rare: one shell in 10 f. and 4 shells and 3 fragments in 19 f.
- A. reticulata** (Montagu). (*Rissoa*.) W. M. E. Common: taken in 8 dredgings, 2–19 f. As many as 259 shells, several of them 3.5 mm. in length, were taken in one haul in 5 f. off Inishlyre.
- A. punctura** (Montagu). (*Rissoa*.) W. M. E. Common: taken in 10 dredgings, 2–19 f., and abundantly in many, e.g., 419 shells in 10 f. off Light-house Cove, 246 in 11 f., and 203 in 19 f. in mid-bay.
- Manzonia zetlandica** (Montagu). (*Rissoa*.) M. Rare: a single shell dredged in the bay in 19 f.
- M. costata** (Adams). (*Rissoa*.) W. M. E. Common: taken in 12 dredgings, 2–19 f., and often in large numbers. A haul in 10 f. off Light-house Cove yielded 493 shells.
- Zippora membranacea** (Adams). (*Rissoa*.) M. E. Rare? Taken in 2 dredgings, 1 living specimen in 5 f., Inishlyre Roads, and 6 shells in 19 f. in mid-bay.
- Persephone violacea** (Desmarest). (*Rissoa*.) W. E. Frequent: a total of 33 shells was taken in 6 dredgings, 2–10 f.
- Rissoa parva** (Da Costa). W. M. E. Common: living between tide-marks all round the shores of the bay; shells in greater or less quantity in almost all dredgings, 2–19 f. The numerical proportions of the type and of var. *interrupta* varied greatly in different dredgings, although in the littoral zone of the island the variety was markedly predominant, occurring in swarms round the roots of *Cystoseira ericoides*. A 5 f. haul off Granuaile's Castle in 1909 gave 1,015 of the variety to 500 of the type, while a haul off Mulranny in from 5½ to 11 f. gave 46 of the variety to 177 of the type. Many living specimens dredged in 5 f. off the Castle were thickly encrusted with a coralline growth, probably a species of *Melobesia*.
- R. inconspicua** Alder. W. M. E. Frequent, taken in 7 hauls, 2–19 f., a total of 55 specimens, many living in 5 f. off Inishlyre,

- Onoba striata** (Adams). (*Rissoa*.) W. M. E. -Frequent: living between tide-marks; shells taken, occasionally in abundance, in 14 hauls, 2-19 f.
- Ceratia proxima** (Alder). (*Rissoa*.) M. Rare: in 3 dredgings in 11 f., 14 f., and 19 f., a total of 5 shells.
- Cingula obtusa** (Cantraine). (*Rissoa soluta*.) W. M. Locally abundant: taken in 3 dredgings, 10-19 f., a total of 72 shells. One living specimen between tide-marks at Portkilly, Clare Island.
- C. semistriata** (Montagu). (*Rissoa*.) W. M. E. Frequent and locally abundant; taken in 11 dredgings, 2-19 f., as many as 159 shells yielded by 1 haul in 10 f. off Light-house Cove; living in 5 f., Inishlyre Roads.
- C. trifasciata** (Adams). (*Rissoa cingillus*.) W. E. Rare? Twice dredged off the island, once in 5 f. and again in 10 f., a total of 8 shells. Frequent, living, at low water, Portlea, Clare Island (G. P. Farran); sparingly between tide-marks at Achill Sound (R. Welch), at Annagh Island, and at Mulranny.
- Barleeia rubra** (Montagu). W. Locally abundant; 75 perfect and 14 broken shells taken in 5 f. off the Castle, '09, and 4 shells in 10 f. off Light-house Cove, '10.
- Skenea planorbis** (Fabricius). W. E. Frequent, but nowhere abundant, at low-water mark, Clare Island; also at Annagh Island. Dredged in 10 f. off Light-house Cove, 3 shells.
- Jeffreysia diaphana** (Alder). W. E. Rare? One living example taken in 4 f., Inishlyre Roads, 1910. Sixteen living at low tide, Portlea, Clare Island, August, 1910 (G. P. Farran).
- Adeorbis subcarinatus** (Montagu). W. M. E. Locally abundant: taken in 8 dredgings, 2-19 f., sometimes in large numbers, 106 shells having been counted in a dredging in 10 f. off Light-house Cove.
- Bittium reticulatum** (Da Costa). (*Cerithium*.) W. M. E. Frequent, living, between tide-marks, Clare Island, common in dredgings; taken 15 times, 2-19 f. One haul off the Castle in 5 f. gave 160 perfect and 108 broken shells. Abundant and of large size in the Westport channel, where examples fully 16 mm. in length were dredged off the Scotch Bonnet in 2 f.
- Triforis perversa** (Linné). (*Cerithium*.) W. M. E. Common, though rather less so than the preceding species. Dredged 8 times, 4-19 f. One 5 f. haul off the Castle, Clare Island, gave 26 perfect and 101 broken shells; another in 10 f. off Light-house Cove gave 132 perfect shells, of which 3 measured 7 mm. in length.
- Cerithiopsis tubercularis** (Montagu). W. M. Frequent: dredged 4 times, 5-19 f., a total of 37 shells.

- Turritella communis** Risso. (*T. terebra*.) W.M.E. Common on oozy bottoms in the shallow waters along the eastern shores of the bay; rare in the west. Dredged 14 times, 2–20 f., one haul in 4 f. off Inishgowla giving as many as 118 shells. Found living in hundreds at low water on a *Zostera* bed off Annagh Island in May, 1910, many specimens fully 50 mm. in length; one living example dredged in 20 f. in the bay.
- Caecum trachea** (Montagu). W. M. E. Very frequent: dredged 6 times, 4–19 f., a total of 123 shells, of which 64 were taken in a single haul in 10 f. off Light-house Cove.
- C. glabrum** (Montagu). W. M. E. Very frequent: dredged 7 times, 2–19 f., a total of 180 shells, the greatest number in any one haul being 102 taken in 19 f. in mid-bay. The largest shell was slightly over 2 mm. long.
- Chenopus pes-pelecani** (Linné). (*Aporrhais*.) M. Apparently rare: a few shells taken in 4 dredgings, 7–16 f.; living in 7 f.
- Trivia europaea** (Montagu). (*Cypraea*.) W. M. E. Occasional, living, at low-water mark on E. and S. shores of island, and frequent at Annagh Island; occasional in 6 dredgings, 2–19 f.
- Erato laevis** (Donovan). (*Marginella*.) W. Rare: 4 juvenile shells dredged in 10 f. off Light-house Cove.
- Eulima subulata** (Donovan). M. Frequent: taken in 8 dredgings, 6–20 f., a total of 45 specimens; living at 6 f., 10 f., and 14 f. One haul off Mulranny in from 5½–11 f. yielded 22 specimens.
- E. bilineata** Alder. W. M. Rare: 3 shells dredged, one in 5 f. off the Castle, another in 10 f. off Light-house Cove, and a third in mid-bay in 19 f.
- E. polita** (Linné). W. M. Frequent: dredged 6 times, 5–19 f., a total of 3 living specimens, 30 perfect, and 84 broken shells. Living in one haul in from 5½–11 f.
- E. incurva** (Renier). (*E. distorta*.) W. M. E. Rather rare: taken in 5 hauls, 5–19 f., a total of 15 shells. Living in 19 f.
- Jordaniella nivosa** (Montagu). (*Odostomia*.) M. Rare: 3 fresh shells dredged in 14 f. 2 miles N. E. of Old Head, 1910.
- Odostomia unidentata** (Montagu). W. M. E. Rather rare: 6 shells in 10 f. off Light-house Cove, 7 in 11 f. and 1 in 19 f. in the bay, and 2 in 4 f. off Inishlyre.
- O. plicata** (Montagu). W. E. Rare: 3 shells in 10 f. off Light-house Cove, and 2 shells at low-water mark, Dorinish.
- O. acuta** Jeffreys. W. M. E. Rare: dredged 3 times: 1 shell in 10 f. off Light-house Cove, another in 19 f. in the bay, and 4 others in 5 f., Inishlyre.

- Odostomia conspicua* Alder. W. Rare: one mature but not quite perfect shell, 5.5 mm. in length, dredged in 10 f. off Light-house Cove, 1910. An addition to Marine Province V. Irish records for this species, the largest of the true *Odostomias*, are very few, the present making only the fourth.
- O. conoidea* (Brocchi). M. Rare: twice dredged in the bay, 2 shells in 16 f. and 6 in 19 f., the largest 4.5 mm. in length.
- Brachystomia pallida* (Montagu). (*Odostomia*.) M. E. Rare: taken in 2 dredgings, 1 shell in 10 f. in the bay, and 4 in 5 f. in Inishlyre Roads.
- B. rissoidea* (Hanley). (*Odostomia*.) W. Rare: 5 shells in 10 f. off Light-house Cove.
- Liostoma clavula* (Lovén). (*Odostomia*.) M. Rare: 1 shell dredged in 14 f. in the bay, 1910.
- Ondina diaphana* (Jeffreys). (*Odostomia*.) M. Rare: a single shell dredged in the bay in a haul in from 10-12 f., 1910.
- O. divisa* (J. Adams). (*Odostomia insculpta*.) W. M. E. Rather rare: taken in 4 dredgings, 5-19 f., and in a shore-gathering at Dorinish, a total of 27 shells.
- Pyrgulina decussata* (Montagu). (*Odostomia*.) W. M. E. Not infrequent: dredged 4 times, 5-19 f., a total of 42 shells, as many as 24 in one haul in 5 f. off Inishlyre.
- P. spiralis* (Montagu). (*Odostomia*.) W. M. E. Frequent in 4 dredgings, 2-19 f., a total of 144 shells, of which 78 were taken in a 10 f. haul off Light-house Cove.
- P. interstincta* (Montagu). (*Odostomia*.) W. M. Rare: in 2 dredgings only, 1 shell in 10 f., and 3 in 19 f.
- P. indistincta* (Montagu). (*Odostomia*.) W. M. Frequent in 4 dredgings 6-19 f., a total of 77 shells.
- P. scalaris* (Philippi). (*Odostomia*.) W. M. Rare: 4 shells taken in 10 f. off Light-house Cove, and 2 juvenile shells and a fragment in 10 f. in the bay. The largest of the 6 examples taken of this rare and beautifully sculptured shell measured 5 mm. in length.
- P. interrupta* (Totten). (*Odostomia rufa* var. *fulvocincta*.) W. M. E. Rather rare: in 3 hauls, 6-19 f., a total of 16 shells. Also taken living at low tide at Annagh Island and at Inishimmel, a single specimen in each station. The largest of the 16 shells taken was 11 mm. long.
- Turbonilla lactea* (Linné). (*Odostomia*.) M. E. Not infrequent: a total of 14 shells taken in 3 hauls in the bay, 5-19 f., and 19 shells in drift-material at Dorinish.
- Eulimella acicula* (Philippi). (*Odostomia*.) M. Rather rare: dredged 3 times, 10-19 f., a total of 18 shells, the largest 5 mm. long.

- Eulimella nitidissima** (Montagu). (*Odostomia*.) M. E. Rare: only 2 shells taken, one in 2 f. off Inishlyre, the other in 19 f. in mid-bay.
- Trophon muricatus** (Montagu). M. Rare: in one dredging only in 10 f. off Old Head, 2 shells.
- Ocenebra erinacea** (Linné). (*Murex*.) E. Frequent: living at low tide on the shores of the eastern islands, as Annagh Is. and Dorinish; not seen in Clare Is., and only once taken in dredging, a single shell in 5 f. off Inishlyre.
- Purpura lapillus** (Linné). W. E. Common in all suitable stations.
- Nassa reticulata** (Linné). W. M. E. Rather common: in 8 dredgings, 5–16 f.; living in abundance in 5 f., and frequent at low tide round the shores of the eastern islands.
- N. incrassata** (Ström). W. M. E. Common: living at low-water mark on the shores of Clare Is., and of the eastern islands; shells taken in 9 dredgings, 2–8 f.
- Buccinum undatum** (Linné). W. M. E. Frequent, living, at low water; shells frequent in dredgings, 5–10 f.
- Clathurella linearis** (Montagu). (*Defrancia*.) M. E. Frequent: dredged 6 times, 5–19 f., a total of 72 shells. Living in 5 f. off Inishlyre.
- C. purpurea** (Montagu). (*Defrancia*.) M. E. Very rare; one mature broken shell dredged in the bay in 19 f.
- Mangilia striolata** (Scacchi). (*Pleurotoma*.) W. M. E. Rather rare: dredged 5 times, 4–19 f., a total of 18 shells, 9 of these in one haul in 19 f. The largest shell was 12 mm. long.
- M. attenuata** (Montagu). (*Pleurotoma*.) M. Rare: one shell at 16 f., and 2 others at 20 f. One dead specimen, Clew Bay: *Nichols*, 1900.
- M. costata** (Donovan). (*Pleurotoma*.) W. M. E. Common: dredged 6 times, 5–19 f., 179 shells in all. Living in 5 f. off Inishlyre.
- M. brachystoma** (Philippi). (*Pleurotoma*.) M. Rare: one shell taken in 16 f. and 7 in 19 f.
- M. nebula** (Montagu). (*Pleurotoma*.) W. M. Frequent: dredged 8 times 5–19 f., 53 shells in all. Living at 10 f. and at 19 f.
- Haedropleura septangularis** (Montagu). (*Pleurotoma*.) W. M. E. Rare: in 3 dredgings, 5–10 f., 8 shells, the largest 16·5 mm. long.
- Bela rufa** (Montagu). (*Pleurotoma*.) W. M. E. Rare: dredged 4 times, 2–19 f., a total of 7 shells.
- B. turricula** (Montagu). (*Pleurotoma*.) E. Rare: in 4 dredgings amongst the eastern islands in from 2–5 f., 5 shells taken.

## Order OPISTHOBRANCHIATA.

## Sub-Order TECTIBRANCHIATA.

- Actaeon tornatilis* Linné). W. M. Rather rare: in 4 dredgings, 6-19 f. 10 shells, chiefly juveniles.
- Tornatina obtusa* (Montagu). (*Utriculus*.) M. E. Rather rare: dredged 4 times, 2-19 f., 32 shells, of which 4 belonged to Var. *lajonkairiana* Basterot.
- T. mammillata* (Philippi). (*Utriculus*.) W. M. Frequent: dredged 4 times, 5-19 f., a total of 84 shells, of which 55 were taken in a 19 f. haul. Living in 5 f. off Granuaile's Castle.
- T. truncatula* (Bruguère). (*Utriculus*.) W. M. E. Common: in 3 dredgings, 2-19 f., 377 shells, of which 261 were taken in one haul in 10 f. off Light-house Cove.
- Cylichna umbilicata* (Montagu). (*Cylichna*.) W. M. E. Common: dredged 12 times, 2-19 f., also taken in shore-gatherings at Dorinish, a total of 216 shells, of which 80 were taken in a 19 f. haul in mid-bay, and 48 in a 10 f. haul off Light-house Cove. One example of the Var. *conulus* Jeffreys was taken in 11 f.
- C. nitidula* (Lovén). (*Cylichna*.) M. Rare: 3 shells taken in tow-net on dredge in 14 f., 2 miles N. E. of Old Head. New to the shallow-water region of Marine Province V., the only other record being one from 183 fathoms.
- Volvulella acuminata* Bruguère. (*Cylichna*.) M. Rare: taken in 4 hauls in the bay, 10-19 f., a total of 12 shells and a fragment. Three of the shells measured 3 mm. in length, two 3.5 mm., and one nearly 4 mm. In Irish waters this rare shell appears to occur usually in but small numbers.
- Scaphander lignarius* Linné. M. Rare? only once taken, a single shell in 19 f.
- Bulinella cylindracea* (Pennant). (*Cylichna*.) W. M. Frequent: dredged 9 times, 5-19 f. 42 shells in all, the largest 12.5 mm. long.
- Diaphana hyalina* (Turton). (*Utriculus*.) W. M. E. Rather rare: taken in 5 dredgings, 4-11 f., 16 shells in all.
- Bulla utriculus* Brocchi. M. Rare: only once taken, 4 shells in 19 f.
- B. hydatis* Linné. E. Westport, Clew Bay. one specimen (Thompson MS.): Nichols, 1900.
- Acera bullata* Müller. E. Rare: One large living specimen dredged in 5 f. off Inishlyre, July, 1900. In 3 fathoms, Clew Bay: Forbes, '53.

- Philine aperta** Linné. W. M. E. Local. Very fine specimens, one fully 60 mm. long, were taken drifting in with the flowing tide off Annagh Island in May, 1910; also taken, living, in 4 dredgings in the bay, 6–16 f.
- P. scabra** (Müller). W. M. Rare: 4 shells taken, one in each of 4 hauls in from 10–14 f.
- P. catena** (Montagu). W. M. Rare: dredged 4 times, 10–19 f., 8 shells in all.
- P. quadrata** (S. Wood). } M. Both very rare, only one shell of each species  
**P. punctata** (Clark). } taken in a haul off Mulranny in from 5½–11 f.
- Limacina retroversa** (Fleming). (*Spirialis*.) W. M. Rare. The delicate shells of this pelagic species which are occasionally cast up in large quantities on the western shores of Ireland, occurred sparingly, but in perfect condition, in 2 dredgings, 8 shells in 14 f. in mid-bay, and 2 in 10 f. off Light-house Cove.
- Aplysia punctata** Cuvier. W. M. Rare? One specimen taken in 7 f. off Granuaile's Castle, August, '09; 6 larger specimens, closer inshore off the Castle, in July, 1910; and 1 in 11 f. in the bay in August, 1910.
- Pleurobranchus plumula** (Montagu). W. E. Occasional at low water under stones; 2 specimens at Portkilly, Clare Island, 1 at Scotch Bonnet, and a fourth at Inishimmel.
- Runcina coronata** (Quatrefages). (*R. Hancocki*.) W. Local. Some thick slabs of *Lithophyllum incrustans* taken from low-tide rock-pools at Portarriv, Clare Island, on the 22nd July, 1910, and left over night in a dish of sea-water in the laboratory, yielded 16 specimens of this species when examined next morning. *Runcina* probably occurs all round the Irish coasts. It is now on record for Dublin, for Valentia Harbour, and for Inishbofin, in addition to the above Clare Island station.

## Sub-Order ASCOGLOSSA.

- Hermæa bifida** (Montagu). W. Very rare: one living specimen 9 mm. in length was taken by Mr. A. D. Cotton in July, 1909, in a low-tide pool near the Castle, Clare Island. The general colour of this specimen was so deep a chocolate as almost to obliterate the dendroid markings.
- H. dendritica** (Ald. and Hanc.). W. Abundant at low-water mark all round the S. and E. coasts of Clare Island, as at Portkilly, Portarriv, Portlea, &c., July 22nd–24th, 1910, always occurring on *Codium tomentosum*, and so closely assimilating in colour with the varied tones of green assumed by the seaweed as almost to defy detection. The presence of the animal was usually betrayed by the creamy spawn-clusters deposited chiefly round the base of the main stems. No less than 93

specimens were found living on two medium-sized plants of *Codium* taken from rock-pools at low tide, Portarriv, and plants from Portkilly, Portlea, and other stations were hardly less productive. The largest specimen taken measured 6 mm. in length.

The species spawned freely in the laboratory on the island two days after capture, and many of the spawn-clusters were much more convoluted than those shown in Alder and Hancock's plate ("Monog. Brit. Nudibr. Moll. '), fully 6 coils being counted in one cluster.

**Elysia viridis** Montagu. W. Almost as abundant on the island as the preceding species and occurring about low-water mark in the same stations on the S. and E. shores. Occasionally found on *Cystoseira ericoides*, but much more frequently and abundantly on *Codium tomentosum*, with the colour of which it assimilates almost as closely as does *Hermaea dendritica*. The largest specimen taken was 1 inch long.

The brown variety *olivacea* occurred near Carrignapartan.

**Limapontia capitata** Müller. W. E. Rare? In stagnant rock-pools near high-water mark, always on the green seaweed *Cladophora sericea* Kütz. In two stations on Clare Island, at Portarriv in July, 1909, and at Portkilly in August, 1910, one specimen in the first station and 12 in the second. Also taken in a similar station at Old Head on the mainland in July, 1909, when 25 specimens were picked out of one small tuft of *Cladophora*. The Old Head specimens were but 1 millimetre in length; those taken at Portkilly were almost 3 millimetres.

**Actaeonia Cocksii** Ald. and Hanc. (*Cenia Cocksii* Ald. and Hanc.). W. Rare: Four specimens were taken along with *Limapontia* on *Cladophora sericea* in rock-pools at Portarriv, Clare Island, July 20, 1910. On a first examination in the laboratory on the island the head showed the short, blunt appendages relied on by Alder and Hancock (Ann. & Mag. Nat. Hist., 2nd Ser., i, p. 403) as the chief distinctive character of their *Actaeonia corrugata*, and the specimens were accordingly so named. Two months later, however, I became convinced that they were really referable to *Actaeonia Cocksii*, first described, named, and figured as *Cenia Cocksii* by Alder and Hancock (*loc. cit.*, p. 104, Plates XIX and XX).

Two of the four specimens taken at Portarriv lived with me, feeding on *Cladophora*, up to the 3rd November, or for fully two months and a half, and during this period the head-appendages developed into distinct tentacles one-seventh the length of the animal, *i.e.* 0.5 mm. to a body-length of 3.5 mm. The animals agreed in all points with the detailed description of *Cenia Cocksii* given by Sir Charles Eliot in his Supple-



ment (Ray Soc., 1910) to Alder and Hancock's Monograph of the Nudibranchs, and the crystalline point of the verge which he failed to trace in his Millport specimen was obvious in the Portarriv examples, and agreed precisely with Alder and Hancock's figure (*loc. cit.*, Pl. XX, fig. 6).

The particulars, none of them of any great importance, in which the Clare Island Actaeonia differed from Alder and Hancock's description and plate, were the absence of any distinct lateral ridge, the greater prominence of the visceral hump, and the irregularity of the pale lateral markings, which formed rather a longitudinal series of yellow blotches than a regular line of tubercular spots. The heart-beats were clearly visible through the light-coloured visceral hump, numbering from 50 to 60 per minute, and so vigorous as to set up a distinct rhythmic alteration in the outline of the hump.

In captivity, the Clare Island Actaeonias deposited three spawn-clusters irregularly oval in shape, with from 3 to 12 large eggs, about 0.5 mm. in their longest diameter. The nuclei were bright orange and immersed in a milky envelope which became perfectly clear in the later stages of development. In one of the clusters the eggs within about 14 days from extrusion developed so far as to show the eye-spots distinctly in the revolving larvae, though the larvae did not succeed in breaking free from the egg. No sign of a shell or of any veliger structure appeared at any stage of the development, which, so far, agreed with Pelseener's account of the development of *Cenia Cocksii*.

Sir C. Eliot (*loc. cit.*, pp. 143 & 177) expresses doubts as to the distinctness of *Cenia Cocksii* from *Actaeonia corrugata*. I would hazard the suggestion that *A. corrugata* is but an immature stage of *Cenia Cocksii*, with nascent tentacles. In any case, I am satisfied that most of my Co. Dublin records for *A. corrugata* (*Ir. Nat.*, 1908, pp. 112; 1909, pp. 169 & 174) should be referred to the present species, *A. Cocksii*, which is new to our Irish fauna, though not an addition to it if it be really identical with the already recorded *A. corrugata*.

#### Sub-Order NUDIBRANCHIATA.

- Aeolis papillosa** (Linné). W. E. Frequent: two specimens at low water, Portarriv, Clare Island, July, 1910; 10 specimens, many spawning, at low water, Inishshimmel, May 10th, 1910.
- A. glauca** Ald. and Hanc. W. Rare: one specimen trawled by the "Helga" in the bay in from 13-16 f., May, 1909 (G. P. Farran).

- Galvina picta** (Ald. and Hanc.). (*Eolis*.) W. Rare: one specimen on a Laminaria root trawled in from 17-19 f. in the bay, May, 1909 (G. P. Farran).
- Favorinus albus** (Ald. and Hanc.). (*Eolis*.) W. Rare: 3 specimens, 20 mm. long, were dredged in 5 f. off Granuaile's Castle, July, 1910. The long anterior tentacular-like processes of the foot, described and figured as pointing backwards in Alder and Hancock's Monograph, were found to be quite mobile in these Clare Island specimens and pointed as freely forwards as backwards.
- Facelina coronata** (Forbes and Goodsir). (*Eolis*.) W.E. Frequent: 2 specimens at low water, Portlea, Clare Island (R. Ll. Praeger), several specimens on the outer shore of Dorinish.
- Doto fragilis** Forbes. M.? Clew Bay, Co. Mayo (W. Thompson): *Ald. and Hanc.*, 1851.
- Archidoris tuberculata** (Cuvier). (*Doris*.) W.E. Frequent under stones at low-water mark on the E. and S. shores of the island and on the shores of Annagh Island and Inishimmel. Most of the specimens taken were pure yellow; a few only were mottled with brown and pink.
- Jorunna Johnstoni** (Ald. and Hanc.). (*Doris*.) W. A single specimen 1 inch in length was taken in a rock-pool at Portlea, July, 1910.
- Cadlina obvelata** (Müller). (*Doris repanda*.) E. Frequent under stones at low-water mark, Annagh Island, Scotch Bonnet, and Inishimmel, May, 1910, the largest 1 inch in length.
- Rostanga coccinea** (Ald. & Hanc.). (*Doris*.) W. Rare. Three specimens of this brilliantly coloured Dorid were taken by Mr. A. D. Cotton on a red sponge at low water, Carrick-na-partan, Clare Island, July 20, 1909. One of these spawned in the laboratory two days after it had been taken, the spawn-coil being a broad band, nearly five times the length of the animal, in which the cream-coloured eggs were thinly and irregularly scattered. A fourth specimen was taken by Miss Jane Stephens in July, 1910, near Granuaile's Castle, on the red sponge *Ophilitaspongia seriata*.
- Triopa claviger** Müller. W.E. Rare. One specimen was taken at Portarriv in July, 1910, by Miss Mary Shaw, and another at Dorinish in May of the same year by Miss Jane Stephens.
- Polycera quadrilineata** (Müller). W. Rare? Two living specimens 12 mm. long were taken in a dredging in 5 f. off the harbour, Clare Island, in July, 1909. In addition to the characteristic orange lineations on the body, these examples were marked by longitudinal rows of black spots, and no doubt belong to Var. *a* of Alder's arrangement of the Nudibranchs in Jeffreys' "British Conchology," v., p. 75.

- Acanthodoris pilosa** (Müller). (*Doris*.) W. Rare? One specimen was taken in Clare Island harbour in April, 1909 (J. B. Butler).
- Lamellidoris bilamellata** (Linné). (*Doris*.) E. Three specimens were found under stones at low water, Inishimmel, May, 1910.
- Goniodoris nodosa** (Montagu). W. E. Frequent: 4 specimens dredged in 5 f. off the harbour, Clare Island, 1 taken at low water near Portlea (G. P. Farran), 1 at low water, Annagh Island (Miss J. Stephens), and 4 at low water at the south-west end of Curraun Achill.
- Thecacera pennigera** (Montagu). W. Rare. On the 24th July, 1910, while examining in the laboratory, Clare Island, a basin full of red seaweed (*Plocamium*), part of the material dredged the day before by Mr. Praeger and myself from a depth of 5 f. off Granuaile's Castle, I had the good fortune to detect a single specimen of this rare species. Though hardly  $\frac{1}{2}$  inch long, the vivid orange and black colouring of the animal immediately betrayed it as it emerged from the weed and crawled up the side of the basin. Comparison on the spot with the description and the admirable plate in Alder and Hancock's Monograph, placed beyond question the identity of the specimen with *Thecacera pennigera*. In addition to the large clavate processes behind the branchiae, the Clare Island specimen, preserved in spirit, showed directly in front of the branchiæ a semicircle of 8 small bead-like tubercles, a feature not mentioned by Alder and Hancock, and not apparent in the living animal.

Class **SCAPHOPODA.**

- Dentalium vulgare** Da Costa. (*D. turentinum*.) W. M. E. Frequent: taken in 8 hauls, 5-19 f., a total of 23 living specimens, 40 perfect, and 12 broken shells, the largest 38 mm. long. In one haul in 5 f. off the harbour, Clare Island, 10 living specimens were taken.
- D. entalis** Linné. M. Rare: a total of 7 living specimens taken in the bay, 1 in 11 f., 3 in 13 f., 1 in 18 f., and 2 in 19 f., the largest 40 mm. long. The relative frequency of the two species of *Dentalium* in the Clew Bay area is precisely the reverse of what obtains in the Dublin marine area, where *D. vulgare* is quite rare.

Class **PELECYPODA.**Order **PROTOBRANCHIATA.**

- Nucula nucleus** (Linné). W. M. E. Abundant, living, and of large size, on muddy bottoms in shallow water, 2-5 f. in the eastern parts of the area; valves frequent off the island and in the bay, 5-19 f. Living specimens dredged off Inishlyre measured 13 mm.  $\times$  11 mm.

*Nucula nitida* G. B. Sowerby. W. M. Local: taken in 6 dredgings, 8-19 f., but occurring in 4 of these only as single valves. Living, 21 specimens, in 8 f., and 1 in 19 f.

Order FILIBRANCHIATA.

*Anomia ephippium* Linné. W. M. E. Common, living, all round the shores of the bay; immature valves frequent in almost all dredgings from 4-19 f. At low water on the inner shores of Dorinish in May, 1910, this species was found to attain to a large size. One living specimen found growing here on the shell of a living *Pecten varius* measured 3 inches (76 mm.) in its longest diameter; many others reached to fully  $2\frac{1}{2}$  inches (64 mm.).

*A. patelliformis* Linné. E. Rare? Under stones at low water, Annagh Island R. Ll. Praeger): probably frequent, but overlooked.

*Arca tetragona* Poli. W. M. Rare. A living specimen measuring 19 mm.  $\times$  11 mm. was found by Miss Stephens in a rock-pool at Portarriv, July, 1910, embedded in a thick slab of *Lithophyllum incrustans* and associated with *Saxicava rugosa* and *Killia suborbicularis*. Valves to the number of 20 were taken in 5 dredgings, 8-19 f.

*Pectunculus glycimeris* (Linné). W. M. Frequent: in 5 dredgings, 5-21 f., a total of 12 living specimens and 10 valves. Living in 3 hauls in from  $5\frac{1}{2}$ -21 f. Of 6 living specimens taken in one of these hauls, 4 exceeded 60 mm. in their longest diameter and one measured 68 mm.  $\times$  67 mm.

*Mytilus edulis* Linné. W. M. E. Common all round the bay; valves dredged in from 8-21 f.

*Modiolus adriaticus* (Lamarck). (*Mytilus*.) M. Very rare: in 2 dredgings only, one in 7 f., the other in  $5\frac{1}{2}$ -11 f., a total of 3 valves and 2 fragments. The longest valve was 7 mm.  $\times$  4.5 mm.

*M. modiolus* (Linné). (*Mytilus*.) W. M. E. Frequent: living at low water amongst the inner islands and in dredgings in from 1-5 f., but of small size for the species, the largest taken (on Laminaria roots off Annagh Island) measuring only 63 mm. Valves occasional in the bay in from 8-19 f. and small living specimens here and there on the E. and S. shores off the island.

A living specimen dredged in about 2 f. off Annagh Island contained a living egg-bearing female of the Pea Crab (*Pinnotheres Pisum*) with a carapace measuring 7.5 mm.

*M. barbatus* (Linné). (*Mytilus*.) E. Common, living, and of large size, at low water on stones and on bivalve shells amongst the inner islands, as at Annagh Island, Scotch Bonnet, Dorinish, and Inishimmel. Large

masses of living specimens, some 64 mm. long, attached to *Laminaria* roots were dredged in  $1\frac{1}{2}$  f. off Annagh Island. In from 3–10 f. among weeds, Clew Bay: *Forbes* '53.

**Modiolus phaseolinus** (Philippi). (*Mytilus*.) W. M. E. Rare: in 4 hauls, 5–10 f., a total of 1 living specimen (in 8 f.), 1 pair of valves, and 7 single valves, all juveniles of small size, the largest hardly more than 1 mm. long. Mature examples of this species appear to be quite rare. The largest specimen I have taken on the Dublin coast, where it is not uncommon in shore gatherings, scarcely exceeded 1.5 mm. in length.

**Modiolaria marmorata** (Forbes). W. M. E. Rather rare. Living between tide-marks, Portlea, Clare Island, and in 5 f. off the Castle and off Inishlyre; valves occasional in dredgings, 8–15 f. Some of the Inishlyre specimens were of large size, one measuring 17 mm. × 9 mm.

**M. discors** (Linné). W. E. Frequent, living in 5 f. off the harbour, Clare Island, and in 2–5 f. in the Westport Channel; occasional between tide-marks.

**M. costulata** (Risso). M. Six living specimens dredged in 10 f. in the bay, May, 1909 (communicated by Miss A. L. Massy).

#### Order PSEUDOLAMELLIBRANCHIATA.

**Ostraea edulis** Linné. M. E. Valves of the Oyster occurred frequently on the shores of the inner islands and were dredged in the bay in large numbers in 6 hauls, 16–19 f. The oyster is found, too, in a living state, either native or the remains of older cultivation, in the shallow channels amongst the inner islands.

**Pecten pusio** (Linné). M. Rare? In 5 dredgings, 5–16 f., 1 living and 5 perfect and 5 broken valves.

**P. varius** (Linné). W. M. E. This is the characteristic *Pecten* of the inner islands. Living examples of large size are abundant on the shores of Annagh Island, Dorinish, Scotch Bonnet, Inishlyre, &c., and frequent in dredgings here amongst the muddy channels in from 2–5 f. A specimen dredged off Scotch Bonnet in May, 1910, measured 60 mm. × 54 mm. Valves were taken in 6 dredgings in the open bay, 8–19 f.

**P. opercularis** (Linné). W. M. E. Frequent: valves taken in 12 dredgings, 2–19 f., the largest 57 mm. in breadth. Living in 2 f. and in 16 f.

**P. maximus** (Linné). M. E. Local. Living and well-grown specimens were found to be abundant in May, 1910, in a shallow bay on muddy bottom between Dorinish and Inishimmel. They were visible here from our boat at low water on a calm day, and were easily fished up with an oar. Valves occasional in 4 dredgings in the bay, 10–16 f.

*Pecten tigerinus* Müller. M. Rare: dredged 4 times, 10-20 f., 1 living specimen (18 f.) and 6 valves, the largest 24 mm. × 22.5 mm.

Var. *costata* Jeffreys. A single valve dredged in the bay.

*Lima Loscombi* G. B. Sowerby. M. Very rare: a single fresh valve 7.5 mm. × 5 mm. was dredged in 10 f. about 1½ mile N.E. of Old Head, August, 1910.

Order EULAMELLIBRANCHIATA.

*Astarte sulcata* (Da Costa). M. Rare: only 2 valves taken, one in 16 f. and the other in 20 f. This is quite a rare species in the shallow waters of West Ireland, though off the Dublin coast it is frequent, living, even at a depth of no more than 8 f.

*A. triangularis* (Montagu). W. M. E. Common off the island in 5 f. and in 10 f.; frequent in the bay, and rare amongst the inner islands, where it was taken, sparingly, in only one dredging off Inishlyre. A total of 252 paired valves, many with the living animal, was taken in 9 dredgings in from 5-19 f., the largest specimen 2.5 mm. Living at 5 f., 10 f., 15 f., and 19 f. A single haul in 5 f. off Granuaile's Castle yielded 181 paired and 60 single valves.

*Arctica islandica* Linné. (*Cyprina*.) M. Not infrequent. Taken in 6 hauls in the bay, 10-25 f., a total of 13 valves and 1 pair of juvenile valves. Large valves 102 mm. in breadth were taken in 10 f. and 16 f. in mid-bay.

Shells of this species are so rarely cast up on our western shores, and records of their occurrence there in shallow waters are so few, that the species has come to be regarded as quite rare on the Irish west coast. Further research will probably show that it is really frequent on the west, though nowhere so common there as on our east coast or inhabiting such shallow water.

*Lucina spinifera* (Montagu). M. Rare: one small valve in 13 f. and another in 20 f.

*L. borealis* (Linné). W. M. E. Common, both living and dead, on the sandy eastern shores of the bay and in dredgings, 2-25 f., the dredged specimens being usually juvenile. Valves gathered on the beach at Belclare were 41.5 mm. in breadth.

*Axinus flexuosus* (Montagu). M. E. Frequent and locally abundant: taken in 10 hauls, 2-19 f., the largest valve measuring 12 mm. × 11 mm. A living specimen was taken in 10 f. in the bay.

*Diplodonta rotundata* (Montagu). M. Frequent and locally abundant in the bay. Taken in 8 hauls, 10-19 f., a total of 97 valves, one 24 mm. and several 23 mm. in breadth. A haul in 19 f. gave 57 valves, another in 16 f., 33 valves; but no living specimen was taken, though many of the valves were quite fresh and several juvenile.

- Montacuta ferruginosa** (Montagu). W. M. Frequent: dredged 9 times, 5–19 f., valves only, which were taken in large numbers in 8 f. and in 14 f. The largest valve was 8 mm. in breadth.
- M. substriata** (Montagu). M. Very rare: one valve taken in 19 f.
- M. bidentata** (Montagu). W. M. E. Common; taken in 12 hauls, 2–19 f., living in 6 of these, in 2 f., 4 f., 10 f., 14 f., 16 f., and 19 f. Valves very abundant in many hauls.
- Turtonia minuta** (Fabricius). W. M. Frequent on the E. and S. shores of Clare Island on rocks amongst *Lichina* and the variety *incurvata* of the Common Mussel; also in rock-pools on *Cladophora* and *Enteromorpha*. Valves occasional in dredgings 8–14 f.
- Kellia suborbicularis** (Montagu). W. M. E. Very frequent embedded in *Lithophyllum incrustans* Fosl. in rock-pools on the E. and S. shores of Clare Island, usually in association with *Saxicava*; occasional at low water, Dorinish and Scotch Bonnet, and dredged, living and dead, in 11 hauls, 4–19 f. The largest specimen taken, a living one from 15 f., measured 9 mm. × 8 mm.
- Lasaea rubra** (Montagu). W. M. E. Abundant on rocks amongst *Lichina* and dwarf Mussels on the E. and S. shores of Clare Island, and occasional at Annagh Island. A few valves and pairs of valves were taken in 3 dredgings, 8–19 f.
- Lepton squamosum** (Montagu). M. E. This species is widespread and apparently not rare in the Clew Bay area. The beautifully sculptured valves occurred in 5 dredgings made in 1910 in from 2–19 f. In no case was a living specimen obtained; but the majority of the 22 valves taken were quite fresh; many of them were juvenile, and one had attached to it a portion of the animal. The largest valve measured 11 mm. × 8.5 mm.

Details of the 5 dredgings are as follows: off Scotch Bonnet, 2 f., 1 valve; off Inishlyre, 4 f., 1 valve; in the bay, in 16 f., 6 valves and 2 fragments, in 10 f., 7 valves, and in 19 f., 7 valves and 2 fragments.

- L. nitidum** Turton. W. M. Not infrequent: taken in 3 dredgings, 10–19 f., in 1910, a total of 3 live specimens, 24 single valves and 1 pair of valves, the largest (Var. *convexa* and the type) measuring 2 mm.

The following are details of the 3 dredgings:—

In mid-bay, 19 f. 1 living specimen of type, 5 valves of Var. *convexa* Alder., and 1 valve of Var. *lincolata* Jeffreys.

In 10–12 f., 1½ mile N.E. of Old Head, 1 live specimen and 10 valves of type, 1 live specimen and 8 valves of Var. *convexa*.

Off Light-house Cove, in 10 f., a pair of valves of Var. *convexa*.

- Tellina crassa** Pennant. W. M. E. Rare: dredged 4 times, 5-21 f., a total of 5 living specimens and 5 valves. Living at 10 f. and at 21 f.
- T. balthica** Linné. E. Abundant, living and dead, in muddy creeks at Annagh Island and Mulranny; also on a muddy sand beach on Curraun Achill, opposite Cloghmore.
- T. squalida** Pulteney. M. E. Rare: several valves on the beach north of Annagh Island, and a few at Curraun Achill, opposite Cloghmore. In 3 hauls in the bay, 7-15 f., a total of 7 valves.
- T. tenuis** Da Costa. W. M. E. Rare? Taken in 5 hauls, 5-16 f., 2 to 4 valves in a haul; also a few valves on the beach at Mulranny and at Old Head.
- T. fabula** Gronovius. M. E. Local: valves abundant off Mulranny in from  $5\frac{1}{2}$ -11 f., and occasional in 2 other dredgings in the bay in 7 f. and in 19 f. A few valves on the beach, Annagh Island.
- T. donacina** Linné. W. M. Common: taken in 11 hauls, 5-19 f., and living at 5 f., 10 f., 14 f. and 15 f., a total of 10 living specimens, 6 paired valves, and 100 single valves.
- T. pusilla** Philippi. M. Rare. Nine valves were taken in a haul off Mulranny in from  $5\frac{1}{2}$ -11 f. in May, 1909, and 1 living specimen in the bay in 19 f., August, 1910.
- Scrobicularia piperata** (Gmelin). E. Abundant in muddy creeks and on muddy shores at Annagh Island, at Mulranny, and at the S. W. extremity of Curraun Achill.
- Syndosyma alba** W. Wood. (*Scrobicularia*.) W. M. E. Frequent. Taken in 10 hauls, 2-19 $\frac{1}{2}$  f.; living on muddy bottom in from 2-4 f. off Inishlyre and Inishgowla.
- S. nitida** (Müller). (*Scrobicularia*.) M. Very rare; one valve and 2 fragments taken in 14 f. in the bay.
- S. prismatica** (Müller). (*Scrobicularia*.) W. M. Rare: dredged 6 times 7-16 f., a total of 3 living specimens (10 f. and 14 f.), and 14 valves.
- Donax vittatus** (Da Costa). E. Rare? a few valves, only, taken in two shore collectings at Old Head and at Mulranny; absent from all dredgings. The rarity of this shell in the Clew Bay area contrasts strikingly with its profusion on the Co. Dublin shores.
- Mactra solida** Linné. W. M. E. Frequent: taken in 8 hauls, 2-19 f., living at 5 f., 15 f., and 19 f. The Var. *elliptica* was the prevalent form.
- M. subtruncata** (Da Costa). M. E. Frequent: dredged 8 times, 2-19 $\frac{1}{2}$  f.; living at 2 f., 8 f., and 13 f.; valves occasional on the beaches at Old Head and Belclare.



- Mactra stultorum** Linné. W. M. E. Rather rare: in 5 hauls, 7–15½ f., a total of 10 valves and 2 live specimens (in 10 f. and in 14 f.).
- Gouldia minima** (Montagu). (*Circe*.) W. M. E. Rather rare: dredged 5 times, 5–19 f., a total of 15 valves, of which 9 were taken in 19 f. The largest valve was 11 mm. in diameter.
- Dosinia exoleta** (Linné). (*Venus*.) W. M. E. Wide-spread and locally abundant: taken in 8 dredgings, 2–19 f., and living at 14 f., 15 f., and 19 f. Valves frequent on the beaches at Belclare and Annagh Island.
- D. lincta** (Pulteney). (*Venus*.) W. M. More generally diffused than the preceding species. Dredged 12 times, 5–25½ f.; living in 19 f.
- Venus verrucosa** Linné. E. Very rare. Absent from all dredgings, only 2 valves taken in shore gatherings, one at Annagh Island, the other near the S. W. extremity of Curraun Achill.
- V. casina** Linné. M. E. Rare: a total of 7 valves taken, 4 on the beach at Annagh Island, 2 in 2 f. off Scotch Bonnet, and 1 in 19 f. in the bay.
- V. fasciata** Da Costa. W. M. E. Common: dredged 12 times, 2–21 f., living at 2 f., 5 f., 10 f., and 19 f.
- V. gallina** Linné. W. M. E. Common: taken in 15 hauls, 2–20 f., living at 2 f., 10 f., 14 f., 15 f., and 19 f. The Var. *laminosa* (Montagu) was twice taken, in 8 f. and (living) in 19 f.
- V. ovata** Pennant. W. M. E. Common: in 14 hauls, 2–19 f., living at 2 f., 4 f., 5 f., 8 f., and 10 f.
- Lucinopsis undata** (Pennant). W. M. Rare: dredged 3 times, 5–19 f., a total of 4 valves.
- Tapes virgineus** (Linné). M. E. Very frequent: taken in 5 hauls, 2–19 f., both living and dead. Valves on the beaches at Annagh Island, Belclare, &c.
- T. geographicus** (Chemnitz). (*T. pullastra*.) W. E. Rather rare: sparingly at Portlea, Clare Island (Var. *perforans*), and valves not infrequent on the shore at Old Head, Annagh Island, Belclare, and Curraun Achill.
- T. decussatus** (Linné). E. Valves frequent in dredgings off Inishlyre in 5 f.; very common on the shore at Annagh Island and Belclare, and occasional at Curraun Achill.
- T. aureus** (Gmelin). E. Very frequent: a characteristic species of the inner islands. Living at low water, Dorinish, Annagh Island, &c., and living and dead in dredgings off Scotch Bonnet and Inishlyre in from 2–5 f. The largest shell taken measured 37 mm. × 32 mm. Clew Bay in from 3 to 10 f.: *Forbes*, '53.
- Venerupis irus** (Linné). W. Rare: twice dredged off Clare Island, once in 5 f. (2 fragments) and again in 10 f., 2 valves,

- Cardium echinatum* Linné. M. E. Not infrequent: a total of 20 valves taken in 4 hauls, 10-19 f., and a few others gathered on the beaches at Annagh Island and Mulranny.
- C. exiguum* Gmelin. E. A characteristic species of the inner muddy shores and channels, living specimens and valves being frequent in 2 f. off Scotch Bonnet, in 4 f. off Inishgowla, and in 2-5 f. off Inishlyre. Valves frequent on the shores near Old Head, at Belclare, at Annagh Island, and at Dorinish, living specimens occurring also at low water in the two last-mentioned stations. The largest valve taken measured 26 mm × 13 mm. Dredged in Clew Bay, weedy ground, in from 3 to 10 fathoms: *Forbes*, '53.
- C. fasciatum* Montagu. W. M. Frequent: dredged 7 times, 5-19 f., living in 5 f., 10 f., and 19 f. Valves were taken in large numbers at 10 f. and at 14 f.
- C. nodosum* Turton. W. M. E. Rather common: taken in 11 hauls, 2-19 f., a total of 21 living specimens and 150 valves. Living at 2 f., 4 f., 5 f., and 10 f. Common among weed in from 3 to 10 f., Clew Bay: *Forbes*, '53.
- C. edule* Linné. W. M. E. Rather rare? Valves occasional on the shore at Portarriv, Clare Island, and not infrequent on the mainland shores at Old Head, Belclare, Annagh Island, Mulranny, and Curraun Achill. Valves occasional in dredgings in from 2-5 f.
- C. norvegicum* Spengler. W. M. E. Frequent: dredged 6 times, 4-19 f., a total of 3 living specimens and 11 valves. Living at 4 f., 7 f., and 15 f. Two valves dredged in 19 f. measured 63 mm. in length and breadth.
- Psammobia ferroensis* Chemnitz. M. Valves frequent in the bay in 6 hauls, 7-19 f., and occasional on the beach at Annagh Island.
- P. tellinella* Lamarck. W. M. Frequent: dredged 7 times, 5-21 f., a total of 3 living specimens, 3 paired and 20 single valves. Living off Clare Island in 5 f. and in 10 f.
- P. vespertina* (Chemnitz). E. Rare: a pair of valves in 5 f., Inishlyre Roads, 2 valves in 2 f. off Scotch Bonnet, and 1 valve on the beach at Annagh Island.
- Mya arenaria* Linné. E. Local: valves only, on the muddy shore at Annagh Island.
- M. truncata* Linné. M. E. Rather rare: valves occasional on the beaches at Belclare, Annagh Island, and Curraun Achill.
- Corbula gibba* (Olivi). W. M. E. Very common: taken in 17 hauls, 2-20 f., the valves in profusion in many hauls, and living specimens occurring at 2 f., 8 f., 11 f., 14 f., 16 f., and 19 f.
- Lutraria elliptica* Lamarck. W. M. E. Not infrequent: valves in 5 hauls, 2-19 f.

- Solen pellucidus** Pennant. M. Rather rare: dredged 4 times, 8–19 f. living at 13 f., and 19 f., a total of 18 valves, 2 pairs, and 2 living specimens, the largest valve 28·5 mm. in breadth.
- S. ensis** Linné. W. M. Rather rare: perfect or broken valves taken at 5 f., 8 f., and 13 f., together with one living example in the 8 f. haul.
- S. siliqua** Linné. W. M. E. Frequent: several living specimens in a haul in 11–19 f. and broken valves in 8 dredgings, 8–19 f. Valves occasional on the beaches at Old Head and Belclare.
- Saxicavella plicata** (Montagu). (*Panopaea*.) M. Rare: twice dredged in Clew Bay from a mile and a half to two miles off Old Head, in August, 1910, 1 valve and a pair of valves in 14 f. and 1 valve in from 10–12 f. The largest valve taken measured 7·5 mm. × 4·5 mm.
- Saxicava rugosa** (Linné). W. M. E. Common between tide-marks and in dredgings. Living examples of large size were frequent in low-tide rock-pools on Clare Island, associated with *Kellia suborbicularis* and deeply embedded in *Lithophyllum incrustans*. Taken in 15 dredgings, 2–19 f., and living at 5 f., 16 f., and 18 f. The characteristic borings in limestone were, however, only twice observed—once in loose boulders on the outer shore of Dorinish with dead shells, and again, with 6 living specimens, in a dredging in from 5½–11 f. off Mulranny.
- Var. **arctica**. Valves frequent in 10 f. and in 19 f.
- Cochlodesma praetenu** (Pulteney). (*Thracia*.) W. M. E. Frequent and locally abundant. Dredged 10 times, 2–19 f., single or paired valves, the largest (in 19 f.) measuring 25 mm. × 17 mm. In one haul, off Mulranny, in from 5½–11 f., 41 valves were taken.
- Thracia papyracea** (Poli). W. M. E. Frequent and locally abundant: taken in 8 hauls, 5–19 f. One haul off Mulranny in 5½–11 f. yielded one living example and 218 valves, many up to 22 mm. in breadth.
- T. distorta** (Montagu). W. M. E. Rare: dredged 5 times, 5–14 f. a total of 2 paired and 4 single valves.

## VI. BIBLIOGRAPHY.

In the strict sense of the term, there is no bibliography of the Clew Bay marine mollusca, since the only published references to the subject are to be found in general works not dealing specially with the Clew Bay area. For the purpose of this list a few records have been extracted from the following works, after the names of which are added in brackets the contracted titles used for them in the present list. The "British Conchology" of Jeffreys does not appear to yield any additional Clew Bay Records.

ALDER (Joshua) and Albany HANCOCK :

A Monograph of the British Nudibranchiate Mollusca. Ray Soc., 1845-1855. (*Ald. and Hanc.*, 1851.)

FORBES (Edward) and Sylvanus HANLEY :

A History of British Mollusca and their Shells. 4 vols. 1853. (*Forbes*, '53.)

THOMPSON (William) :

The Natural History of Ireland, vol. iv. 1856. (*Thompson*, '56.)

NICHOLS (A. R.) :

A List of the Marine Mollusca of Ireland. Proc. R. I. Acad., 3rd Ser., vol. v, pp. 477-662, 1900. (*Nichols*, 1900.)

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LAND AND FRESH-WATER MOLLUSCA.

BY ARTHUR WILSON STELFOX.

PLATES I, II.

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1. INTRODUCTION.

CARPENTER<sup>1</sup> and Praeger,<sup>2</sup> as well as other writers, have pointed out the interest attached to the intermingling and overlapping of northern and southern—Arctic and Lusitanian—species along the west coast of Ireland.

This is well exemplified in the Mollusca, though it is sometimes difficult to decide to which group a particular species should be referred, owing to the wide range in western Europe that some of these have obtained. *Geomalacus maculosus*, *Helicella itala*, *H. barbara*, *Helix aspersa*, *Pupa anglica*,<sup>3</sup> and *P. cylindracea* are typical southerners and reach their most northerly stations in the Britannic area. *Zonitoides nitidus*, *Planorbis glaber*,<sup>4</sup> *Vertigo lilljeborgi*, and *Pisidium lilljeborgi* may be taken as typical of the northern group, the majority of which are partially circumpolar in their distribution or have close

<sup>1</sup> The mingling of the North and the South. Irish Nat., v, 57-68. 1896.

<sup>2</sup> A Tourist's Flora of the West of Ireland. 1909.

<sup>3</sup> *Pupa anglica* has often been spoken of as a "northern" species, from its frequently inhabiting the northern faces of the cliffs and similar shady habitats, &c. It is, however, a typical Lusitanian and occurs from St. Kilda, off the west coast of Scotland, to Algeria in north Africa, and has its nearest allies on the Atlantic Islands.

<sup>4</sup> *Planorbis glaber* occurs from northern Europe to the Atlantic Islands and appears to be replaced in Arctic Europe by *P. arcticus*, in Siberia by *P. sibiricus*, and in North America by *P. parvus*.

allies in North America or Siberia. These two groups together comprise what I shall refer to afterwards as the "western" fauna.

Some of the western species appear to have formerly occupied a much greater area than they now inhabit, and they have probably been replaced by a newer fauna from the east in all but the most isolated districts of western Europe. The migration of others would appear to have been aided by a continuous coast-line from the Iberian peninsula northwards during the period of their dispersal. Some of the former have been preserved by the mountains and other places of retreat on the mainland of the Continent, but the British archipelago has served as a retreat for several species which otherwise would have been exterminated ere long.

The land and fresh-water Mollusca of Ireland may be roughly divided into two groups, namely, "western" and "eastern." These terms are used since they briefly express the distribution of the species in western Europe, although in Ireland the eastern group is rather "central," while the western element is frequently dominant in parts other than in the west. Thus the greater part of the fauna of Wicklow is distinctly "western."

In parts of Ireland separated by natural barriers from the central limestone plain it is usual to find almost identical molluscan faunas. Thus, that of north-west Donegal does not differ essentially from that of south-west Kerry, the west division of Cork, or parts of Wicklow. The greater part of the ground included in the Clare Island Survey is isolated from the central plain, but it embraces in the Castlebar and Clew Bay districts western extensions of the limestone area. Hence the list of the land and fresh-water mollusks of the district is considerably greater than otherwise would have been the case. That some of the species included in this list have inhabited this country since pre-Glacial times, there is, I think, sufficient evidence. The apparent lack of this evidence in the case of others belonging to the eastern group tends, in my opinion, to throw considerable doubt upon the supposed pre-Glacial arrival of this part of the fauna. If it be true that we have species of pre-Glacial and others of post-Glacial arrival, it would be expected that some of the more widely distributed species would have reached us during both periods. It is therefore interesting to find that some of these present two forms or races with different geographical ranges in Ireland, the one corresponding with that of species of the western group, while the other resembles the distribution of the eastern fauna.

When the country has been closely re-surveyed, and we have expunged from our lists all records founded upon specimens collected in gardens, towns, or other similar situations, where there is the slightest possibility of their having been introduced by man; and when the marls containing fresh-water



species, which in many districts underlie our peat-bogs, have been scientifically examined, we shall be in a better position to discuss the probable time of the arrival in Ireland of species of the eastern group. In several cases where the pre-peat marls have been examined, the species contained in them present a more western facies than that of the fauna now living in the district. One of the characteristic species of these marls, in certain districts, is *Planorbis glaber*, which at the present day has a distinctly anti-central or "western" range in Ireland. Species with such a range are often referred to as "calci-fuge," but, in the case of the Mollusca, I think this term is hardly applicable. The western species do not appear to object to the presence of lime, yet evidently they have been unable to maintain their position upon the limestone areas, probably owing to increased competition in these favourable districts.

The nomenclature which is employed throughout this report is that given in the "List of the Land and Fresh-water Mollusks of Ireland" (Proc. of R.I. Acad., xxix, Section B, No. 3. 1911). All the records given for the *Pisidia* are founded upon specimens verified by Mr. B. B. Woodward, to whom I tender my most sincere thanks for his invaluable kindness in identifying specimens sent to him.

The area dealt with, as will be seen by the accompanying map (fig. 1), is probably more extensive than that covered by most workers on the Survey. It includes, besides Clare Island and the adjacent mainland from Belmullet to Killary, Achill Island, the Bills of Achill, Inishturk, Inishbofin, and Caher Island, and extends as far inland as Castlebar. The greater part of this area belongs to West Mayo according to Praeger's division of Ireland.<sup>1</sup> Inishbofin, however, is in West Galway.

## 2. FIELD-WORK.

Until the commencement of the Clare Island Survey only one paper dealing solely with the Mollusca of West Mayo had been published. I refer to that by J. G. Milne (4), which deals mainly with the Mollusca found by him on Achill Island in 1891. Some collecting by Miss A. L. Massy, P. H. Grierson, G. P. Farran, and R. J. Welch had, however, brought the list of species for this division at the commencement of this Survey up to fifty-three. When the "Irish List" (18) was published in 1910, this number had increased to eighty-eight; since then no further additions have been made.

During the preparation of the present report I have spent fifty days in the district, viz., 8th till 16th April, and 4th till 16th September, in 1909;

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<sup>1</sup> Irish Topographical Botany. 1901.

24th March till 3rd April, in 1910; and 15th July till 1st August, in 1911. Twelve days were spent in actual field-work on Clare Island; six and a half on Achill; four hours on Caher Island; two days on Inishturk; three and a half days on Inishbofin; one day in The Mullet; five in Erris; six and a half around Clew Bay and at Castlebar; five in the Louisburgh district; and four in work upon the mountains of the mainland. In September, 1909, I had the assistance of the late Dr. G. W. Chaster, Messrs. E. Collier, J. Napier Milne, and R. J. Welch, and a great amount of work was accomplished during this visit. Mr. Welch spent 10 days in the district in June, 1910, principally on Clare Island, and has handed me his notes made during that trip. Throughout the period of the Survey I have received considerable assistance from various workers, in the way of information as to likely ground for shells, as well as specimens; among these I may mention F. Balfour Browne, G. P. Farran, Nevin H. Foster, H. Wallis Kew, D. McArdle, and R. Ll. Praeger.

To those acquainted with the district, the above time-schedule will show how much filling-in work remains to be done. That this work will add greatly to the list of species found in any of the sub-districts, I doubt, as most of my work has been done in the choicest bits of each district, these having been carefully selected from the Ordnance maps previous to each visit.

The Mullet and Erris, however, may still yield surprises; while a complete survey of the lakes and rivers of the Clew Bay and Castlebar areas will prove interesting.

In the detailed reports to be found below, it may seem that I have given useless and unnecessary notes. As, however, there is a probability that, at some future time, this district will be re-surveyed, my aim has been to give those who will be in charge of this second survey as much information as possible, in order that any changes which may have taken place between now and then may be the more easily observed.

### 3. THE SUB-DIVISION OF THE DISTRICT.

Each island naturally forms a district in itself, no matter how small it may be in area. In dividing the mainland into districts, I have tried to show contrasts, rather than similarities. These sub-divisions, it will be seen, are five in number, namely—The Mullet; Erris; Louisburgh; Clew Bay and Castlebar; and the mountains of Curraun, Croaghpatrick, and Mweelrea above 500 feet altitude.

The Mullet consists of the peninsula known by that name westward of the canal at the town of Belmullet. Erris includes the strip of land between sea-level and the 500-foot contour-line south of Broadhaven and north of the Clew

Bay and Castlebar district. Louisburgh includes a similar strip south of Clew Bay and between the mountains of Croaghpatrick and Mweelrea and the sea. The Clew Bay and Castlebar district consists of that portion of the limestone area of West Mayo, or areas influenced by limestone Boulder-clays, from Mulranny and Old Head harbour round Clew Bay, and it extends as far inland as the limits of the vice-county.



FIG 1. c

#### 4. COMPARISON OF THE SUB-DISTRICTS.

A comparison of the different sub-districts into which I have divided the area surveyed is not difficult to make. The islands, except for a stretch of Carboniferous sandstone on Clare Island, are composed mainly of Silurian and metamorphic rocks, so also are the districts of The Mullet, Erris, and Louisburgh. All are for the most part covered with peat, with narrow stretches of

cultivated ground or sand-dunes along the coasts. Fresh-water lakes and pools are numerous, but small and often peaty, except where these lie among the sand-hills, the latter being usually highly calcareous. In Achill Island. The Mullet, and near Louisburgh the coastal lakes form one of the chief topographical features. The Clew Bay and Castlebar division is low-lying and undulating, composed mainly of Carboniferous and metamorphic rocks, which are generally covered with calcareous Glacial drift, in which lakes and waterways are naturally numerous.

As might be expected, the last-mentioned district contains the bulk of the fresh-water mollusca included in the total list, for, although many of these shells are also met with in the Louisburgh district, the fresh-water snails are but poorly represented in the remaining areas. In the case of the slugs and terrestrial shells the contrast between Clew Bay and Castlebar and the other districts is not so strongly evident on paper. Yet the limestone area shelters at least one species, *Pyramidula rupestris*, which is absent from the other districts. On the other hand, *Zonitoides excavatus* appears to be absent from the limestone area, but perhaps occurs in some unworked corner of it, where the metamorphic rocks are exposed or where non-calcareous Boulder-clay overlies the Carboniferous rocks. Along the southern shores of Clew Bay, between Belclare and Murrisk, the maximum contrast is to be observed between the "calcicole"<sup>1</sup> and "calcifuge"<sup>1</sup> fauna. At this point, known as the Deer-park, the mountain slopes almost to the sea-shore and is covered in places with a dense tangle of native scrub, with intervening stretches of heath-land, while between the base of the mountain and the sea there extends a narrow flat belt of calcareous Boulder-clay lying upon the Carboniferous limestone. The road from Westport to Louisburgh runs along the base of the hilly ground, and the wall along its southern side forms the actual boundary between the limestone and non-calcareous areas. Upon this wall we find such a characteristic calcicole plant as *Ceterach officinarum*, and the mollusk *Pyramidula rupestris*, while five yards up the hillside the prevailing flora is a calcifuge one, consisting largely of *Calluna vulgaris* and *Erica cinerea*, with patches of Hazel, Holly, and Birch wood. Among this scrub, *Z. excavatus* is common, associated with shade-loving, but not necessarily calcifuge species, such as *Hygromia fusca*, *Acanthinula lamellata*, and *Acicula lineata*.

Upon the mainland twenty species have been found which are as yet unknown from any of the adjoining islands. These are mainly fresh-water species, and ones which have a central and eastern range in Ireland and a southern distribution in Great Britain. In the following lists those records which are founded on doubtfully native specimens are not considered.

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<sup>1</sup> I use these terms for want of better.

LIST OF SPECIES FOUND ON THE MAINLAND AS YET UNKNOWN FROM THE ISLANDS.

<i>Limax maximus.</i>	<i>Physa fontinalis.</i>
<i>Pyramidula rupestris.</i>	<i>Aplecta hypnorum.</i>
<i>Vertigo angustior.</i>	<i>Paludestrina ventrosa.</i>
<i>Succinea putris.</i>	<i>P. jenkinsi.</i>
<i>S. oblonga.</i>	<i>Bithynia tentaculata.</i>
<i>Phytia myosotis.</i>	<i>Valvata cristata.</i>
<i>Limnaea stagnalis.</i>	<i>Neritina fluviatilis.</i>
<i>Planorbis albus.</i>	<i>Margaritana margaritifera.</i>
<i>P. contortus.</i>	<i>Anodonta cygnea.</i>
<i>P. fontanus.</i>	<i>Sphaerium corneum.</i>

Four species have been taken on the islands not yet recorded from the mainland:—*Limax cinereo-niger*, *Pupa muscorum* (fossil), *Pisidium steenbuchi*, and *P. hibernicum*. All of these are, of course, known from the mainland in other parts of Ireland.

Four species are known from Clare Island which have not been reported from the other islands:—*Limax cinereo-niger*, *Helicella intersecta*, *Acanthinula lamellata*, and *Valvata piscinalis*.

Six species are recorded for Achill Island not known to occur on the other islands:—*Limnaea auricularia*, *Planorbis glaber*, *Paludestrina stagnalis*, *Pisidium pulchellum*, *P. steenbuchi*, and *P. liljeborgi*.

Three are found on Inishbofin not yet known on any of the other islands:—*Vallonia costata* (fossil), *Pupa muscorum* (fossil), and *Pisidium hibernicum*. Of these three, the first two occurred in the deposit described on p. 51, and have not been found in a living state on Inishbofin.

*Helicella barbara* has been taken on the islands of Achill and Bofin, but not on Clare; *Hygromia fusca* and *Arion circumscriptus* on Clare Island and Achill Island; while *Acanthinula aculeata* has been taken only on Clare Island and in the deposit on Inishbofin. All these species are frequent in the mainland except *H. barbara*, which has been found only upon the sand-dunes of The Mullet.

##### 5. RARE SPECIES FOUND IN THE DISTRICT.

In a group like the land and fresh-water Mollusca, in which so much work has been done in Ireland, there was little expectation of finding any new shells; it was, however, hoped that during the present survey, some of our more local western species might be found to possess a wider distribution

than had been known hitherto. In this we were not disappointed, for *Pisidium hibernicum*, which up to the present year was unknown from any part of the world but West Cork and South Kerry, has been recognized by B. B. Woodward amongst specimens of this genus sent to him for identification.

These examples were taken in Lough Gowlanagower on Inishbofin. Two other species of *Pisidia* found in the district were unknown from Ireland at the time this survey was commenced. These—*P. lilljeborgi* and *P. steenbuchi*—appear to be of ancient origin, and in Ireland are probably most abundant along the west coast, though both are known also from the central plain.

Next in importance to the above discoveries, I regard the finding of numerous forms of *Limnaea pereger*, which show an almost complete gradation between normal Irish specimens and those doubtful species *L. involuta* Harvey and *L. praetenuis* Bowell (see Plate II, figs. 1–39). The anatomy of these West Mayo *Limnaeae* has not yet been examined. When this has been done, I feel sure that the radula or genitalia will show the same liability to vary as the shape, size, and texture of the shell. Before, however, one's opinion upon this delicate subject could carry any weight, it would, in my opinion, be necessary to collect and dissect examples from many different habitats, each season, for a number of years.

The finding of *Limax cinereo-niger* upon Clare Island makes an interesting addition to the molluscan fauna of our western Irish islands; while the presence of *Vertigo angustior* and *Succinea oblonga* upon the mainland at Dooaghtry may be included among the best discoveries made during the survey.

One remarkable feature of the district, worth drawing attention to here, is the luxuriance of the fauna of the sea-cliffs, which on some of the islands proved the chief strongholds of the land mollusca (see Plate I).

That precipitous cliffs, overlooking the western ocean, can shelter a fauna typical of our native woods upon the mainland, is a fact which must be taken into consideration when we are speculating on the means of dispersal of these "specialized" animals.

## 6. THE QUESTION OF DISPERSAL.

The lists of species found on the islands off the western coast of Mayo resemble closely those which may be compiled upon the opposite mainland. To some this fact will tend to confirm the idea that shells are carried across barriers such as the sea by chance means, as by winds, currents, birds, or insects. To others, such as myself, it points to a former connexion with the mainland by land-bridges.

Thus, in the case of Clare Island, the molluscan fauna of parts of the mainland such as Old Head, Dooaghty and Curraun, is so similar to that of the island, that I believe a land-connexion must have existed between these localities during the period when this part of the fauna was dispersed. The geologists engaged upon the Survey are willing to allow that a post-Glacial Boulder-clay land-bridge existed between the island and the mainland. While this probably accounts for the presence on Clare Island of *Hyalinia cellaria*, *Zonitoides nitidus*, *Helicella intersecta*, *H. itala*, *Hygromia hispida*, and *Helix aspersa*, as well as most of the fresh-water species, the arrival of the remainder seems more than likely to have been pre-Glacial. If there existed any place of retreat during the Ice Age on the west coast of Ireland,<sup>1</sup> the great sea-cliff of Croaghmore would strike one as being a most probable refuge; facing, as it does, away from the mainland and towards the temperate waters of the Atlantic, the ice descending from the mainland could not surely have affected the conditions prevailing upon the cliff-face to any great extent.<sup>2</sup>

The hypothesis that shells are carried by birds or insects (see "The Dispersal of Shells," by H. Wallis Kew) is founded mainly upon evidence afforded by the fact that water-beetles, birds, &c., have been found to transport *fresh-water* snails. There has been little evidence to support such a theory of dispersal in the case of the terrestrial species; yet it is a fact that while Clare Island and the other islands included in this survey contain almost all the land-species which, from a study of habitat, would be expected to occur on them, they are singularly deficient in species of the fresh-water group. This does not appear to me to be altogether due to the want of suitable habitats, for the lakes on some of the islands, such as those in Achill, are very similar to those of the Louisburgh district. The latter, however, contain twenty-four fresh-water species, while in the former only fourteen have been found, eight of those from Achill, and six from Louisburgh, being of the genus *Pisidium*, some at least of the members of which are capable of spreading across almost waterless tracts of land (p. 10). *Sphaerium corneum*, which must be considered one of the most likely species to be carried by animals (see H. Wallis Kew, *op. cit.*), is unknown on any of the western islands.

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<sup>1</sup> It is often urged by those who do not believe in the pre-Glacial origin of our fauna and flora that the proximity of glaciers or snow-fields signifies an "Arctic climate," in which only species now regarded as of Arctic origin could live. Many mollusks, however, which are abundant in the west of Ireland, are also common in close proximity to glaciers in western Norway. These are protected during the long, cold winters in the latter country by a thick mantle of snow, a covering which nature seldom provides for our western Irish animals. Thus our winter is perhaps more likely to be injurious to some species than that of semi-glaciated districts such as parts of Norway.

<sup>2</sup> These remarks cannot apply to some of the smaller islands, where no places of retreat are visible. Thus it appears that their molluscan faunas must be of post-Glacial origin.

While many naturalists have sought for means by which shells could be dispersed by chance, few appear to have studied the power of fresh-water species to travel over "dry land," such as from one river-basin to another. It seems probable that during wet weather fresh-water snails may travel considerable distances, aestivate during intervening spells of drought, and proceed once more when rain again falls.<sup>1</sup>

The power of some of these mollusks to live out of water for considerable periods, especially when young, is considerable.<sup>2</sup> From personal observation it seems to me almost certain that such species as some of the more widely distributed *Pisidia*, *Limnaea pereger*, *L. truncatula*, *L. palustris*, *Ancylus fluviatilis*, and *Planorbis spirorbis* would have little difficulty in overcoming most barriers, excepting sea or waterless tracts of land. It is therefore not surprising to find that these species are generally to be met with in the most isolated peninsulas and on the western islands of Ireland. These habitats appear to differ only by the fact that the land-bridges connecting the peninsulas to the mainland are still in existence, while in the case of the islands the connecting links have disappeared.

## 7. INFLUENCE OF MAN UPON THE FAUNA.

In cultivated areas, and more particularly near seaports and towns, man's influence upon the flora of a country is well known. Conchologists, however, have, up to the present time, scarcely studied the effect of man's presence upon the distribution of the mollusca. Thus a shell gathered in a garden, in many cases, has been considered sufficient proof that the species to which it belongs is a native of the area in which the garden is situated.<sup>3</sup>

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<sup>1</sup> Since writing the above, I have received the following notes from Mr. H. Lamont Orr, of Belfast, which confirm the suggestion that some species of fresh-water shells may cross damp areas of "dry land." "When collecting on Black Mountain [Co. Antrim], 600 feet above sea-level, I turned over a stone lying among the grass and rushes, and I was surprised to see the bleached shells of *Pisidia*. Upon further examination I found a considerable number of live *Pisidia*. The situation was a grassy slope, with a gradient of about one in three or one in four, and at no time could have held standing water. I found the living shells at the roots of grass, where the ground was damp, but not splashy. They were full-grown specimens, and must have lived for more than one season." Had a pond been dug in the neighbourhood, and some of these *Pisidia* found by Mr. Orr at the roots of the grass made their way into it, and been subsequently discovered by a conchologist, we should have been asked to believe that here indeed was absolute proof of the carriage of shells by birds, insects, or wind. I myself have taken *Pisidia* in places somewhat similar to Mr. Orr's habitat. Among places where these have occurred to me, I may mention the north-eastern cliffs of Clare Island, the great talus beneath Fair Head in Antrim, and at an altitude of 1,200 feet on the sea-cliffs of Brandon in Kerry.

<sup>2</sup> Young *L. stagnalis* have remained out of water, sealed against the side of a bell-jar, in my house, from June, 1910, till about January, 1911, except upon the occasions when I pushed them back into the water.

<sup>3</sup> See L. E. Adams, *Journal of Conch.*, xiii, 211-214. 1911.



This makes one consider for what reason do we study the range of a particular species? Everyone must answer this question after his own fashion and according to his own view of the subject; nevertheless, most will agree that the final aim of geographical conchologists is to determine the natural range of a species *before man's influence acted upon it*. If this be true, the publication of "garden" records is the greatest barrier which stands between us and our goal.

Gerrard, writing in the sixteenth century, says of a certain plant:—"It groweth upon the mountaines of Germanie: we have great quantitie of it in our London gardens." But although botanists have long ago come to distinguish between "casual," "native," and "naturalized" plants, few conchologists when publishing their local lists have stated whether any of the species included in these are confined to gardens or cultivated ground. In a part of the country such as West Mayo, where man's influence has been so little felt, it is a simpler matter in most cases to separate the natives from the introduced species than in the surroundings of London, Manchester, or other large towns. Because a mollusk is found in a garden it does not necessarily follow that it has been imported by artificial means; yet such a record is quite useless for the purpose of geographical distribution. Thus, in the districts included in the Clare Island Survey, *Limax flavus*, *Milax sowerbyi*, *Arion hortensis*, and *Hygromia rufescens*, having been taken by me only in the neighbourhood of habitations, I do not consider that up to the present they can be considered "native" in West Mayo. On the other hand, we cannot say that they are not "native" in Ireland, nor can we say that they are not "found" in West Mayo. How, then, are we to record their standing? The formula proposed by R. Ll. Praeger in his report on Clare Island Flowering Plants (Part 10 of this series) solves, so far as I can see, this difficult problem. Praeger in this adopts Dunn's definition of a native (S. T. Dunn: Alien Flora of Britain, pp. 9-10). A native species is defined as one living in a natural habitat, which it has reached by natural means from an uncontaminated source. This is designated NNN, while a species, in an artificial habitat, to which it has been brought by artificial means from a contaminated source, is shown by \*\*\*. Between these two we have six sets of conditions, and by these eight combinations of N and \*, the standing of any species may be recorded, according to our own ideas on the subject. In the table at the end of this report I have given the standing of each species, as it appears to me, by means of the above formula.

Were it possible to do this with every record of every species for every division of Ireland, the NNN distribution of some shells, such as *Helix aspersa*, *Milax sowerbyi*, *Limax flavus*, and *Hygromia rufescens*, would differ essentially

from their range in the country as known at present. So many old records would have to be dealt with, however, that before one could accomplish this work an almost complete re-survey of our whole island would be necessary in the case of such species as *Arion hortensis*, or of those just mentioned, all of which live more or less under the "protection" of man. The bulk of our molluscan fauna is, however, composed of "anthropophobes" rather than "anthropophiles"; thus when a re-survey of the country on scientific lines is undertaken, the range of a species such as *Hygromia fusca* or *Acanthinula lamellata*, may be taken as NNN, or at least NN\*.

The latter combination would have to be used where a plantation had taken the place of a native wood, or where introduced trees, such as Fir or Beech, are planted among native trees, thus altering the habitat from a "natural" into an "artificial" one. For purposes of geographical distribution only those species which can be conscientiously recorded as either NNN or NN\* are of the slightest use. Except around Westport, Newport, Mulranny, Louisburgh, and the smaller villages, by roadsides or in the neighbourhood of habitations, man has not affected the mollusca of West Mayo up to the present.<sup>1</sup>

## 8. ANNOTATED LISTS.

### CLARE ISLAND.

Perhaps nowhere in Europe is there a place in which the aboriginal fauna can be studied better than in Clare Island. Man's influence is but little noticed, as neither his cultivation of certain portions of the island nor the close cropping of other parts of it by sheep and cattle, appears to have affected the mollusca to any extent. The reason for this is, I think, that before the historic period the mollusks had been driven to the cliffs by the heavy accumulation of peat on the flatter parts of the island. Here they have dwelt secure, and are still unaffected by the changes that have taken place in the other parts of the island. The partial draining of Lough Avullin may have exterminated some fresh-water species, but no proof of this has been obtained so far. The fresh-water fauna is, however, distinctly poor, and I should have expected to find *Planorbis glaber*, *Aplecta hypnorum*, and

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<sup>1</sup> I have been forwarded by B. Ll. Praeger four shells found in "mud from the boots of Pat Grady on landing on Clare Island from Carrowmore, after two days at Louisburgh, November, 1910." The shells are four in number, two specimens being of *Carychium minimum*, and one each belonging to *Vallonia pulchella* and *Pupa anglica*. All the shells had been dead for a considerable period, and were perhaps wind-blown specimens derived from some of the coastal marshes near Louisburgh. It is scarcely likely that living mollusks thus transported would found a colony, but if nothing more the observation shows the danger of founding records of mollusca upon dead shells.

*Limnaea auricularia* in addition to those species at present on the list. *Valvata piscinalis*—discovered by R. J. Welch in the outlet of L. Avullin—was a surprise, until I remembered that this shell is frequently met with on the western islands of Scotland. This is, however, the only Irish record other than for the mainland. None of the land-shells on the island can be considered unexpected, though the list is more complete than I had hoped for and absentees are few, *Helicella barbara* being the most prominent. Several species on the island are in a somewhat precarious condition and a few unfavourable seasons might accomplish their extinction. Among these *Z. nitidus*, *H. intersecta*, and *L. palustris* stand in the worst position. *H. nemoralis* is still plentiful in places, but does not appear to be thriving—a condition observable on all of these western islands. The remainder appear to be holding their own well, and should exist on the island far into the future. In the case of only two species in the following list is there sufficient evidence to doubt their rank as natives. These—*Arion hortensis* and *Limax maximus*—seem to be confined to the gardens adjoining Mr. McCabe's hotel at the harbour, and they have undoubtedly been imported from the mainland, other obviously imported animals occurring with them. The chief interest from a conchologist's point of view centres round the fauna of the cliffs which almost encircle the island, and the escarpment of Knocknaveen in the interior of it. The cliffs and banks along the southern shore are too dry at certain seasons to shelter a large fauna, but on the series of cliffs facing east and north-east, from Kinnacorra to the light-house, a larger list may be compiled. The cliffs on the north-eastern shoulder of Knocknaveen also proved to be a good collecting-ground, especially for the Hyaliniae. It is, however, upon the great sea-cliff of Croaghmore that the real head-quarters of the land-shells of the island are situated (Plate I). Upon this twenty-seven of the forty-two species of terrestrial species found on the island may be collected. On the 1200-foot path along the face of the cliff I took *A. agrestis*, *A. ater*, *A. subfuscus*, *A. intermedius*, *V. pellucida*, *H. alliarum*, *H. nitidula*, *H. pura*, *H. crystallina*, *S. edentulum*, *P. rotundata*, *A. aculeata*, *H. fusca*, *C. lubrica*, *P. anglica*, *P. cylindracea*, *C. bidentata*, *C. minimum*, *L. truncatula*, and *A. lineata*. Between 800 and 1100 feet altitude, *L. arborum*, *H. radiatula*, *E. fulvus*, *P. pygmaeum*, and *A. lamellata* also occurred, while at about 500 feet *V. substriata* and a single dead specimen of *B. perversa* were taken. Shells appeared to be most abundant at about 1000 feet. At this elevation every handful of moss yielded dozens of specimens, each patch of *Luzula* was crowded with *Hygromia fusca*, and if the day were damp hundreds of *Arion ater*—all var. *aterrima*—might be seen crawling upon the vegetation. This slug is reported by Welch and Praeger

to show great partiality for the flowers of *Silene acaulis* (see Part 10, p. 24 and Plate V). I also observed it feeding on this plant, as well as on the flowers of *Jasione montana*, but its customary food seemed to be sheep-droppings, or decaying vegetable matter. During the long drought of 1911 *A. ater* was frequently seen under stones in the beds of half-dried streams and under clumps of Sphagnum. The effect of exposure—or perhaps it is due to the action of salt water during winter storms—is well shown on many of the shells living on Croaghmore, especially in the cases of *Pupa anglica* and *Clausilia bidentata* (Plate II, fig. 41). Many examples of these are to be found with the upper half of their shells completely bleached or eroded while the lower remains in perfect condition, having been formed since the passing of the previous winter. The old shells of these, and often of other species, are bleached throughout. The most interesting shell living on Croaghmore is, to my mind, *Limnaea truncatula*, which swarms on the bare rock-faces of the cliff and is frequently associated among the moss and other vegetation with what would generally be termed “woodland” species. Excepting the escarpment of Knockaveen, the only inland sanctuaries for mollusca are the small areas of native scrub on the hill-sides above L. Avullin and in the valleys above Portlea, near Maum. These two localities furnished almost identical lists, but no species is confined to either station. Upon the northern slope of the last-mentioned valley stand the ruins of several cottages. These attracted my attention for two reasons. Firstly, there were many stones to turn over round about them; secondly, I wanted to see if man’s former habitation was reflected in the neighbouring fauna. In no case was man’s former presence traceable, for while *Hyalinia alliaria*, *Arion subfuscus*, and other species typical of the island lived about the ruins, *Limax arborum* and *Zonitoides excavatus*—the latter a typical “anthropophobe”—occupied the interior of one of the buildings, eight examples of the latter occurring under a large stone near the hearth. Perhaps one of the strangest groups in the fauna is that met with at the extreme western end of the island where *Plantago sward* is the prevailing form of vegetation. During heavy winter storms this portion of the island must be almost immersed in sea water. Yet no less than fifteen species of mollusca have been found to live in this area. The list is as follows:—*Limax arborum*, *Milax gagates*, *Agriolimax agrestis*, *A. laevis*, *Arion ater*, *A. intermedius*, *Hyalinia alliaria*, *Clausilia bidentata*, *Ancylus fluviatilis*,<sup>1</sup> *Limnaea pereger*, *L. palustris*, *Planorbis spirorbis*, *Pisidium subtruncatum*, *P. casertanum*, and *P. personatum*.

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<sup>1</sup> The fresh-water species occurred in the pools forming Lough-na-phuca, and in the small stream which flows through some of these pools.

LIST OF MOLLUSKS OF CLARE ISLAND.

**Limax arborum** Bouch.-Chant.—Two distinct colour-forms of this slug are to be met with. One, probably var. *maculata*, Roebuck, is rather dark, and is covered with spots on the body in a manner very similar to the young of *L. maximus*, but is distinguished at once from that species by possessing the characteristic shield-markings of the present slug. The second form is referable to the var. *nemorosa* Baudon. Of the variety *alpestris*, Less. and Poll., which prevails on Inishbofin, Inishturk, and on Caher Island, no specimen was observed on Clare Island so far as I am aware.

[**L. maximus** L.—Occurs in the gardens adjoining Mr. M'Cabe's hotel near the Harbour, but is certainly an artificial introduction.]

**L. cinereo-niger** Wolf.—The nocturnal habits of this beautiful slug render its presence often overlooked. In the present instance it is due to H. Wallis Kew that I am able to record it from the island. Mr. Kew, having been fortunate enough to discover its habitat at Kinnacorra, returned after nightfall with Welch and Praeger, and the party had the satisfaction of proving that the species was plentiful over a considerable area of the rock-strewn heath-land which lies above Kinnacorra. No typical specimens were taken, so far as I am aware, nor did any occur to me when Praeger and I visited the locality in July, 1911. Examples sent by Mr. Welch to W. Denison Roebuck, were referred by him to var. *maura* Held. During my last visit, however, a single specimen was taken in a small, disused limekiln above Lighthouse Cove, which might almost be referred to the type, though the white dorsal stripe was scarcely distinct enough. The majority of the specimens taken at Kinnacorra in 1911 were of an almost unicolorous greyish-brown, with a paler dorsal stripe. None were full-grown, and none clearly showed the characteristic markings of the foot-sole. One specimen was exceptionally handsome from the fact that at irregular intervals large black spots nearly an eighth of an inch in diameter were scattered over the body; this is, perhaps, the var. *punctata*, Lessona, recorded by J. W. Taylor from Sutherland and Cork. The beautiful lineation of the shield of this slug, resembling a "thumb-print," was strongly marked in all examples. An attempt was made to discover the food of these slugs during a damp night in July, 1911, by Praeger and myself, but we were unable to find them eating anything. We observed, however, that whereas all the specimens of *L. arborum* were seen on rocks, evidently feeding on lichens or algae, *L. cinereo-niger* was always crawling on the short grass which grows between the boulders and the clumps of taller vegetation.

- Agriolimax agrestis** L.—Abundant in all parts of the island, except on the moorland. The prevailing form is of a unicolorous brown, but that with reticulated markings was also frequent. The var. *lilacina*, which is frequent on Achill and the Curraun promontory, occurred near Portlea, as well as two jet-black specimens.
- A. laevis** Müll.—Frequent over the low-lying parts of the island, and found also on the moorland surrounding Creggan Lough, as well as upon the slopes of Knocknaveen.
- Milax gagates** Drap.—Common at the west end of the island, and occurs also along the southern and south-eastern shores. Several almost jet-black specimens were noted, and the tan-coloured form was taken in the Abbey. The var. *plumbea* is the prevailing form.
- Vitrina pellucida** Müll.—Decidedly rare, though odd specimens were taken in most parts of the island.
- Hyalinia cellaria** Müll.—Common in the Abbey, and taken sparingly in the ditches near the Pound, and along the south shore between the Harbour and the Abbey. All the specimens are referable to *Vitrea hibernica* Kennard. The shells from the Abbey were all of the opaque, white form, var. *margaritacea* Schmidt.
- H. alliaria** Miller.—The most generally distributed species of the genus, and shares with *P. rotundata* and *Z. excavatus* the claim to be the commonest shell on the island. All specimens are of the large, dull, flat, western form, and in colour range from the type to opaque white or green. This western form appears referable to Westerlund's var. *anceps*, found in Sweden.
- H. nitidula** Drap.—Except upon the cliffs of Croaghmore, this shell was decidedly rare, though it was noted also on Knocknaveen and along the south and north-east coasts. All examples have the suddenly expanding and drooping aperture characteristic of the *H. nitens* of Michaud.
- H. pura** Alder.—Not nearly so common as the next species, but both type and var. *nitidosa* are frequently to be found.
- H. radiatula** Alder.—Type and the green form are equally common in most parts of the island.
- H. crystallina** Müll.—Generally distributed, but not common. Most specimens appear referable to *H. contracta* Westerlund.
- Euconulus fulvus** Müll.—Common in most parts of the island, but full-grown shells were seen only on the north-east cliffs and on Croaghmore.
- Zonitoides nitidus** Müll.—Extremely local and rare. Observed only in a damp spot above Lighthouse Cove, and with *S. pfeifferi* along the margin of the stream at the harbour.

**Z. excavatus** Bean.—Both the type and the var. *vitrina* occur, but the former seems the more generally distributed. This shell was a noticeable absentee from the cliffs of Croaghmore and those of the north-east coast, although common on the moorland up to the very edge of the latter cliffs. The presence of a calcareous Boulder-clay and Carboniferous and Silurian sandstones must be put down as the most likely cause for this otherwise unaccountable fact.

**Arion ater** L.—Abundant over nine-tenths of the island, even on the heathery slopes of Croaghmore, which are frequently fired for grazing purposes. The habit of this slug in resting beneath clumps of Sphagnum possibly saves it from being killed by these fires. Until my last visit, during the drought of 1911, scarcely any examples but those of the black form were observed, though a few brown ones were seen, and quite a colony of the var. *plumbea* occurred round the Signal Tower. Upon my last visit, however, everything appeared changed, and these two colour-forms were quite as abundant as the type in all of the low-lying parts of the island. Could the dry season have effected this remarkable change in the relative proportions of these colour-forms?

**A. subfuscus** Drap.—Both the type and var. *cinereo-fusca* occurred in most parts of the island, but this species was common only on the great cliff of Croaghmore. On the open tracts of moorland in the centre of the island both this and the last species were frequently observed crawling at mid-day and in sunshine.

**A. intermedius** Normand.—Extremely abundant on the cliffs of Croaghmore, and generally distributed. The majority of the specimens seen by me resembled in a remarkable degree the original illustration of *Geomalacus mabilli* Baudon, which slug is regarded by J. W. Taylor<sup>1</sup> as a synonym of *A. intermedius*.<sup>2</sup> None of the specimens which I have seen from Clare Island have shown when at rest the serrated dorsal outline characteristic of this slug—a condition which Dr. Scharff believes to be due to the animal being saturated with moisture. In order to be quite sure that we were not dealing with a pale form of *A. hortensis*, I examined the radulae of about a dozen examples, and although these showed considerable variation from those of *A. intermedius* taken in the neighbourhood of Belfast, they were at once distinguishable from the radulae of *A. hortensis* taken on the mainland at Louisburgh. The vivacity of the Clare Island specimens of this slug, to which character Mr. Welch drew my attention, is only equalled by that of *Agriolimax laevis*.

<sup>1</sup> Baudon, Mémoire sur Les Limaciens du Département de l'Oise, pl. 1, figs. 8–12.

<sup>2</sup> Monograph L. & F. W. Moll. ii. 240.

- [**A. hortensis** Fér.—Several half-grown examples, with *Limax maximus* and other slugs, in the garden opposite the hotel at the harbour. Evidently introduced with plants or other imports.]
- A. circumscriptus** Johnston.—As on Achill and in parts of the mainland, this species was distinctly local on Clare Island. It is probably common on the northern escarpment of Knocknaveen during winter, as well as along the north-east coast.
- Punctum pygmaeum** Drap.—Fairly common at the roots of herbage along the southern and north-eastern coasts of the island. Also taken on the cliffs of Knocknaveen and Croaghmore and among the scrub above Portlea.
- Sphyradium edentulum** Drap.—Particularly common on Croaghmore and on the southern slope of Knocknaveen, overlooking the Harbour, and occurred also in several places round the southern coast. This seems to be one of the species which ranges over the most peaty areas, as I took several examples under a stone upon the heathery slope south of the lighthouse, associated with *Z. excavatus*.
- Pyramidula rotundata** Müll.—Generally distributed, and, though not abundant everywhere, is one of the commonest species on the island. All specimens were pale and many almost unicolorous.
- Acanthinula aculeata** Müll.—Sparingly in moss above Lough Avullin and on the cliffs of Knocknaveen and Croaghmore. Several pure white specimens were taken by the late Dr. Chaster in the second locality.
- A. lamellata** Jeffreys.—In the same localities as the last—except on Knocknaveen—but common only in the remnants of old scrub above Lough Avullin and Portlea.
- Vallonia pulchella** Müll.—Taken in great numbers by R. J. Welch round and upon some large boulders sunk in the earth near the lace school, east of the Harbour. Also frequent along the southern cliffs, and one specimen occurred to me at 250 feet on the southern shoulder of Knocknaveen.
- Helicella itala** L.—A small dark-banded form occurs on the sand-flat at the Harbour, those found along the southern and north-eastern cliffs being much larger and paler in colour. In the latter station the shell lives on banks of stiff Boulder-clay, which, although containing calcareous matter, are nevertheless a somewhat strange habitat for this species.
- H. intersecta** Poiret.—The large western form of this shell is common in a very restricted area on the sand at the Harbour and for a short distance up the road leading to Maum. (Plate II, fig. 51.)
- Hygromia fusca** Mont.—Common on the cliffs of Knocknaveen, and on Croaghmore to an altitude of about 1,300 feet, or as high as there is



sufficient vegetation to shelter it; clumps of *Luzula maxima* in all cases being its habitat. Three colour-forms occur, viz., greenish-brown, pale brown, and darker brown.

**H. hispida** L.—Great numbers of a dark and very hispid form occur around the Abbey, while along the north-eastern cliffs and near the Harbour a paler form occurs more sparingly.

**Helix aspersa** Müll.—Almost confined to the areas around the Harbour and the Abbey, but was also taken by Welch along the south coast between these two localities. A marked peculiarity shown by many specimens of this shell on Clare Island, as well as on the adjoining islands and in parts of the mainland, is that while the young shells are all of the normal mottled colouring the last or last two years' growth is almost black, but frequently this is interrupted by vertical streaks of a chestnut colour. Seldom does it happen that the colouring of any specimen is uniform throughout the entire period of its growth. (Plate II, fig. 53.) Beneath the stones in the interior of the Abbey nearly all the shells are malformed in a remarkable manner, being wrinkled and so fragile that one can scarcely handle them.

**H. nemoralis** Müll.—Except along the north-east coast, this species is very scarce indeed, but it nevertheless is to be found on the cliffs of Knocknaveen, and on the southern shore between the Harbour and the Abbey. The commonest form was 00300 *libellula* or *rubella*. Some of those taken on Knocknaveen had very thin shells, which were covered with bruises, probably caused by the specimen being blown down the cliff in stormy weather. White-lipped examples were not plentiful, but in the last-mentioned locality J. N. Milne took a very beautiful one of var. *rubella*, without bands. A single specimen of the var. *citriozonata* occurred at the same place.

**Cochlicopa lubrica** Müll.—Common throughout most parts of the island, greenish specimens being the only form of variation.

**Carychium minimum** Müll.—Generally distributed. The majority of the shells are rather large and slender.

**Pupa anglica** Fér.—Fairly common in all portions of the island, and especially common on the great cliff of Croaghmore and along the N.E. coast. Type and vars. *pallida* and *alba* all observed, but the type is the prevailing form. (Plate II, fig. 46.)

**P. cylindracea** Da Costa.—Like *P. anglica*, this shell is found nearly everywhere, and is equally abundant on Croaghmore. A large proportion of the shells from this locality appear referable to the var. *anconostoma* Lowe, the denticle being poorly developed or absent. (Plate II, figs. 47,

48, 49.) The shape of these shells is also different from the type, as they are distinctly more cone-shaped and not cylindrical, but all intermediate forms appear to exist.

**Clausilia bidentata** Ström.—Extremely common on Croaghmore and in several other localities, and shows great variation in size and shape, specimens from the more exposed situations being shorter and more tumid than those occurring on the more sheltered parts of the cliffs. (Plate II, figs. 40, 41, 42.)

**Balea perversa** L.—On my first visit to the island I failed to find this shell, though it was searched for keenly. It turned up afterwards on the cliffs of Croaghmore and Knocknaveen, while a single specimen occurred to me at the Abbey, and Welch took another at the west end.

**Vertigo antivertigo** Drap.—Very common where it occurred, but not so generally distributed as the next two species. Near the Signal Tower in the bed of a small stream, south slope of Knocknaveen, shore L. Avullin, and N.E. coast.

**Vertigo substriata** Jeffreys.—Widely distributed over the island, but as usual not found in large numbers, nevertheless it is undoubtedly common on Croaghmore, near the Signal Tower with *V. antivertigo*, and along the south coast. Also taken in moss above L. Avullin, on the N.E. cliffs, and on the south slope of Knocknaveen.

**Vertigo pygmaea** Drap.—Very generally distributed, but nowhere abundant. Two forms were noted: one small and stumpy and of a pale colour, lives on the dry southern cliffs, while a darker and very slender form is found along those of the N.E. coast.

**Succinea pfeifferi** Rossm.—Fine specimens at the Harbour Pool in July, 1911. Frequent in the damper parts of the eastern districts of the island, as round L. Avullin and along the north-eastern coast. Some of those from the Harbour bear shells of a peculiar bronze-green colour.

**Limnaea pereger** Müll.—A small stunted form is to be found in nearly all permanent water on the island, and fair-sized specimens occur in L. Avullin, Creggan L., the Harbour Pool and one of those forming Lough-na-phuca at the west end. This last "lakelet" consists of about a dozen or more pools, surrounded—and at most seasons, at any rate, isolated from each other—by "Plantago-sward." A small stream flows through some of the pools, but the majority depend on rain for their supply, and were quite dry in July, 1911. During winter storms these pools must frequently be distinctly brackish, and it is therefore not surprising to find that the majority of the shells are very small and greatly eroded. (Plate II, figs. 1-7.)

- L. palustris** Müll.—Occurred in one of the pools of Lough-na-phuca, where a small rather deeply-sutured form was common. In the Harbour Pool I took two large specimens during my last visit.
- L. truncatula** Müll.—Generally distributed, but most plentiful on the face of the cliffs of Croaghmore. Several white shells were taken by the late Dr. Chaster in the bed of a stream, or perhaps it was a road—it is frequently difficult to distinguish between these in certain places in the west—above Craigmore.
- Ancylus fluviatilis** Müll.—Common in all streams between the Abbey and the Signal Tower; but though many other suitable habitats occur, none seemed to shelter this species.
- Planorbis spirorbis** L.—Very local, and common only in the drains by the roadside between the Harbour and Craigmore. Also lives in Lough-na-phuca, in the marsh below the cliff of Knocknaveen, and round L. Avullin, though in the latter localities not more than half a dozen specimens were taken in all. All specimens seem referable to a stunted form of *Planorbis leucostoma* Millet.
- P. crista** L.—After repeated failures this shell was found in Creggan Lough, where to judge from the number of young shells afterwards collected by Welch, it is perhaps not rare.
- Acicula lineata** Drap.—The type was taken in moss on the cliff of Knocknaveen, but seemed exceedingly rare, only five or six examples in all being found. On Croaghmore it appeared more plentiful, but none of the var. *alba*—usually the more common form in Ireland—was met with. Several specimens were taken in the latter locality clinging to the stems of the moss *Hypnum cupressiforme*—an association commented upon by J. A. Hargreaves in the Journal of Conchology (xii, 331) as being frequent in Yorkshire.
- Valvata piscinalis** Müll.—Taken by Welch in the outlet of Lough Avullin, where during September, 1909, it was very plentiful. However, during my last visit in July, 1911, scarcely a single specimen was seen.
- Pisidium subtruncatum** Malm.—Occurred sparingly in Lough-na-phuca and in the marsh at the base of the cliff of Knocknaveen.
- P. casertanum** Poli.—Widely distributed and common in most parts of the island.
- P. pusillum** Gmelin.—Sparingly in Lough Avullin and in Creggan Lough on my last visit, but not previously taken on the island.
- P. nitidum** Jenyns.—Taken in Light-house Pool and near Craigmore.<sup>1</sup>

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<sup>1</sup> *P. pulchellum* appeared in my first notes as occurring on the island, but the specimens were afterwards identified by B. B. Woodward as *P. nitidum*. I regret therefore that this shell was reported by me from the island in Proceedings R.I.A., xxix, Section B, 125.

- P. obtusale* Pfeiffer.—With the last species in Light-house Pool, and also occurred in Creggan Lough.
- P. personatum* Malm.—Widely distributed and common in the roadside pools, field-drains, and bog-pools.
- P. milium* Held.—Not at all common, but was taken in Light-house Pool, in Lough Merrignagh, at Craigmore, and in the marsh north of Knocknaveen.

Three species in the above list—*Z. excavatus*, *A. lamellata*, and *H. fusca*—are almost confined to the Britannic area. These with *Hygromia granulata*, a mollusk not found within the boundaries of the present survey, form a small but interesting group of shells perhaps protected from exterminating influences by the isolation of our islands. Judging by the geological evidence, *A. lamellata* is retiring towards the north-west corner of Europe, as I learn from A. S. Kennard that it is known from the Miocene of central Europe, and it has been recorded from several Pleistocene deposits in the south of England,<sup>1</sup> though not now known to live in these districts.

The distribution of the Pisidia is uncertain, owing to the difficulty of recognizing our species in Continental lists. The remaining species are widely distributed in western Europe, but five are mainly coastal in their range, and are unknown from central or northern Europe. Sixteen are almost circumpolar in their distribution, or there exist closely allied species in the polar lands of Asia or America. Thirteen are recorded by Kennard and Woodward (*ibid.*) from the Pliocene of the south of England, and thirty-eight from the Pleistocene. The remaining seventeen species, absent from the Pleistocene, have a mainly western distribution, and perhaps did not live in Pleistocene times in the localities where deposits of that age are known; or they are slugs; or they have fragile shells not likely to become fossilized.

#### THE MULLET.

So isolated a district is the peninsula of The Mullet, that it might almost be compared with the neighbouring islands, rather than with the adjoining parts of the mainland. Perhaps one might be forgiven for terming it an "island" still connected to the mainland by a "land-bridge." It will be at once seen, therefore, that its fauna deserves special attention. Unfortunately one evening and one long day were all the time that I was able to devote to its exploration, during which time a cold, dry, northerly wind blew continuously. Thus my list must be correspondingly short, and the absence from it of many species, such as *Limax arborum*, *Pyramidula rotundata*, and

<sup>1</sup> See Kennard and Woodward: On the Post-Pliocene Non-Marine Mollusca of the South of England, *Proceedings of the Geologists' Association*, xvii, (5), 213-260.

*Clausilia bidentata*, need not be commented upon. The peninsula consists in reality of several low rocky masses which have once been islands, connected to each other by extensive sand-dunes, and it provides even less shelter for a molluscan fauna than any of the islands included in the survey. Along the north coast—a part which I have not yet been able to visit—more favourable ground probably exists. Though considerable areas of the sands are shifting too constantly to harbour any fauna or flora, the list of xerophile species is larger than that of any of the islands. The fresh-water fauna is—for such an ultra-western locality—a large one. All the species are, however, typically “western,” and the list does not include any of the common central species, such as *Physa fontinalis*, *Limnaea stagnalis*, or *Sphaerium corneum*.

The following is my list for the district:—

*List of Mollusks of The Mullet.*

<i>Agriolimax agrestis</i> .	<i>Cochlicopa lubrica</i> .
<i>A. laevis</i> .	<i>Carychium minimum</i> .
<i>Vitrina pellucida</i> .	<i>Pupa cylindracea</i> .
<i>Hyalinia alliaria</i> .	<i>Vertigo antivertigo</i> .
<i>H. radiatula</i> .	<i>V. pygmaea</i> .
<i>H. crystallina</i> .	<i>Succinea pfeifferi</i> .
<i>Euconulus fulvus</i> .	<i>Limnaea pereger</i> .
<i>Arion ater</i> .	<i>L. palustris</i> .
<i>A. subfuscus</i> .	<i>L. truncatula</i> .
<i>A. intermedius</i> .	<i>Aplecta hypnorum</i> .
<i>A. circumscriptus</i> .	<i>Planorbis glaber</i> .
<i>Punctum pygmaeum</i> .	<i>P. crista</i> .
<i>Vallonia pulchella</i> .	<i>P. spirorbis</i> .
<i>V. costata</i> .	<i>Paludestrina stagnalis</i> .
<i>Helicella itala</i> .	<i>P. ventrosa</i> .
<i>H. intersecta</i> .	<i>Pisidium milium</i> .
<i>H. barbara</i> .	<i>P. nitidum</i> .
<i>Hygromia hispida</i> .	<i>P. obtusale</i> .
<i>Helix aspersa</i> .	<i>P. personatum</i> .
<i>H. nemoralis</i> .	

As I have already said, the absentees from the above list need not be commented upon, but several of those contained in it are worthy of a passing remark. Although *Vallonia pulchella* is frequently met with on the western islands, its companion, *V. costata*, has been reported only from one of these<sup>1</sup>

<sup>1</sup> *V. costata* occurs on Cruit Island in West Donegal, but it is only at high-water that this piece of land is an island, being at other times connected to the mainland by a broad sand-flat, across which shells may be blown at times.

until found in Inishbofin during the present survey. Thus its abundance at Cross Abbey is interesting.

The fact that *Helicella intersecta* occurred on the peninsula did not surprise me, but I was astonished to find that all the specimens which I saw in this district belonged to the small form which I had hitherto associated with the central limestone plain. The large or western form being common at Louisburgh, Curraun, and on Clare Island, I expected to find the same form on The Mullet. Some authorities on the Continent have regarded these two forms as distinct species, referring the larger one to the *H. intersecta* of Poiret<sup>1</sup> and the smaller one to the *H. striata* of Draparnaud (*non* Müller). The type of *H. caperata*, Mont. would appear to be the latter shell.

In the graveyard at Cross Abbey, *Helix nemoralis* occurred abundantly, but three forms only were observed in this locality. Of these the var. *citri-nozonata* accounted for about sixty per cent. of the total, typical specimens for about twenty-five per cent., while the remainder were of a bandless yellow form with bright purple lip. A peculiar feature of this last form—common in many of the western sand-hills—is that the lip is not reflected, and its colour scarcely shows upon the exterior. Thus it gives one the impression of either an immature or a malformed example. *Aplecta hypnorum*, which I have been unable to find upon any of the islands, is common in many places, and occurs even in the extreme southern portion of the peninsula.<sup>2</sup>

That this species may have at one time existed on all or some of the islands seems not improbable. To judge by its habits, its existence in any isolated district must always be precarious, as a severe spell of dry weather might exterminate it. Upon the mainland of Ireland and in England this shell has the reputation of appearing and disappearing at intervals—a phenomenon which could not happen easily upon islands. The form of *Limnaea pereger* occurring in Cross Lough is a very elegant one (Plate II, fig. 24), with a high spire and strong opaque white shell. Some few years ago R. Ll. Præger collected a similar form of this shell on North Inishkea, which island lies off the coast of The Mullet. *Paludestrina stagnalis* and *P. ventrosa* were taken in Lough Leam, into which the sea rises at high water.

<sup>1</sup> The synonymy of this group of shells has been so muddled that it is now quite impossible to be certain of the identity of Poiret's species. This has led to the adoption of Montagu's name by many authorities.

<sup>2</sup> Dr. Scharff mentions this species from Achill Island (*Irish Nat.*, i, 151), but this is seemingly an error. He was then under the impression that J. G. Milne had recorded the species from that island (*Journal of Conch.*, vi, 413), but Milne says that it is not to be met with west of Newport; a statement which my work in the latter district appears to verify, though to the south of Clew Bay *A. hypnorum* is frequently met with to the extreme points of the mainland.

ACHILL ISLAND.

The area of Achill—some fifty square miles—is best realized by one who makes an attempt to survey a part of its fauna. Thus, although six and a half days were spent by me on the island in addition to time spent there by J. G. Milne and others, much work remains to be done. I do not anticipate that a large number of species will be added to the list, but some that figure below are perhaps commoner or more widely distributed than my work has led me to believe. Owing to the considerable advance of our knowledge since the publication of J. G. Milne's paper on the mollusca of the island (1891),<sup>1</sup> it seems well to give a complete annotated list. Owing partly to the great extent of the island and partly to the diverse character of its different portions, I have divided Achill into three sub-districts, viz., North, South, and West. The southern division is bounded on the north by the road running from the head of Salia Bay, past Lough Naneaneen and Loughannascaddy, to River and thence past Shruhillebeg Lough to the sea at Dookinelly. The western portion is bounded on the east by the 200-foot contour-line, running from near Corrymore House, through Slievemore village, and round the eastern shoulder of Slievemore, down to the sea near the quay west of Dugort. The northern district includes the intervening tract of comparatively low-lying ground, all the sand-dunes, and almost all the lakes which yield fresh-water species. The letters N, S, and W, following the name of a species, denote in which division it has been found. Additions to Milne's list are marked\*.

*List of Mollusks of Achill Island.*

**Limax arborum** Bouch.-Chant.—N.S.W. Generally distributed, and ranges to the highest point of the island, 2204 feet.

\*[**L. maximus** L.—N. A few specimens in the village of Valley, associated with *Hygromia rufescens*, and in all probability introduced by man.]

**Agriolimax agrestis** L.—N.S.W. Common throughout the low-lying parts of the island, except on the most peaty areas, the vars. *brunnea*, *reticulata*, and near the sea var. *lilacina*, predominating.

\***A. laevis** Müll.—N. Frequent round the shores of the lakes near Valley.

[**Milax sowerbyi** Fér.—N. Reported by J. G. Milne from Dugort. Still found there, and also in the village of Valley. An evident introduction.]

**M. gagates** Drap.—N.W. Frequent. Mainly type and var. *plumbea*. One almost jet-black example at 800 feet altitude above the eastern Lough Nakeeroge. Var. *rava*—Slievemore village (J. G. Milne).

<sup>1</sup> Journal of Conchology, vi, 412-421.

- Vitrina pellucida** Müll.—N.W. Generally distributed, but nowhere so common as in the northern parts of Ireland.
- Hyalinia cellaria** Müll.—N.S. Near habitations, and in the old church at Kildawnet. In the latter locality only the var. *margaritacea* Schmidt (var. *alba*, J. G. Milne) was observed. Milne states that this white form does not occur on the island.
- H. alliaria** Miller.—N.S.W. Generally distributed up to at least 800 feet, the type being slightly commoner than the var. *viridula*.
- \***H. nitidula** Drap.—N.S.W. Frequent on the northern cliffs and in similar damp and shady spots. At the foot of the cliffs between the two Loughs Nakeeroge, the var. *helmi* occurred commonly and without the type. The latter form was taken on the sea-cliff of Croaghaun at 1400 feet.
- \***H. pura** Alder.—S.W. Frequent on the cliffs, and met with at Kildawnet.
- H. radiatula** Alder.—N.S.W. Generally distributed.
- H. crystallina** Müll.—N.S.W. Generally distributed, but seldom common.
- Euconulus fulvus** Müll.—N.S.W. Generally distributed.
- Zonitoides nitidus** Müll.—N. Regarded by J. G. Milne as that species "which above all would appear to be a survival of forest times." It is, however, in this country—so far as my experience has gone—essentially a marsh or lake-side dweller. It occurs sparingly on the warren near Valley and by Keel Lough.
- \***Z. excavatus** Bean.—S. The type appears abundant in the woods at Glendarary, while a few specimens of the var. *vitrina* occurred to me by the shore, near the same locality.
- Arion ater** L.—N.S.W. Generally distributed. Vars. *castanea* and *plumbea* frequent near the sea. On the elevated peaty areas the var. *aterrima*, Taylor, was alone met with; this form is common to the highest point of the island, over 2200 feet.
- A. subfuscus** Drap.—N.S.W. Generally distributed up to 1800 feet. The prevailing form appears referable to var. *cinereo-fusca*.
- \***A. intermedius** Normand.—N.S.W. Generally distributed. Almost all the specimens seen by me were of the grey form.
- [**A. hortensis** Fér.—N.S.(? W.). Recorded by J. G. Milne from the gardens at Dugort—where it has probably been brought with plants—and from the Signal Tower. *A. intermedius* is common at the last station, though not mentioned by Milne; I am therefore inclined to regard this record as due to an error of determination, as it would be a most unlikely habitat for *A. hortensis*. In the plantation at Glendarary, this slug is abundant; and though it has all the appearance of a native,



it may be only a "garden escape." All the examples in the last locality were of the very black form, with bright orange foot-sole.]

- \***A. circumscriptus** Johnston.—N. Frequently met with, but always rare.
- Punctum pygmaeum** Drap.—N.S. Local, and does not appear to be plentiful.
- Sphyradium edentulum** Drap.—N.S. Probably generally distributed.
- Pyramidula rotundata** Müll.—N.S.W. Generally distributed up to 1400 feet altitude, except on the peaty areas.
- Helicella itala** L.—N. Abundant on all sandy areas.
- H. barbara** L.—N. Common at Keel Strand, at Dugort, and on the warren at Valley, though recorded by J. G. Milne only from the last station and regarded by him as a new-comer.
- \***Hygromia hispida** L.—S. Not mentioned by J. G. Milne, and appears absent from the greater part of the island. It is, however, common along the shore at Kildawnet.
- [**H. rufescens** Pennant.—N. Still in Milne's station in the gardens at Dugort, and, as he suggests, is undoubtedly an artificial introduction. Also occurs on the refuse-heaps in the village of Valley.]
- \***H. fusca** Mont.—Abundant on the cliffs—on clumps of *Luzula maxima*—at 800 feet altitude, above the eastern Lough Nakeeroge. Also occurs almost at sea-level on the cliffs a quarter of a mile east of the village of Dugort.
- Vallonia pulchella** Müll.—N. Frequent and common on the sand-dunes.
- Helix aspersa** Müll.—N.S. J. G. Milne regarded this species as probably a recent introduction; but from its almost universal occurrence on the western islands, I think it has an undoubted claim as a native. There is always the chance, however, that this shell may have been introduced by primitive man as an article of food. It is more widely distributed on Achill than Milne appears to have been aware of, and occurs not only at Keel, but also at Dooagh; while it is abundant in the southern portion of the island at Kildawnet.<sup>1</sup>
- H. nemoralis** Müll.—N.W. Considered by J. G. Milne as dying out on Achill—an opinion which is probably correct. Besides the only station mentioned by Milne—Ship Point—it still survives on the sand-dunes near Lough Nambrack; on the cliffs, close to the sand-hill deposits, at Dugort; and on the cliffs to the east of the eastern Lough Nakeeroge,

<sup>1</sup> In a former paper (Proceedings R.I.A., vol. xxix, Section B, No. 3, p. 93) I quoted Mr. J. G. Milne as saying "that this shell is apparently losing ground in certain localities, and that it was seemingly extinct in Achill." I regret that this note appeared under *H. aspersa*, as it really referred to *H. nemoralis*.

in the western division of the island. Without doubt, it will be found in other places on the cliffs, and in the neighbourhood of Kildawnet. The specimens taken near Lough Nakeeroge were large, flat, and very fragile; and in general appearance they were very similar to many of the shells taken in 1910, on Tory Island in Donegal.<sup>1</sup> On the warren at Lough Nambrack a fair number of the var. *citriozonata* were taken. Want of shelter, the shifting of the sands, and the increase of peat are perhaps the main causes acting towards the extermination of this and other shells on Achill, and indeed on many of the other islands.

[*H. hortensis* Müll.—? N. “Occurred with *H. nemoralis*, with a similar band formula.”—J. G. Milne. This is undoubtedly an error of determination, as I have previously pointed out. The white-lipped form of *H. nemoralis*, which is found on Achill, must have been mistaken by Milne for this species.]

*Cochlicopa lubrica* Müll.—N.S.W. Generally distributed; but absent from the extremely peaty areas.

\**Pupa anglica* Fér.—N.W. Common on the cliffs at Dugort and near the eastern Lough Nakeeroge.

*P. cylindracea* Da Costa.—N.S.W. Generally distributed.

*Vertigo antivertigo* Drap.—N. Frequent in the Keel and Dugort neighbourhoods.

*V. substriata* Jeffreys.—N. “Dugort, in the fields of the Colony.”—J. G. Milne. Not seen by me on any of my visits, though probably frequent along the northern cliffs.

*V. pygmaea* Drap.—N. Frequent.

*Clausilia bidentata* Ström.—N.W. J. G. Milne considered that this shell “had vanished from Achill with the trees, and that it now stopped where the trees stop, at Mulranny.” *Clausilia bidentata*, however, still flourishes on the cliffs, close to Dugort; while it is also common on the cliffs at the eastern Lough Nakeeroge.

[*Succinea putris* L.—? N. The shells recorded as this species by J. G. Milne from Dugort and Keel must have been our western form of *S. pfeifferi*, which has so often been mistaken for a small form of *S. putris* by English conchologists.]

*S. pfeifferi* Rossm.—N. Frequent by the lake-shores and in marshy places.

*Carychium minimum* Müll.—N.S.W. Common everywhere off the peaty land.

<sup>1</sup> Irish Nat., Sept. 1910.

- \**Ancylus fluviatilis* Müll.—N.W. A large, very fragile, and strongly striated form is found in the eastern Lough Nakeeroge, and also in Keel Lough.
- Limnaea auricularia* L.—N. Common in marshy spots in the sand-dunes near Doo Lough, and also in the lake itself. Occurs more sparingly in Keel Lough. All the specimens belong to the var. *acuta* Jeffreys. This variety, which prevails all along the west coast and in the north of Ireland, appears similar to some forms of the continental *L. lagotis* Schrank.
- L. pereger* Müll.—N.S.W. Some interesting varieties of this shell occur on the island, which go far to convince me of the great effect of environment on this, as well as on some other species. In the sandy lakes the usual form is met with, with acute spire and inflated body-whorl; while in some of the peaty lakes, forms approaching *L. involuta* Harvey may be found. An intermediate, referable to var. *lacustris* Leach, is to be found in Keel Lough, which is a large sheet of water, but one not much affected by peat. (Plate II, figs. 8-14.)
- L. truncatula* Müll.—N.S. Frequent; and is found even on the great bog north of Dooagh.
- Planorbis glaber* Jeffreys.—N. Occurs in Loughs Keel, Nambrack, and Doo; but appears rare, and during my last visit was not seen alive.
- \**P. crista* L.—N. Common in the marshy portions of Lough Doo, and is also found in Keel Lough.
- \**Paludestrina stagnalis* Baster.—S. Occurs along the muddy shores near Achill Sound.
- \**Pisidium pulchellum* Jenyns.—N. Occurs in Lough Gall and in Keel Lough.
- \**P. casertanum* Poli.—N.S.W. Generally distributed, and is the only shell which seems to inhabit some of the western lakes of the island. Occurs in Lough Acorrymore—550 feet altitude—but was not seen in Bunnafreva Lough West.
- \**P. obtusale* Pfeiffer.—N.S. Occurs in Lough Gall and Sraheens Lough.
- P. pusillum* Gmelin.—N.S. Common in Lough Gall and in Sraheens Lough, and reported from Dugort by J. G. Milne.
- \**P. personatum* Malm.—N.S. Frequent in boggy drains with *P. casertanum*.
- \**P. milium* Held.—N. Common with *Planorbis crista* in Lough Doo.
- \**P. steenbuchi* Möller.—N. The first living specimens collected in Ireland appear to have been those taken in Keel Lough.
- \**P. lilljeborgi* Clessin.—N.S. Common in Keel Lough among wind-drifted material. This shell occurred among material collected for me at Keel by the late Dr. G. W. Chaster in September, 1909, but was not recognized at that time. It is also found in Sraheens Lough and Lough Gall.

In J. G. Milne's list, thirty-eight species are recorded as living on Achill; two of these—*Helix hortensis* and *Succinea putris*—are certainly erroneous records. Since then, twenty species have been added. Even now, I do not think the list is complete, for *Acicula lineata* must surely occur somewhere on the cliffs; *Balea perversa* may linger in the same places, as it is met with on the cliffs of Clare Island; *Acanthinula aculeata* and *A. lamellata* are, perhaps, in the woods at Glendarary, as these have been only superficially surveyed; and *Limnaca palustris* or *Alplecta hypnorum* may lurk in some of the many pools along the shores. The absence of *Planorbis spirorbis* appears to be real, and is surprising when one considers its frequency on Clare Island and its prevalence on the Curraun promontory. *Helicella intersecta* is another unaccountable absentee from the present list, and plenty of suitable habitats exist for *Limax cinerco-niger*.<sup>1</sup>

#### THE BILLS OF ACHILL.

This remote group of rocks was visited in June, 1910, by some members of the survey—R. Ll. Praeger, R. J. Welch, and A. D. Cotton—who have reported that no specimens of mollusca were to be seen, though woodlice and other small animals were abundant among the vegetation in the bird colonies. On Lambay, in County Dublin (Irish Nat., xvi, 41–42), under somewhat similar conditions, several species were collected among the débris of the nesting-places; but it is possible that the molluscan fauna of The Bills has been exterminated by the heavy Atlantic seas which must break over the rocks in winter time.

#### THE BLACK ROCK.

For *Limax flavus* J. W. Taylor (Mon. L. and F. W. Moll. II, 87) gives the following record for West Mayo, "Black Rock Lighthouse, 1890. R. Widdicombe."

That this slug is native on the island, which, I learn, is but a sea-swept stack, is scarcely possible. Mr. R. J. Ussher, who visited the island in July, 1911, informs me that he only observed one species of flowering plant—*Armeria maritima*—upon that occasion.

It is most probable, therefore, that the specimens sent to the referees of the Conchological Society had been brought from the mainland, with stores for the lighthouse attendants.<sup>2</sup> (See record for *L. flavus* from Inishturk, p. 33.)

<sup>1</sup> For a list of the shells found on the neighbouring island of Inishbiggle and for various localities and lakes on Achill, see J. G. Milne's paper (4).

<sup>2</sup> This opinion is shared by Mr. W. Demison Roebuck, to whom the specimens were sent by Mr. Widdicombe.

INISHKEA.

During the Clare Island Survey no party visited these islands, which lie to the west of The Mullet. From the North Island, however, I possess specimens of *Limnaea pereger* (Plate II, fig. 23), collected in 1905 by R. Ll. Praeger. These are somewhat similar to examples taken in Cross Lough on The Mullet, and are of an opaque white colour, strong in texture, with an acute spire and slender body-whorl.

CAHER ISLAND.

Caher is a small rocky island about half a mile in width and one mile in length, lying some two and a half miles N.E. of Inishturk, partially drift-covered, and rising gradually towards the north-west, where it attains an altitude of some 200 feet. Thus the northern and eastern parts of the island are more or less sheltered from the prevailing winds, and though the vegetation here can scarcely be called luxuriant, it is sufficient to harbour at least twenty-four species of land mollusca. A few shallow pools near the highest point of the island, containing *Limnaea pereger*; several marshy spots in which *L. truncatula* is to be found; and the small lakelet (Kilkeel Lough) about one hundred yards in diameter, near Caher Point, are the only habitats on the island for fresh-water shells. In the last-mentioned locality *L. pereger* occurs also and is associated with *Pisidium milium* and *P. personatum*. The water of this lake is distinctly saline. (See report on Rhizopoda, by Wailes and Penard, Part 65, p. 12.)

The list of shells taken by me on the island is as follows;—

*List of Mollusks of Caher Island.*

<i>Limax arborum.</i>	<i>Vallonia pulchella.</i>
<i>Milax gagates.</i>	<i>Helicella itala.</i>
<i>Agriolimax agrestis.</i>	<i>Helix aspersa.</i>
<i>A. laevis.</i>	<i>Cochlicopa lubrica.</i>
<i>Vitrina pellucida.</i>	<i>Carychium minimum.</i>
<i>Hyalinia alliaria.</i>	<i>Vertigo antivertigo.</i>
<i>H. nitidula.</i>	<i>V. substriata.</i>
<i>H. radiatula.</i>	<i>V. pygmaea.</i>
<i>H. pura.</i>	<i>Pupa anglica.</i>
<i>H. crystallina.</i>	<i>P. cylindracea.</i>
<i>Euconulus fulvus.</i>	<i>Limnaea pereger.</i>
<i>Arion ater.</i>	<i>L. truncatula.</i>
<i>A. intermedius.</i>	<i>Pisidium milium.</i>
<i>Pyramidula rotundata.</i>	<i>P. personatum.</i>

All of these would be found in a typical faunal list from a western island, and the absentees are perhaps more interesting. Thus I could not find *Hyalinia cellaria*, *Arion subfuscus*, *Zonitoides excavatus*, *Punctum pygmaeum*, *Sphyradium edentulum*, *Hygromia hispida*, *Helix nemoralis*, nor *Clausilia bidentata*. The precincts of the old church would probably have yielded some from this list, but I was unable to spend more than a few moments at this spot. One species—*Vallonia pulchella*—is common by the lake-shore on Caher, which did not occur to me on Inishturk, while the abundance of *Vitrina pellucida* and *Hyalinia alliaria* contrasted strangely with their extreme scarcity on the latter island.

#### INISHTURK.

This in several ways resembles Clare Island on a smaller scale, but suitable habitats for mollusca are even more restricted than on the latter. Grassy cliffs, such as those of Croaghmore and Knocknaveen, are absent, the majority being quite precipitous and almost devoid of vegetation. Around Garanty, however, some of the ridges with which the island is everywhere crossed are on their northern slopes covered with a dense scrubby vegetation, which includes Hazel, Holly, and Birch. It is not surprising, therefore, to find that twenty-six out of the thirty-one land shells obtained by me on the island occur in this neighbourhood. Ooghnalee, a vertical pipe communicating with the inland end of a large sea-cave, yielded an interesting list of species. In this cave the only specimen of *Vitrina pellucida* was taken. The ancient graveyard was disappointing,<sup>1</sup> and contained nothing of interest beyond *Hyalinia cellaria*, a colony of *H. nitidula* var. *helmi*, and some *Helix aspersa* with the curiously wrinkled texture met with in shells of this species upon several of the other islands surveyed.

Habitats for fresh-water species are confined to the three small lakes, some boggy pools and small streams. Lough Coolaknick contains *Limnaea pereger*, *Pisidium casertanum*, *P. nitidum* and *P. milium*; Lough Aleen, *L. pereger*; and Lough Namucka, in the most exposed situation of all, contains *L. pereger*, *L. palustris*, and *Pisidium pusillum*, while its shore appears to be the only haunt of *Zonitoides nitidus*. Except in the habitats mentioned above, the island is almost devoid of a molluscan fauna, consisting as it does, for the greater part, of heavily glaciated ridges of Silurian rock, bare of drift, but here and there thinly covered with peaty soil. Upon these inhospitable areas *Limax arborum*—the so-called Tree Slug—is usually abundant; *Arion ater* is common; while *A. subfuscus*, *A. intermedius*, *Hyalinia alliaria*, *H. radiatula*, *Pyramidula rotundata* and *Cochlicopa lubrica* occur sparingly.

<sup>1</sup> The large quantity of Bracken (*Pteris Aquilina*) may account for the scarcity of shells.

The total list of species found on Inishturk is as follows:—

*List of Mollusks of Inishturk.*

Limax arborum.	Helicella itala.
[L. flavus (probably introduced by man).]	Hygromia hispida.
Agriolimax agrestis.	Helix aspersa.
A. laevis.	H. nemoralis.
Milax gagates.	Cochlicopa lubrica.
Vittrina pellucida.	Carychium minimum.
Hyalinia cellaria.	Pupa anglica.
H. alliaria.	P. cylindracea.
H. nitidula.	Vertigo antivertigo.
H. pura.	V. substriata.
H. radiatula.	V. pygmaea.
H. crystalina.	Clausilia bidentata.
Euconulus fulvus.	Ancylus fluviatilis.
Zonitoides nitidus.	Limnaea pereger.
Z. excavatus.	L. palustris.
Arion ater.	L. truncatula.
A. subfuscus.	Pisidium casertanum.
A. intermedius.	P. nitidum.
Punctum pygmaeum.	P. pusillum.
Pyramidula rotundata.	P. milium.

A few of these call for special mention. *Limax flavus*, a single specimen, which occurred beneath a stone close to the Congested Districts Board store at Garranty, is, I feel sure, an artificial introduction. Except in this one instance, and excluding the influence exercised upon it by browsing cattle and sheep, I could detect no sign that man's habitation of Inishturk had affected its molluscan fauna. *Milax gagates*, though frequent round the north-eastern shore, is not so abundant as on most of the western islands, while *H. alliaria*—perhaps the most typical land-shell of the west of Ireland—appeared to be almost extinct, and though after vigorous search I managed to find a few dead shells here and there throughout the island, no living specimen occurred. The type of *Z. excavatus* was frequently met with, and of the var. *vittrina* a few specimens were taken near Garranty. *Helicella itala*, *Hygromia hispida*, and *Clausilia bidentata* are confined to the south shore, the latter two being conspicuous absentees from the graveyard and the village at Garranty. *V. antivertigo* was several times encountered, but the other two species of this

genus were seen only in a damp gully near the south-eastern corner of the island. *Pupa anglica* was common in many places, the type prevailing in the open, and the vars. *pallida* and *alba* where the vegetation became denser. *Ancylus fluviatilis* occurred abundantly in the small stream flowing into the harbour at Garranty and probably lives in some of the other rivulets as well.

Although the above list is very similar to that from Clare Island, several notable absentees will be noted. Some of these, such as *Limax cinereoniger*, *Arion circumscriptus*, *Sphyradium edentulum*, *Acanthinula aculeata*, and *Acicula lineata*, would have no doubt been found had my visit been paid at a more favourable time of year. The scarcity of *Luzula maxima* and of the kind of ground that favours its growth is possibly responsible for the absence of *Acanthinula lamellata* and *Hygromia fusca*, while *Helicella intersecta* and *H. barbara* could hardly exist on the island.

On Inishturk, as well as on all the western islands I have visited, the struggle for existence among the mollusca is clearly to be seen, and evidence in favour of Mr. C. B. Moffat's idea,<sup>1</sup> that island faunas tend steadily to diminish, is vividly brought before one's mind. A hundred years hence and several of the species upon my list may have vanished for ever from Inishturk.

#### INISHBOFIN.

Compared with the islands of Turkind Clare, Inishbofin may be considered as low-lying. There are, nevertheless, several hills exceeding 250 feet in elevation. None of these is steep enough to yield any great degree of shelter; but, as in the case of the other islands, there exist along the eastern shore several places where a rank vegetation flourishes. To the south of Church Lough are several rocky slopes, which proved excellent collecting-ground, while behind the sandy beach of the eastern harbour is an extensive tract of damp meadow-land, appropriately called Cloonamore. At Bunnamullan Bay, and about a quarter of a mile eastward of Doonahineena on the north coast, there is a certain amount of cover for mollusca upon some of the cliffs, which in places run inland for considerable distances. Here and there all round the coasts similar but smaller refuges may be found. Sandy areas are more extensive on Inishbofin than on any of the neighbouring islands nearer than Achill, and an abundance of the two xerophiles, *Helicella itala* and *H. barbara*, is not surprising. One might almost say that the greater portion of the interior of the island possesses no molluscan fauna whatever. Naturally inhospitable to mollusca, the inhabitants have completed what nature began, and by stripping the peaty soil down to the very rocks have left the island, in places,

<sup>1</sup> Irish Nat., xvi, 133-145.



barren beyond description. Except on Tory Island, in Donegal, and on the outer islands of the Shyrgaard of Norway, I have never seen such desolate tracts of land. Fresh-water habitats are frequent, but yielded no species of special interest, with the single exception of *Pisidium hibernicum*. I have to thank G. P. Farran for an unpublished list of mollusks collected by him on the island during the years 1900 and 1901. This contains twenty-three species, five of which were only represented by dead examples found in the "shell-pockets" on the sand-dunes. The total list of species known to live or to have lived on Inishbofin is as follows<sup>1</sup> :—

*List of Mollusks of Inishbofin.*

[ <i>Limax maximus</i> (? introduced).]	<i>Helix aspersa</i> .
<i>L. arborum</i> . <sup>1</sup>	<i>H. nemoralis</i> .
<i>Agriolimax agrestis</i> .	<i>Cochlicopa lubrica</i> .
<i>A. laevis</i> .	<i>Carychium minimum</i> .
<i>Milax gagates</i> .	<i>Pupa anglica</i> .
<i>Vitrina pellucida</i> .	<i>P. cylindracea</i> .
<i>Hyalinia cellaria</i> .	( <i>P. muscorum</i> .)
<i>H. alliaria</i> .	<i>Vertigo antivertigo</i> .
<i>H. nitidula</i> .	<i>V. substriata</i> .
<i>H. pura</i> .	<i>V. pygmaea</i> .
<i>H. radiatula</i> .	<i>Clausilia bidentata</i> .
<i>H. crystallina</i> .	<i>Balea perversa</i> .
<i>Euconulus fulvus</i> .	<i>Limnaea pereger</i> .
<i>Zonitoides excavatus</i> .	<i>L. palustris</i> .
<i>Arion ater</i> .	<i>L. truncatula</i> .
<i>A. subfuscus</i> .	<i>Planorbis crista</i> .
<i>A. intermedius</i> .	<i>P. spirorbis</i> .
( <i>Punctum pygmaeum</i> .)	<i>Acicula lineata</i> .
<i>Sphyradium edentulum</i> .	<i>Pisidium subtruncatum</i> .
<i>Pyramidula rotundata</i> .	<i>P. casertanum</i> .
<i>Vallonia pulchella</i> .	<i>P. hibernicum</i> .
( <i>V. costata</i> .)	<i>P. milium</i> .
( <i>Acanthinula aculeata</i> .)	<i>P. nitidum</i> .
<i>Hygromia hispida</i> .	<i>P. obtusale</i> .
<i>Helicella itala</i> .	<i>P. pusillum</i> .
<i>H. barbara</i> .	

<sup>1</sup> Those enclosed in brackets have not so far been found in a living state. The list of species found in the deposit near Carricknamoyla, opposite Inishlyon, will be found on p. 51.

*Notes on some of the more interesting species.*

G. P. Farran reports *L. maximus* from near the harbour, and it seems most likely that this slug may have been imported from the mainland as on Clare Island and Achill Island.

*H. cellaria* is confined to the graveyard and the neighbourhood of houses. Probably native in the former situation. *Z. excavatus*, except on the cliffs at Bunnamullan Bay, is very local and rare. Of *S. edentulum* I took only one example; this occurred on the cliffs east of Doonahineena. *V. pulchella* is apparently almost extinct, except on several sandy areas between Lough Bofin and The Stags of Bofin, though abundant in the deposit near Carricknamoyla. *H. hispida* seems to be confined not only to the graveyard, but to one spot in this enclosure, viz., beneath the east window of the old church. *H. itala* is abundant on all the sandy areas, but *H. barbara* and *H. aspersa* were only noted near those along the southern and eastern shores. Of *H. nemoralis* G. P. Farran says:—"None seen alive; recent shells common in sandhills." These, at first, were all I could find, and the species appeared to be extinct on all the sandy areas. Profiting, however, by experience gained on the other islands, I afterwards found it living on the cliffs east of Doonahineena, and sheltering under *Saxifraga umbrosa* on the bluffs south of Church Lough. In the latter place it was fairly common, but in the former it appeared to be struggling to maintain its hold. All the shells were small, and also exceedingly delicate in texture. Several of the var. *libellula* with white lips and no bands no doubt would have been passed in certain quarters as *Helix hortensis*,<sup>1</sup> but an examination of the darts showed them to be *H. nemoralis*.

*Pupa anglica* occurred frequently, the beautiful var. *alba* being almost the commonest form met with. *P. muscorum* I could not find alive, though to judge by the deposits it must have been very common formerly. It is evidently one of the shells which, along the west coast at any rate, is losing ground. (See Irish Nat., xvi, 359.)

*Vertigo antivertigo* and *V. substriata* were met with on the shore of Loughnabraid and at Cloonamore, but *V. pygmaea* was seen only near the sandy area east of Church Lough. Though common in the deposits, it was not till

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<sup>1</sup> In spite of friendly warning from R. Welch and myself, J. W. Taylor (Mon. L. and F. W. Moll., vol. iii, p. 363) has recorded *H. hortensis* from Achill Island and Ballina. I am quite sure, however, that this species has never been taken so far in either division of Co. Mayo. The former record is an old one of J. G. Milne's (Journ. of Conch., vol. vi, p. 417), which I have previously pointed out must be an error (Proceedings R.I.A., xxix, Section B, 95. 1911), while the habitat given in the latter case—Bartragh Island—would be sufficient to cast doubt upon the record to anyone who had studied the habits of the respective species in this country. As Mr. Welch has so often pointed out, *H. hortensis* does not live on the exposed sandy areas of the west coast, where the white-lipped form of *H. nemoralis* is quite common.

near the close of the first day's work that I found *Clausilia bidentata* alive—a single shell on the cliffs of the great sea-gully at Alladoon, opposite Inishshark. On the following day it was taken sparingly on the cliffs east of Doonahineena.

*Balea perversa* occurred on the south-east angle of the mortared wall enclosing the graveyard. *Acicula lineata* figures in G. P. Farran's list, but was not seen by me, though several likely spots were carefully searched for it. The habitats for the fresh-water species are as follows:—

Lough Fawna—*L. pereger*, *P. obtusale*.

Loughnabraud—*L. pereger* and *Pl. crista*.

Loughnagrooaun—*L. pereger*, *P. obtusale*.

Lough Gowlanagower—*L. pereger*, *P. pusillum*, *P. hibernicum*, and *P. milium*.

Church Lough—*L. pereger*, *L. palustris*, *Pl. crista* (in the outlet), *P. subtruncatum*, *P. milium*, *P. casertanum*.

Stream in the meadow-land at Cloonamore—*Pl. spirorbis*, *Pisidium subtruncatum*, *P. pusillum*, *P. nitidum*, and *P. milium*.

Several other streams and pools contained *P. casertanum* and *P. milium*. Lough Bofin was found to be too salt to contain any fresh-water species.

The best find on Inishbofin was undoubtedly *Pisidium hibernicum*. This bivalve, unknown up to the present outside Ireland, has hitherto been taken only in three small alpine tarns, one in South Kerry and two in West Cork. I have suggested to Mr. B. B. Woodward that it may be an American species, but so far he has failed to recognize it among the species described from that continent.

Taken as a whole, the molluscan fauna of Inishbofin strikes me as being rather more closely related to that of the mainland of West Galway than to that of either Inishturk, Clare Island, or Achill Island, though on paper the lists of species from these districts will be found to be similar.

#### LOUISBURGH.

This may be regarded as the richest district in mollusca of all those included in the survey, for of the eighty-eight species so far recorded for West Mayo, seventy are to be found living within its boundaries. The absentees are mainly fresh-water species, which have a more or less strictly central distribution in Ireland, and do not extend their range beyond the districts of Westport or Castlebar. The great stretches of highly calcareous sand-dunes between Louisburgh and the entrance to Killary Harbour contain many lakes, in which, besides the usual western fauna, represented by shells

like *Limnaea auricularia* var. *acuta*, *Planorbis crista*, and *P. glaber*, a number of species are found which are unknown in other parts of the west coast. These latter are some of the more widely-ranging members of the central fauna, and include *Limnaea stagnalis*, *Physa fontinalis*, *Bithynia tentaculata*, and *Sphaerium corneum*. Immediately north of the entrance to Killary Harbour is a rough uncultivated area of heavily glaciated rocky knolls known as Dooaghtry. This, on the landward side, is in sheltered places covered with patches of dense scrub, while towards the west it is deeply covered with blown-sand. It contains three shallow lakes and a fair extent of marshy ground. Dooaghtry is perhaps the richest sanctuary for mollusca on the west coast, and provides shelter for no less than sixty-three species. Besides *Zonitoides nitidus*, *Z. excavatus*, *Acanthinula aculeata*,<sup>1</sup> *A. lamellata*, *Hygromia fusca*, *Balea perversa*, *Pupa anglica*, *Vertigo anti-vertigo*, *V. substriata*, *V. pygmaea*, *Acicula lineata*, *Limnaea auricularia*, and *Planorbis glaber*, we find here two species—*Vertigo angustior* and *Succinea oblonga*—which are otherwise unknown in West Mayo. Both these shells are common, but whereas *V. angustior* is confined to the shore of Dooaghtry Lough, the latter is widespread and swarms over several miles of country, wherever damp marshy land is to be found. A note on the habitat of this *Vertigo* may be interesting, since it is similar in every respect to that in which it occurs at Dog's Bay in West Galway. It lives on the sides of stones sunk in more or less wet ground, and is particularly common on clumps of the moss—*Hypnum velutinum*—which grow on and around the stones. Throughout the coastal portions of this district of Louisburgh *Helicella itala* is abundant and *H. intersecta* (the large western form) occurs on the sand near the town of this name. Thus the inexplicable absence of *H. barbara* is more pronounced. The effect of exposure near the coast is shown to a great extent on *H. itala*. On the flat wind-swept swards, where the turf is still unbroken, thousands of this shell, of a size no bigger than an ordinary *Hygromia hispida*, may be found sheltering under a vegetation which has all the appearance of a well-kept lawn. In the hollows of the dunes, in some cases no more than one hundred yards from where the dwarf form lives, moderate-sized specimens occur, which bear little or no resemblance in colour, texture, or shape to their puny neighbours. Similar forms appear to occur on the west coast of France: from these several supposed species have been described, which we in this country probably include in our *Helicella itala*. (Plate II, figs. 44 & 45.)

<sup>1</sup> A single specimen of the spineless form, var. *sublaevis* West., occurred amongst scrub at Dooaghtry. This appears to be a very rare variety, as only a few previous instances of its occurrence in Ireland are recorded.

The woods at Old Head, and above all those in the Deer-park near Belclare, at the extreme eastern corner of this district, would well repay further work. Even during my hurried visits to these localities excellent lists were compiled after but a few minutes' collecting.

The letters after the names of species in the following list—B, O, L, R, or D—signify that the species referred to was taken in the neighbourhood of Belclare (metamorphic area), Old Head, Louisburgh, Roonah Lough and Lough Baun, or at Dooaghtry. Where no letter is found, the species may be taken as generally distributed in the district.

*List of Mollusks of the Louisburgh District.*

- |                                    |  |
|------------------------------------|--|
| Limax maximus, O.                  | Vallonia pulchella, R. D.  |
| L. arborum.                        | Helix aspersa.   |
| Agriolimax agrestis.               | H. nemoralis.  |
| A. laevis.                         | Cochlicopa lubrica.  |
| Milax gagates, D, L.               | Pupa anglica.  |
| Vitrina pellucida.                 | P. cylindracea.  |
| Hyalinia cellaria.                 | Vertigo antivertigo.   |
| H. alliaria.                       | V. substriata, D.  |
| H. nitidula.                       | V. pygmaea.  |
| H. pura.                           | V. angustior, D.   |
| H. radiatula.                      | Balea perversa, O, D.  |
| H. crystallina.                    | Clausilia bidentata.   |
| Euconulus fulvus.                  | Succinea pfeifferi.  |
| Zonitoides nitidus, R, D.          | S. oblonga, D.   |
| Z. excavatus, B, D.                | Carychium minimum.   |
| Arion ater.                        | Ancylus fluviatilis, in streams<br>on Croaghpatrick, above Mur-<br>risk, up to 450 feet alt. ; also<br>in the Carrownisky River. |
| A. subfuscus.                      | Limnaea auricularia, R, D.   |
| A. intermedius.                    | L. pereger.  |
| [A. hortensis (ingardensonly), L.] | L. stagnalis, R, D.  |
| A. circumscriptus.                 | L. palustris.  |
| Punctum pygmaeum, D.               | L. truncatula.   |
| Sphyradium edentulum O, D.         | Planorbis albus, R, D.   |
| Pyramidula rotundata.              | P. glaber, R. D.   |
| Helicella itala.                   | P. crista.   |
| H. intersecta, L.                  | P. spirorbis.  |
| Hygromia fusca, D.                 | P. contortus, R.   |
| H. hispida, B, R.                  |  |
| Acanthinula aculeata, D.           |  |
| A. lamellata, B, O, D.             |  |

<i>Physa fontinalis</i> , R, D.	<i>Pisidium subtruncatum</i> .
<i>Aplecta hypnorum</i> , R, D.	<i>P. casertanum</i> .
<i>Paludestrina jenkinsi</i> , R.	<i>P. obtusale</i> , D.
<i>Bithynia tentaculata</i> , R.	<i>P. nitidum</i> , R, D.
<i>Valvata piscinalis</i> , R, D.	<i>P. personatum</i> , D.
<i>V. cristata</i> , R.	<i>P. milium</i> .
<i>Acicula lineata</i> , B, D.	<i>P. pusillum</i> , D.
<i>Sphaerium corneum</i> , D.	

*Zonitoides excavatus*, though common in the Deer-park near Belclare, its nearest approach to the limestone area (see p. 6), is rare in the district, and the Dooaghtry record rests on a single specimen taken by the late Dr. Chaster near Killary Lodge in September, 1909. The finding of *Paludestrina jenkinsi*, the first and only record of West Mayo, in the small lake between Lough Baun and the sea is interesting. This pool lies behind the great storm-beach, which is a characteristic feature of the coast; the lake is slightly brackish, as the sea at very high tides flows into it, as it must also do during winter gales. With *P. jenkinsi*, which was not by any means so common as this shell usually is in Ireland, were associated small stunted forms of *Limnaea pereger*, *Valvata piscinalis*, and *Pisidium nitidum*. The presence of *Planorbis glaber*, associated with *P. albus*, is interesting, as it has often been stated that these two shells do not inhabit the same waters. In all probability *P. glaber* will in time give way before the other. The only record for *Arion hortensis* is that from the garden at McDermott's hotel in Louisburgh, where it was, no doubt, imported with plants. As no previous work has been done in this out-of-the-way district, we can only imagine the effects produced by the shifting of the sands, which for the last hundred years or so has been the curse of the Dooaghtry coast.

From the changes which have taken place during the last hundred years (compare the old and modern Ordnance maps), I should not be surprised if some of the present lakes will entirely vanish during the next century. The ancient graveyard, formerly surrounded by dunes, and until a generation ago used for interment, now forms a fortress-like mound upon the coast, and offers an ever-weakening resistance to the elements, for while the wind and rain remove the lighter material from it the river undermines its foundations. The sight of tombstones, skulls, bones, and even coffins and their contents, sliding down a sandy slope into the river below, is one that is not easily forgotten. A few *Helix aspersa* still live in this desecrated spot, rabbits burrow beneath the remaining head-stones, and the cattle use as a "rubbing-post" the end of a coffin, which projects from the face of the sandy cliff.

## ERRIS.

Almost the entire district is heavily peat-covered, and were it not for the small patches of native scrub along some of the river courses—as at Glencastle, a wild pass on the lonely road between Belmullet and Bangor—and the sandy areas along parts of the coast, the list for this division of the county would be a meagre one indeed. In these small areas of woodland, a typical “western” fauna is always to be found. That along the shore of Bellaghragher Bay, about a mile north of Mulranny, proved to be one of the most interesting sanctuaries met with during the survey, and here several species occurred which were not met with elsewhere in Erris. The chief species of interest occurring at Bellaghragher are *Limax maximus*, *Zonitoides excavatus*, *Punctum pygmaeum*, *Hygromia fusca*, *Acanthinula lamellata*, *Balea perversa*, *Pupa anglica*, and *Vertigo substriata*. At Glencastle the main feature was the extraordinary abundance of *Hyalinia nitidula*, which, though generally distributed throughout West Mayo, is not often really common.<sup>1</sup>

Quite a different fauna exists along the shores of Achill Sound at Curraun village. Here sand-dunes and dry stony ground form the chief features, and *Vallonia pulchella*, *Helicella itala*, *H. intersecta*, *Helix aspersa*, and *H. nemoralis* occur in thousands. Of the last-mentioned many remarkable varieties were taken by our party in September, 1909. On the Boulder-clay cliffs which face towards the south, a colony of var. *roseozonata* was discovered, living and resting under the leaves of the Colt's-foot (*Tussilago Farfara*) and apparently feeding on the orange fungus which attacks the leaves of this plant. Among the band-formula variations, 12000, 12300, 12034, 00345, and 00305 may be mentioned, while the fourth and fifth bands in many examples showed a tendency to split into a number of hair-like streaks. (Plate II, fig. 52.) The fresh-water fauna of the district is almost *nil*, streams, peat-holes, and drains forming the only habitats throughout the greater portion of it. In Carrowmore Lough *Physa fontinalis*—a small stunted form—was taken, this large lake appearing to be its most westerly habitat in this neighbourhood. Some interesting dwarf forms of *Limnaea pereger* occur, but the most peculiar is that living in Carrowmore Lough. This is of a commonplace lacustrine form in shape, but is so beautifully and evenly striated that its surface has a distinctly silky appearance in a strong light.

Owing to the great extent of this district and the little time available for its survey, the absentees from the following list need not be commented upon,

<sup>1</sup> I have on several occasions noted that in places where *H. nitidula* was common, *H. cellaria* was absent, but this may have been merely a coincidence.

with the possible exception of *Helicella barbara* and *Hygromia hispida*. The latter must occur somewhere in the area, but is evidently not common; and the former, though undoubtedly absent from the sandy shores about Curraun, probably occurs further north along the shore of Blacksod Bay. The fresh-water list is, I think, possibly complete or almost so. The letters B, C, G, and M following the name of a species denote that it was found at Ballaghcragher Bay, Curraun, Glencastle, or Carrowmore Lough respectively. Those not followed by any letters are generally distributed.

*List of Mollusks of Erris.*

<i>Limax maximus</i> , B.	<i>Hygromia fusca</i> , B.
<i>L. arborum</i> .	<i>Helix aspersa</i> .
<i>Agriolimax agrestis</i> .	<i>H. nemoralis</i> .
<i>A. laevis</i> , C, M.	<i>Cochlicopa lubrica</i> .
<i>Milax gagates</i> , C.	<i>Pupa anglica</i> .
<i>Vitrina pellucida</i> .	<i>P. cylindracea</i> .
<i>Hyalinia cellaria</i> , C, B.	<i>Vertigo antivertigo</i> , C.
<i>H. alliaria</i> .	<i>V. pygmaea</i> , B, C.
<i>H. nitidula</i> .	<i>V. substriata</i> , B.
<i>H. pura</i> .	<i>Clausilia bidentata</i> .
<i>H. radiatula</i> .	<i>Balea perversa</i> , B, G.
<i>H. crystallina</i> .	<i>Carychium minimum</i> .
<i>Euconulus fulvus</i> .	<i>Limnaea pereger</i> .
<i>Zonitoides nitidus</i> , M.	<i>L. palustris</i> , M.
<i>Z. excavatus</i> , B, C.	<i>L. truncatula</i> .
<i>Arion ater</i> .	<i>Physa fontinalis</i> , M.
<i>A. subfuscus</i> .	<i>Ancylus fluviatilis</i> (Srahna-
<i>A. intermedius</i> .	manragh Bridge).
[ <i>A. hortensis</i> (near houses only).]	<i>Planorbis spirorbis</i> , C.
<i>A. circumscriptus</i> .	<i>Pisidium subtruncatum</i> , M.
<i>Punctum pygmaeum</i> , B.	<i>P. casertanum</i> .
<i>Sphyradium edentulum</i> , B.	<i>P. obtusale</i> , M.
<i>Pyramidula rotundata</i> .	<i>P. nitidum</i> , M.
<i>Helicella itala</i> , C.	<i>P. personatum</i> , C.
<i>H. intersecta</i> , C.	<i>P. pusillum</i> , M.
<i>Acanthinula lamellata</i> , B.	<i>P. milium</i> , B.
<i>Vallonia pulchella</i> , C.	



THE HIGH GROUNDS OF CURRAUN, CROAGHPATRICK, AND MWEELREA,  
AND THE DOOLOUGH VALLEY.

Judging by the fauna of the cliffs of Croaghmore on Clare Island, where at an elevation of 1000 feet we find twenty-seven species of mollusca, it cannot be due to altitude that the districts now under consideration yield such poor lists. This poverty is, I fancy, due rather to the enormous accumulation of peat upon these mountainous areas. Perpendicular cliffs are few owing to the smoothing action of the former ice-covering, and where these exist, as on the northern face of Croaghpatrick, the crumbling nature of the rocks renders them unsuited to molluscan life. The fact that all these mountains are composed of non-calcareous rocks also militates against the compilation of a long list of species. In order to survey satisfactorily such a district as the present one, a great deal of time and labour would have to be given up to the work. This I was not able to do, but I consider that it is best to publish the somewhat meagre list which I have compiled. This consists of twelve species only, and is the result of four laborious days' work, none of which, however, were at the most suitable seasons. Twenty-two species known to occur in the Doolough valley are included also, as this locality is completely isolated from the adjoining districts by high ground or peaty areas.

In the following list, C signifies that the species was found on Curraun Mt., P on Croaghpatrick, M on Mweelrea and its neighbours, and D in the Doolough Valley. With the exception of those from the last area, all specimens were collected above 500 feet altitude.

*List of species found in the mountainous areas.*

- |                         |                               |
|-------------------------|-------------------------------|
| Limax arborum, P.       | A. intermedius, P.            |
| Agriolimax agrestis, D. | Punctum pygmaeum, D.          |
| A. laevis, P.           | Sphyradium edentulum, D.      |
| Vitрина pellucida, D.   | Cochlicopa lubrica, D.        |
| Hyalinia alliaria, D.   | Pupa anglica, M, D.           |
| H. nitidula, D.         | P. cylindracea, D.            |
| H. pura, D.             | Vertigo pygmaea, D.           |
| H. radiatula, D.        | V. substriata, D.             |
| H. crystallina, P, D.   | Limnaea pereger, M, D.        |
| Euconulus fulvus, D.    | L. truncatula, M.             |
| Zonitoides nitidus, D.  | Ancylus fluviatilis, C, D.    |
| Z. excavatus, D.        | Pisidium personatum, D, M.    |
| Arion ater, C, D, P.    | P. casertanum, C.             |
| A. subfuscus, C.        | Margaritana margaritifera, D. |

The last-mentioned species was taken some years ago in quantity by Mr. Welch in the Bundorragha River between Doolough and the sea; it has not otherwise been reported from West Mayo, except in the adjoining Erriff Valley. Mr. Welch is responsible for the majority of the Doolough species, as he is the only collector who has worked that area.

The most interesting of the species in the above list is the small dark alpine form of *L. arborum* which abounds all over Croaghpatrick, even to the very summit, an elevation of 2,510 feet. Attention seems to have been first drawn to this interesting form of the present slug by Dr. Scharff<sup>1</sup> who took almost black specimens at considerable altitudes on Macgillicuddy's Reeks in Kerry, during the year 1899. This variety is not, however, confined to the mountainous areas of the west, as it occurs on Knockdhu, Co. Antrim, associated with arctic or alpine plants such as *Arenaria verna* and *Dryas octopetala*, at an altitude of about 900 feet.

#### CLEW BAY AND CASTLEBAR LIMESTONE AREA.

Nowhere in Ireland will the study of the local distribution of the fresh-water mollusca prove more fascinating than in a district situated on the fringe of the central faunal area.

In some instances, as in West Mayo, this corresponds with the edge of the central limestone plain; in other districts, as in the north-east of Ireland, this is not the case. In the latter part of the country many members of the central fauna occupy the greater part of Co. Down, as well as the basins of the Rivers Bann (Lough Neagh, and Lagan. Thus what at first glance would appear to be due to the influence of the limestone evidently cannot be put down entirely to that source. Nevertheless, where limestone areas and non-calcareous and peat-covered ones are contiguous, the line of demarcation of the central fauna is more strongly marked. This is shown clearly in the district under consideration, and a detailed survey of the lakes and rivers between Castlebar and Clew Bay should prove intensely interesting. Even by the time the boundary of West Mayo is crossed at Castlebar many of the central species have vanished;<sup>2</sup> among which *Planorbis umbilicatus*, *P. carinatus* and *P. vortex* are most noticeable.

One species—*Neritina fluviatilis*—still common at Castlebar, does not seem to cross the watershed between this and the basin of the Carrowbeg;

<sup>1</sup> See Scharff and Carpenter, *Irish Nat.*, viii, 213-218.

<sup>2</sup> The district between Castlebar and the River Shannon is perhaps the least known area in Ireland, and it is not possible to give at present the exact boundary of these central species. It is possible that some of them do not occur westward of the Shannon basin.

but all the remaining central species found at Castlebar occur also in the Clew Bay area. Westward of this they are conspicuous by their absence, except in the coastal lakes south of Louisburgh, where some of them make their reappearance. That these outliers once upon a time lived in direct communication with the main body is perhaps possible.

The sudden disappearance of the members of the central fauna, as one proceeds from Newport towards Mulranny, has been commented upon by J. G. Milne (Journal of Conch., vi, 412-421, 1891), and is worthy of notice. Thus, my list for Creevaghau Lough comprises (besides universally distributed species such as *L. pereger*) *A. hypnorum*, *Pl. albus*, *P. crista*, *P. fontanus*, *V. cristata*, *B. tentaculata*, *S. corneum*, *P. obtusale*, *P. pusillum*, and *P. milium*; that from Dougan Lough, *L. stagnalis* (a peculiarly stunted form), *Pl. albus*, *P. contortus*, *P. spirorbis*, *B. tentaculata*, *V. cristata*, *P. casertanum*, *P. lilljeborgi*, and *P. milium*; while from Lough Arrow,<sup>1</sup> collected by F. Balfour Browne, I have *A. hypnorum*, *P. fontinalis*, *Pl. contortus*, *P. fontanus*, *B. tentaculata*, and *S. corneum*. All these lakes lie to the east or south of Newport, and contain a curious mixture of central and western shells. With the exception of *P. contortus*, which occurs in a small lakelet near Burrishoole Abbey, none of the central species has been reported west of Newport; and Bunnamucka Lough, a small lake near Rosturk, contains only *L. pereger*, *L. truncatula*, *Pl. crista*, and *P. milium*, *P. subtruncatum*, and *P. pusillum*, which, if *L. palustris* and *P. glaber* were present, might be looked upon as a typical fauna for a small western lake.

In the southern part of the district the local distribution of the central members of the fresh-water fauna is similar to that around Newport, as eight of these occur in the Carrowbeg at Westport, and none in the 18 miles of country which lie between this town and the nearest of the Louisburgh lakes. The problem which requires to be solved in connexion with these species is whether they have once had a wide western distribution and have since retired to the central plain, or whether they have endeavoured to spread from the central plain in post-Glacial times? The finding of deposits underlying the peat-bogs might solve this, and it is to be regretted that the study of these deposits has been greatly neglected.

The terrestrial species of the central type are, in this district, limited to three—*Pyramidula rupestris*, *Hygromia rufescens* (probably introduced by man), and I include *Succinea putris*—these exhibit a local distribution somewhat similar to the fresh-water species of the group. The two former

<sup>1</sup> This must not be confounded with the larger L. Arrow in Co. Sligo.

are abundant in the environs of Westport, and as far west as Murrisk; while *H. rufescens* is found near houses as far north as Newport, and sparingly by the roadside at Mulranny, where the roads to Ballycroy and Achill part. South of Clew Bay all three species live near the harbour at Old Head, upon the extreme edge of this district, the boundary of which I have extended so as to include their habitats. Here *S. putris* occurs sparingly by the side of the small stream which flows from the woods, and appears on the verge of extinction. *P. rupestris* and *H. rufescens*<sup>1</sup> are to be found among limestone boulders near the old lime-kiln, associated with one of the rarest of West Mayo land-shells, *Vallonia costata*. The limestone appears to have been taken from the Boulder-clays forming the cliffs which face the bay some distance to the east. The upper surface of this Boulder-clay probably marks the post-Glacial level of the land, where Clew Bay now is. Thus it is possible that the ancestors of these shells inhabited an area of land, which has since been destroyed by the inroads of the sea. This idea is strengthened by the fact that *P. rupestris* occurs on Dorinish, one of the many islands which stud the bay, and the only one upon which land-shells have been collected. The semi-marine species which I include in my list are three in number. *Paludestrina stagnalis* is abundant round all parts of the bay (see Nathaniel Colgan's report on the Marine Mollusca, Part XXII); *P. ventrosa* was brought to me by F. Balfour Browne from the salt-marsh below Mulranny; while *Phytia myosotis* is no doubt common in many places, as it occurred south of Newport, in the only habitat in which I searched for it. The following is a full list of species so far found in the district. C signifies that the species was found near Castlebar, W near Westport, N near Newport, M (Murrisk) between Westport and Old Head, and B (Burrishoole) that it occurred between Newport and Mulranny. Those species unmarked may be taken as generally distributed in the district.

*List of Mollusks of the Clew Bay and Castlebar Areas.*

Limax maximus, W, B, C.	A. laevis.
L. arborum.	[Milax sowerbyi, <sup>2</sup> W, B, M.]
Agriolimax agrestis.	M. gagates, W, B.

<sup>1</sup> *H. rufescens* probably owes its origin here to man's interference, and is surely an "escape" from a former cottage-garden, situated close by. The other species are certainly native.

<sup>2</sup> Since *Milax sowerbyi*, *Arion hortensis* and *Hygromia rufescens* are confined to the neighbourhood of habitations, it is impossible to say whether they are "native" or only "naturalized." Their standing is therefore given as \* \* \* in the table at the end of this report. In the south-east of England *H. rufescens* lives in uncultivated areas, but I have no record of its being found in Ireland under such circumstances. *Arion hortensis* is certainly native in many parts of eastern and central Ireland; but in the west it appears to be just making its appearance. Many old records for this slug should in all probability be referred to the dark-grey form of *A. intermedius* Normand.

<i>Vitрина pellucida.</i>	<i>Succinea putris</i> , W, M.
<i>Hyalinia cellaria.</i>	<i>S. pfeifferi</i> , C.
<i>H. alliarda.</i>	<i>Carychium minimum.</i>
<i>H. nitidula.</i>	<i>Phytia myosotis</i> , N.
<i>H. pura</i> , B, M.	<i>Ancylus fluviatilis</i> , M, C.
<i>H. radiatula.</i>	<i>Limnaea auricularia</i> , C.
<i>H. crystallina.</i>	<i>L. pereger.</i>
<i>Euconulus fulvus.</i>	<i>L. stagnalis</i> , C, N.
<i>Zonitoides nitidus.</i>	<i>L. palustris.</i>
<i>Arion ater.</i>	<i>L. truncatula.</i>
<i>A. subfuscus.</i>	<i>Planorbis albus</i> , W, N, C.
<i>A. intermedius.</i>	<i>P. crista</i> , M, N, C.
[ <i>A. hortensis</i> , <sup>1</sup> W.]	<i>P. spirorbis</i> , M, N, W.
<i>A. circumscriptus</i> , W, B.	<i>P. contortus</i> , W, N, C.
<i>Punctum pygmaeum</i> , M, C.	<i>P. fontanus</i> , N, C.
<i>Sphyradium edentulum</i> , W, B.	<i>Physa fontinalis</i> , W, N, C.
<i>Pyramidula rupestris</i> , W, M, C.	<i>Aplecta hypnorum</i> , N.
<i>P. rotundata.</i>	<i>Paludestrina stagnalis</i> , W, M, N, B.
<i>Helicella itala.</i>	<i>P. ventrosa</i> , B.
<i>H. intersecta</i> , W, B.	<i>Bithynia tentaculata</i> , W, N, C.
<i>Hygromia hispida.</i>	<i>Valvata piscinalis</i> , W, C.
[ <i>H. rufescens</i> , <sup>1</sup> W, N, M, B, C.]	<i>V. cristata</i> , W, N.
<i>Acanthinula aculeata</i> , C.	<i>Neritina fluviatilis</i> , C.
<i>Vallonia pulchella</i> , C.	<i>Anodonta cygnea</i> , W.
<i>V. costata</i> , M.	<i>Sphaerium corneum</i> , W, N, C.
<i>Helix aspersa.</i>	<i>Pisidium subtruncatum.</i>
<i>H. nemoralis.</i>	<i>P. pulchellum</i> , W.
<i>Cochlicopa lubrica.</i>	<i>P. casertanum.</i>
<i>Pupa anglica</i> , W, M, C.	<i>P. obtusale.</i>
<i>P. cylindracea.</i>	<i>P. nitidum.</i>
<i>Vertigo antivertigo.</i>	<i>P. pusillum.</i>
<i>V. substriata</i> , M, B.	<i>P. personatum.</i>
<i>V. pygmaea.</i>	<i>P. milium.</i>
<i>Balea perversa</i> , W, M.	<i>P. lilljeborgi</i> , N.
<i>Clausilia bidentata.</i>	

Some examples of *Hygromia rufescens* collected in the environs of Westport show distinct traces of the quinquefasciation characteristic of many *Helices*. (Plate II, fig. 43.)

<sup>1</sup> See note 2 on previous page.

Some common species are absent from the above list. This is, no doubt, due to insufficient work, as I was unable to devote much time to this district.

#### 9. ALTIDUDINAL DISTRIBUTION OF SPECIES.

No great amount of work has been done in this direction by British conchologists, but several interesting papers dealing with it have nevertheless been published.<sup>1</sup>

From a purely conchological point of view, a day's work which perhaps only yields *Arion ater*, *Limax arborum*, and a severe drenching in mist, might be considered unproductive. I can express from experience a feeling of sympathy with those who regard the subject from that point of view, but if a list of a dozen or more species can be compiled at an elevation of a thousand feet above the sea, the interest attached to such should amply compensate one for the exertions expended. A complete list of the mollusca found in Ireland at an altitude over 1,000 feet will, I think, be found closely to resemble a list of the molluscan fauna of the western islands, with this difference, that the xerophytic species will be absent. These xerophiles being all southern species, or having their headquarters in the south of Europe, it might be imagined that this "alpine" list would include only northern species. This is, however, not the case, as a fair proportion of those mollusks met with on our mountain-tops are typical Lusitanians. Thus *Milax gagates* lives on the summit of Brandon in South Kerry, one of the few mountains in Ireland which exceed 3,000 feet in height. Dr. Scharff has pointed out<sup>2</sup> that the members of the genus *Arion* are Lusitanians, yet three of the five species found in Ireland are almost universally met with on our highest mountains.

Confining ourselves to the district included in the Clare Island Survey, we find that suitable habitats for mollusca, at an altitude exceeding 1,000 feet, are few in number and restricted in area. Moreover, the mountains being almost entirely composed of non-calcareous rocks, smoothed by glaciation, and covered with accumulations of peat, our alpine list would be small indeed were it not for the great sea-cliff of Croaghmore on Clare Island. Except for the two species of *Pisidia* in the following list, and *Ancylus fluvialis*, all are

<sup>1</sup> Scharff and Carpenter: "Some Animals from the Magillicuddy's Reeks." *Irish Nat.*, viii, 213-218. 1899. W. Harcourt-Bath: "On the vertical and bathymetrical distribution of the non-marine mollusca, with special reference to the Cotteswold fauna." *Zoologist* (4), xiii, 41-53. 1909.

<sup>2</sup> *European Animals*, p. 90.

to be found in this one locality. In the following table all species which have been recorded as occurring at an altitude of 750 feet or more in West Mayo are listed.

*List of Species found above 750 feet altitude :—*

SPECIES.	750 to 1,000	1,000 to 1,250	1,250 to 1,500	1,500 to 2,000	2,000 to 2,500	2,500 upwards.
<i>Limax arborum.</i>	×	×	×	×	×	×
<i>Agriolimax agrestis.</i>	×	×	×	—	—	—
<i>Milax gagates.</i>	×	—	—	—	—	—
<i>Vitrina pellucida.</i>	×	×	×	—	—	—
<i>Hyalinia alliaria.</i>	×	×	×	—	—	—
<i>nitidula.</i>	×	×	×	—	—	—
<i>pura.</i>	×	×	×	—	—	—
<i>radiatula.</i>	—	×	—	—	—	—
<i>crystallina.</i>	×	×	×	—	—	—
<i>Euconulus fulvus.</i>	×	×	—	—	—	—
<i>Arion ater.</i>	×	×	×	×	×	—
<i>subfuscus.</i>	×	×	×	×	—	—
<i>intermedius.</i>	×	×	×	×	—	—
<i>Punctum pygmaeum.</i>	×	×	—	—	—	—
<i>Sphyradium edentulum.</i>	×	×	×	—	—	—
<i>Pyramidula rotundata.</i>	×	×	×	—	—	—
<i>Hygromia fusca.</i>	×	×	×	—	—	—
<i>Acanthinula aculeata.</i>	×	×	×	—	—	—
<i>lamellata.</i>	×	×	—	—	—	—
<i>Cochlicopa lubrica.</i>	×	×	×	—	—	—
<i>Pupa anglica.</i>	×	×	×	—	—	—
<i>cylindracea.</i>	×	×	×	—	—	—
<i>Vertigo substriata.</i>	×	—	—	—	—	—
<i>Balea perversa.</i>	×	—	—	—	—	—
<i>Clausilia bidentata.</i>	×	×	×	—	—	—
<i>Carychium minimum.</i>	×	×	×	—	—	—
<i>Limnaea truncatula.</i>	×	×	×	—	—	—
<i>Ancylus fluviatilis.</i>	×	—	—	—	—	—
<i>Acicula lineata.</i>	×	×	×	—	—	—
<i>Pisidium casertanum.</i>	×	—	—	—	—	—
<i>personatum.</i>	×	×	×	—	—	—

*Limax arborum* heads the above list in two senses, as it occurs from sea-level to the summit of Croaghpatrick (2,510 feet), the highest altitude at which I have collected in West Mayo. Several species just fail to reach the 750-foot contour-line, so far as my experience has gone. Thus on Clare Island *V. pygmaea*, *V. antivertigo*, and *Z. excavatus* live as high as 600 feet on the shoulder of Croaghmore, above the Signal Tower, while *A. laevis* was taken on Knocknaveen at about 500 feet altitude; and on the mainland this slug was noted on Croaghpatrick at about the same elevation. *Limnaea pereger* was collected in Lough Alisheen (650 feet altitude) among the Mweelrea mountains, by F. Balfour Browne, this being the highest lake in which, up to the present, it has been observed in the district. The remainder of the species occurring in West Mayo are apparently confined to the low-lying parts of the county and the sea-coast, few of them probably living above an altitude of 250 feet.

## 10. RECENT OR HOLOCENE DEPOSITS.

### SAND-DUNE DEPOSITS.

Small deposits of shells occur in sand at Dooaghtry and on Clare Island and Achill Island. None of these, however, appear to be of any great age, and except on Inishbofin, where there is a fine section, nothing approaching the great sand-hill deposits of Dog's Bay,<sup>1</sup> or the north of Ireland,<sup>2</sup> has been found in the districts surveyed.

In the section exposed along the shore of the Harbour on Clare Island Mr. Welch has obtained *Helicella itala*, *Vallonia pulchella*, and *Cochlicopa lubrica*, while in a section at Dooaghtry the same collector found *H. itala*, *C. lubrica*, *Limnaea pereger*, and *L. truncatula*. The latter deposit had clearly been formed at the bottom of a small lake or pool, which had, at some subsequent date, been filled up with blown sand. It is quite possible that, owing to the destruction of the greater part of the Dooaghtry dunes during the last hundred years by westerly winds, many deposits have been destroyed. Nevertheless, around the ancient graveyard, where a small area of the original dunes remains and good sections are to be seen facing the river-course, I was unable to find any shells except *Helix aspersa* and *H. nemoralis*. These occurred in the upper layers, associated with the bones and teeth of various animals, and had evidently been used for human food. From the deposits at Dugort, Achill Island,

<sup>1</sup> See R. D. Darbishire on "Land Shells at Dog's Bay, Connemara." *Journal of Conch.*, iv, 317. 1885.

<sup>2</sup> R. J. Welch: *Irish Nat.*, vii, 77-82. 1898. *Ibid.*, xviii, 113. 1909.



J. G. Milne (Journal of Conchology, vi, 412-421) lists six species, all of which are still living in the neighbourhood, although at that time some had not been found alive. It is quite possible that none of the above deposits are of even prehistoric age, for the kitchen-middens at Dugort are still being augmented by the refuse from the native village. I use the word "native" in contradistinction to the newer village known locally as "The Colony."

The deposit which occurs on Inishbofin, opposite Inishlyon, and close to Carricknamoyla, is of greater interest than any of the foregoing, and seems to be of considerable antiquity. Many sand-dunes may, however, have been formed and been obliterated upon this spot before the present series came into existence; thus the fact that the lower beds in some cases are within eighteen inches of the underlying Boulder-clay does not help us to determine the age of the deposit.

In this section, which is clearly divided into strata, I have found the following shells:—

*Section of the deposit on Inishbofin and list of the shells found in it.*

*Stratum E.*—This bed appeared to be quite recent and to be still forming at the surface. It contained *H. nitidula* (frequent), *H. itala* (common), *H. barbara* (f.), *V. pulchella*?<sup>1</sup> *V. costata*?<sup>1</sup> *H. hispida* (rare), *H. nemoralis* (r.), *C. lubrica* (f.), and *C. bidentata* (very rare).

*Stratum D.*—Only a local deposit, and was mainly composed of marine shells. Possibly a portion of a kitchen-midden.

*Stratum C.*—*H. alliaria*, *H. nitidula*, *H. pura*, *P. pygmaeum*, *P. rotundata*, *A. aculeata*, *V. pulchella*?<sup>1</sup> *V. costata*?<sup>1</sup> *H. hispida*, *H. nemoralis*, *C. lubrica*, *P. anglica*, *P. cylindracea*, *P. muscorum*, *C. bidentata*, *V. substriata*, and *C. minimum*.

*Stratum B.*—Contained *H. itala* (scattered), *C. lubrica* (scattered), and *P. muscorum* (in a distinct zone).

*Stratum A.*—This consisted of fine blown sand and appeared to contain no shells.

*Helix aspersa*, although the commonest living species in the immediate neighbourhood, did not appear in any part of the deposit. Of *P. muscorum*, the *Valloniae*, *H. hispida* and *C. bidentata*, found in the deposit, three were not

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<sup>1</sup> *Vallonia costata* was not recognized until I returned to Belfast, and by that time I had mixed the shells that came from the various strata. I cannot be sure, therefore, that both species of *Vallonia* occurred in Strata C and E. It is quite possible that one may have occurred in C, while the other may only have been taken from E or *vice versa*.

taken alive in this part of the island, and *V. costata* and *P. muscorum* are not now known to live on the island at all. The occurrence of *V. costata* in this deposit is of particular interest, for not only has this species not been found alive on Inishbofin, but it has not previously been found on any of the outlying islands off the Irish coast. In fact, the only "island" that it has been taken on—Cruit Island in West Donegal—is connected to the mainland at low-water by a broad stretch of sand. Were it not for the fact, however, that *V. pulchella* is a common resident on these islands, the distribution of its ally would not be of any special interest.

#### SHELL-MARLS.

Throughout central Ireland few districts will be found which do not contain deposits of marl. This material is a fine creamy substance formed at the bottoms of lakes by decaying vegetation (species of *Chara* predominating), shells, other organisms, and particles of calcareous matter. In the district here dealt with there exist near Castlebar and Westport extensive deposits of this material; but no information is to hand of the shells contained in them. That on the shore of Lakelands Lough near Manulla Junction, in East Mayo, was examined in November, 1911, by R. Ll. Praeger and myself. Owing to artificial drainage the level of this lake, like many others throughout the central counties, has been lowered. At the time of our visit the lake was slightly flooded, but was yet some four or five feet below its old level, which was marked by a distinct beach composed of Carboniferous limestone-boulders. Thus the marl was exposed on the flat foreshore, and its upper surface was in places some 12 inches above the level of the water in the lake. In some places the marl was covered by peat to a depth of about 2 feet. At the junction of the peat and the marl there was in places a band formed of the compressed rhizomes of *Phragmites*. Two holes were dug, and samples of the marl from five different levels were obtained, the lowest sample being from a depth of about 5 feet. The depth of the deposit we were unable to ascertain; it was, however, at least 9 feet deep in places. Millions of shells lie around the present margin of the lake, the majority of which are derived from the underlying marl, but these are mixed with many shells only recently dead.

Among the drift were several species not obtained from the samples of marl, the fauna of which proved to be very poor.

The list of shells obtained in the drift-material is as follows:—

*Zonitoides nitidus*, *Succinea pfeifferi*, *Limnaea pereger*, *L. palustris*, *L. stagnalis*, *L. truncatula*, *Planorbis albus*, *P. contortus*, *Valvata piscinalis*, *V. cristata*, *Bithynia tentaculata*, and *Pisidium pusillum*.

The shells obtained in the samples of marl were:—*Limnaea pereger*, *L. palustris*, *L. stagnalis*, *Valvata cristata*, *Bithynia tentaculata*, and *Pisidium pusillum*.

Of these last only a single specimen of *L. palustris* was found, in a sample from a depth of 2 feet; one each of *V. cristata* and *L. stagnalis* (very young), at a depth of 5 feet; while the remaining species were common in all the samples taken.

At least fifteen per cent. of the shells collected in the flood débris of the lake belonged to *V. piscinalis*; yet the species did not appear in any of the samples of the marl examined.

As no great change in the fauna appears to have taken place in the district, comments on the above lists are unnecessary; and the fact that certain species were present in the drifted material and yet absent from the samples of marl may be due to chance.

The fauna represented in the combined lists would be typical of that found living in many small lakes in this district, but the apparent absence of *Sphaerium corneum*, *Physa fontinalis*, and *Pisidia* (other than *P. pusillum*) is strange.

[TABLE OF DISTRIBUTION.

II. TABLE SHOWING LOCAL DISTRIBUTION OF SPECIES.

LIST OF SPECIES.	Symbols used <sup>1</sup>										Standing in the district according to Fraeger's formula, see p. 11.			
	Clare Island.	Achill Island.	Inishurk.	Gaber Island.	Inishboinn.	The Mullt.	Erris.	Louisburgh.	Curran Mt.	Mweetra.		Croaghpatrick.	Doolough Valley.	Clew Bay and Castlebar.
<i>Limax maximus</i> L., . . . . .	C	A	—	—	B	M	E	L	C	M	P	D	C	NNN and ***
<i>cinereus-niger</i> Wolf, . . . . .	C	—	—	—	—	—	—	—	—	—	—	—	—	NNN
<i>flavus</i> L., . . . . .	—	—	T	—	—	—	—	—	—	—	—	—	—	***
<i>arborum</i> , <i>Bouch.-Chaut.</i> , . . . . .	C	A	T	C	B	—	E	L	—	—	P	—	C	NNN
<i>Agriolimax agrestis</i> (L.), . . . . .	C	A	T	C	B	M	E	L	—	—	—	D	C	" and NN *
<i>laevis</i> (Müll.), . . . . .	C	A	T	C	B	M	E	L	—	—	P	—	C	NNN
<i>Milax sowerbyi</i> (Fér.), . . . . .	—	A	—	—	—	—	—	—	—	—	—	—	C	***
<i>gagates</i> (Drap.), . . . . .	C	A	T	C	B	—	E	L	—	—	—	—	C	NNN and NN *
<i>Vitrina pollucida</i> (Müll.) . . . . .	C	A	T	C	B	M	E	L	—	—	—	D	C	NNN
<i>Hyalina cellaria</i> (Müll.), . . . . .	C	A	T	C	B	—	E	L	—	—	—	—	C	" and NN *
<i>alliaria</i> (Müller), . . . . .	C	A	T	C	B	M	E	L	—	—	—	D	C	NNN
<i>nitidula</i> (Drap.), . . . . .	C	A	T	C	B	—	E	L	—	—	—	D	C	"
<i>pura</i> (Alder), . . . . .	C	A	T	C	B	—	E	L	—	—	—	D	C	"
<i>radiatula</i> (Alder), . . . . .	C	A	T	C	B	M	E	L	—	—	—	D	C	"
<i>crystallina</i> (Müll.), . . . . .	C	A	T	C	B	M	E	L	—	—	P	D	C	"
<i>Zonitoides nitidus</i> (Müll.), . . . . .	C	A	T	—	—	—	E	L	—	—	—	D	C	"
<i>excavatus</i> (Beauv.), . . . . .	C	A	T	—	B	—	E	L	—	—	—	D	—	"
<i>Eucornutus fulvus</i> (Müll.), . . . . .	C	A	T	C	B	M	E	L	—	—	—	D	C	"
<i>Arion ater</i> (L.), . . . . .	C	A	T	C	B	M	E	L	C	—	P	D	C	"
<i>subfuscus</i> (Drap.), . . . . .	C	A	T	—	B	M	E	L	C	—	—	—	C	"
<i>intermedius</i> Normand, . . . . .	C	A	T	C	B	M	E	L	—	—	P	—	C	"
<i>leucostictus</i> Fér., . . . . .	C	A	—	—	—	—	E	L	—	—	—	—	C	***

<i>Pygmaeum pygmaeum</i> ( <i>Drap.</i> ),	C	A	T	—	B:	M	E	L	—	—	—	D	C	NNN
<i>Sphyradium edentulum</i> ( <i>Drap.</i> ),	C	A	—	—	B	—	E	L	—	—	—	D	C	"
<i>Pyramidula rupestris</i> ( <i>Inap.</i> ),	—	—	—	—	—	—	—	—	—	—	—	—	—	"
<i>rotundata</i> ( <i>Müll.</i> ),	C	A	T	C	B	—	E	L	—	—	—	—	C	"
<i>Helicella itala</i> ( <i>L.</i> ),	C	A	T	C	B	M	E	L	—	—	—	—	C	"
<i>intersecta</i> ( <i>Poirét</i> ),	C	—	—	—	—	M	E	L	—	—	—	—	C	"
<i>barbara</i> ( <i>L.</i> ),	—	A	—	—	B	—	—	—	—	—	—	—	—	"
<i>Hygromia fusca</i> ( <i>Mont.</i> ),	C	A	—	—	—	—	E	L	—	—	—	—	C	"
<i>hispida</i> ( <i>L.</i> ),	C	A	—	—	B	M	—	L	—	—	—	—	C	"
<i>rufescens</i> ( <i>Fenant</i> ),	—	A	—	—	—	—	—	—	—	—	—	—	C	***
<i>Acanthinula aculeata</i> ( <i>Müll.</i> ),	C	—	—	—	B <sup>2</sup>	—	—	L	—	—	—	—	C	NNN
<i>lamellata</i> ( <i>Jeffreys</i> ),	C	—	—	—	—	—	E	L	—	—	—	—	—	"
<i>Vallonia pulchella</i> ( <i>Müll.</i> ),	C	A	—	C	B	M	E	L	—	—	—	—	C	"
<i>costata</i> ( <i>Müll.</i> ),	—	—	—	—	B <sup>2</sup>	M	—	—	—	—	—	—	C	"
<i>Helix aspersa</i> <i>Müll.</i> ,	C	A	T	C	B	M	E	L	—	—	—	—	C	"
<i>nenoralis</i> <i>Müll.</i> ,	C	A	T	—	B	M	E	L	—	—	—	—	C	"
<i>Cochlicopa lubrica</i> ( <i>Müll.</i> ),	C	A	T	C	B	M	E	L	—	—	—	D	C	"
<i>Pupa anglica</i> ( <i>Fér.</i> ),	C	A	T	C	B	—	E	L	M	—	—	D	C	"
<i>cylindracea</i> ( <i>Da Costa</i> ),	C	A	T	C	B	M	E	L	—	—	—	D	C	"
<i>muscorum</i> ( <i>L.</i> ),	—	—	—	—	B <sup>2</sup>	—	—	—	—	—	—	—	—	"
<i>Vertigo antiverigo</i> ( <i>Drap.</i> ),	C	A	T	C	B	M	E	L	—	—	—	—	C	"
<i>substriata</i> ( <i>Jeffreys</i> ),	C	A	T	C	B	—	E	L	—	—	—	D	C	"
<i>pygmaea</i> ( <i>Drap.</i> ),	C	A	T	C	B	M	E	L	—	—	—	D	C	"
<i>angustior</i> <i>Jeffreys</i> ,	—	—	—	—	—	—	—	L	—	—	—	—	—	"

<sup>1</sup> Records founded on specimens which are considered to have been doubtfully native are shown in italics, thus, *C. A.*, &c.  
<sup>2</sup> Occurred only as a fossil.

TABLE SHOWING LOCAL DISTRIBUTION OF SPECIES—continued.

LIST OF SPECIES.	Symbols used <sup>1</sup>										Standing in the district according to Praeger's formula, see p. 11.		
	Clare Island.	Achill Island.	Inishturk.	Caher Island.	Inishbohn.	The Mullet.	Erris.	Louisburgh.	Curraun Mt.	Mweelrea.		Croaghpatrick.	Doolough Valley.
<i>Balea perversa</i> (L.), . . . . .	C	—	—	—	B	—	E	L	—	—	—	—	C
<i>Clausilia bidentata</i> (Strom), . . . . .	C	A	T	—	B	—	E	L	—	—	—	—	C
<i>Succinea putris</i> (L.), . . . . .	—	—	—	—	—	M	—	L	—	—	—	—	C
<i>pfeiferi</i> Rossm., . . . . .	C	A	—	—	—	—	—	L	—	—	—	—	C
<i>oblonga</i> Drap., . . . . .	—	—	—	—	—	—	—	L	—	—	—	—	—
<i>Carychium minimum</i> Müll., . . . . .	C	A	T	C	B	M	E	L	—	—	—	—	C
<i>Phytia myosotis</i> (Drap.), . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	C
<i>Ancylus fluviatilis</i> Müll., . . . . .	C	A	T	—	—	—	E	L	C	—	—	D	C
<i>Limnaea auricularia</i> (L.), . . . . .	—	A	—	—	—	—	—	L	—	—	—	—	C
<i>peregr</i> (Müll.), . . . . .	C	A	T	C	B	M	E	L	—	M	—	D	C
<i>stagnalis</i> (L.), . . . . .	—	—	—	—	—	—	—	L	—	—	—	—	C
<i>palustris</i> (Müll.), . . . . .	C	—	—	—	B	M	E	L	—	—	—	—	C
<i>truncatula</i> (Müll.), . . . . .	C	A	T	C	B	M	E	L	—	M	—	—	C
<i>Planorbis albus</i> Müll., . . . . .	—	—	—	—	—	—	—	L	—	—	—	—	C
<i>crista</i> (L.), . . . . .	C	A	—	—	B	M	—	L	—	—	—	—	C
<i>glaber</i> Jeffreys, . . . . .	—	A	—	—	—	M	—	L	—	—	—	—	—
<i>spirorbis</i> (L.), . . . . .	C	—	—	—	B	M	E	L	—	—	—	—	C
<i>contortus</i> (L.), . . . . .	—	—	—	—	—	—	—	L	—	—	—	—	C
<i>fontanus</i> (Lightfoot), . . . . .	—	—	—	—	—	—	—	—	—	—	—	—	C
<i>Physa fontinalis</i> (L.), . . . . .	—	—	—	—	—	—	E	L	—	—	—	—	C



## 12. BIBLIOGRAPHY.

NOTE:—Many of the papers in this Bibliography do not deal directly with the district surveyed, but they have been referred to by the writer in the compilation of the foregoing report.

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## DESCRIPTION OF PLATE II.

Figures 40, 41, and 42 are magnified 1·5 diameters; 46, 47, 48, and 49 are  $\times 3\cdot2$ ; all other figures are natural size.

**Limnaea pereger** (Müll.).

Fig.

1. CLARE ISLAND. From a road-side drain near the Abbey. A. W. S., April, 1909.
2. do. In one of the pools forming Lough-na-phuca. A. W. S., April, 1909.
3. do. In one of the pools forming Lough-na-phuca. A. W. S., April, 1909.
4. do. In shallow lakelet near harbour. A. W. S., July, 1911.
5. do. Creggan Lough. A. W. S., April, 1909.
6. do. Lough Merrignagh. A. W. S., April, 1909.
7. do. From Light-house Pool (shallow peaty water). A. W. S., April, 1909.
8. ACHILL ISLAND. Lough Nakeeroge East (very peaty water). A. W. S., March, 1910. (*L. ? praetenuis* Bowell.)
9. do. In flood débris from Keel Lough. A. W. S., September, 1909.
10. do. In the stream flowing from Keel Lough. A. W. S., July, 1911.
11. do. Keel Lough. A. W. S., March, 1910.
12. do. Lough Gall. A. W. S., July, 1911.
13. do. Lough Doo. A. W. S., July, 1911.
14. do. Shallow pools near Lough Doo (water very limy). A. W. S., July, 1911.
15. INISHTURK. Lough Coolacknick (shallow and peaty water). A. W. S., July, 1911.
16. do. In stream flowing from the well at Garranty. A. W. S., July, 1911.
17. do. Lough Namucka (shallow water and possibly brackish). A. W. S., July, 1911.
18. INISHBOFIN. Lough Gowlanagower (only just dead). A. W. S., 26th July, 1911.
19. do. Church Lough. A. W. S., July, 1911.
20. do. Lough Fawna. A. W. S., July, 1911.
21. CAHER ISLAND. Kinkeel Lough (water distinctly saline at times). A. W. S., July, 1911.
22. do. From shallow pools near the summit of the island (water not more than three inches in depth). A. W. S., July, 1911.

Fig.

23. NORTH INISHKEA. From the bed of a dried-up lakelet. R. Ll. P., July, 1905.  
24. THE MULLET. Cross Lough (in sand-dunes). A. W. S., March, 1910.  
25. do. From peaty pools near Bingham Castle. A. W. S., March, 1910.  
26. do. From roadside drains near Belmullet. A. W. S., March, 1910.  
27. ERRIS. Carrowmore Lough (a large lake with peaty water). A. W. S., March, 1910.  
28. do. On stones in rapid part of the Owenduff at Sranamanragh Bridge. A. W. S., March, 1910.  
29. LOUISBURGH. . In rapidly flowing part of the Carrownisky River. A. W. S., September, 1909.  
30. do. Lough Baun (in sand-dunes). A. W. S., September, 1909.  
31. NEWPORT. . Creevaghau Lough. A. W. S., July, 1911.  
32. do. Dougan Lough. A. W. S., July, 1911.  
33. WESTPORT. . Marsh at Killadangan. A. W. S., March, 1910.  
34. CASTLEBAR. . In Castlebar Lough (on Carboniferous limestone). A. W. S., September, 1909.  
35. NEWPORT. . From lake in sandhills near Mulranny. G. W. Chaster, September, 1909.  
36. LOUISBURGH. . Dooaghtry. A. W. S., March, 1910.  
37. do. From a drain in a peat bog near Louisburgh. F. Balfour Browne, March, 1910.  
38. do. From a roadside drain near Old Head (peaty water). A. W. S., March, 1910.  
39. DOOLOUGH VALLEY. Glencullen Lough (peaty water). A. W. S., March, 1910.

***Clausilia bidentata* Ström.**

40. CLARE ISLAND. Stunted form from the extreme west end of the island. A. W. S., September, 1909.  
41. do. From 1,000 feet elevation on the cliffs of Croaghmore (showing two years' growth). A. W. S., September, 1909.  
42. do. From the cliffs of Knockaveen (an almost smooth specimen). A. W. S., September, 1909.

***Hygromia rufescens* Penn.**

43. WESTPORT. . From near Belclare (showing traces of quinquefasciation). A. W. S., April, 1909.

***Helicella itala* L.**

44. LOUISBURGH. . From wind-swept parts of sand-dunes near Lough Roonah. A. W. S., September, 1909.  
45. do. From sheltered parts of sand-dunes near Dooaghtry. A. W. S. September, 1909.

**Pupa anglica** Fér.

Fig.

46. CLARE ISLAND. . From the north-east cliffs. A. W. S., September, 1909.

**Pupa cylindracea** Da Costa.

47. CO. LEITRIM. . From a dry limestone wall at Drumahaire (a form typical of the central plain). A. W. S., September, 1900.
48. CLARE ISLAND. . From the north-east cliffs (an intermediate form). A. W. S., September, 1909.
49. do. . From an elevation of 1,300 feet on Croaghmore (var. *anconostoma* Lowe). A. W. S., September, 1909.

**Helicella intersecta** Poirét.

50. CO. KILDARE. . From Newbridge, a form referable to *H. caperata* (Mont). A. W. S., September, 1910.
51. CLARE ISLAND. . From sand-dunes near the harbour (the large western form). A. W. S., September, 1909.

**Helix nemoralis** Müll.

52. ERRIS. . From Curraun sand-dunes (showing tendency of lower bands to split). A. W. S., September, 1909.

**H. aspersa** Müll.

53. CLARE ISLAND. . From sands near the harbour (showing change in colour and markings during different periods of growth). A. W. S., September, 1909.

**H. hortensis** Müll.

54. QUEEN'S CO. . From near Maryborough (for comparison with *H. nemoralis*). A. W. S., September, 1910.

**H. nemoralis** Müll.

55. INISHBOFIN. . From hillside near Church Lough (to show the similarity between *H. hortensis* and *H. nemoralis*. var. *albolabiata*). A. W. S., July, 1911.



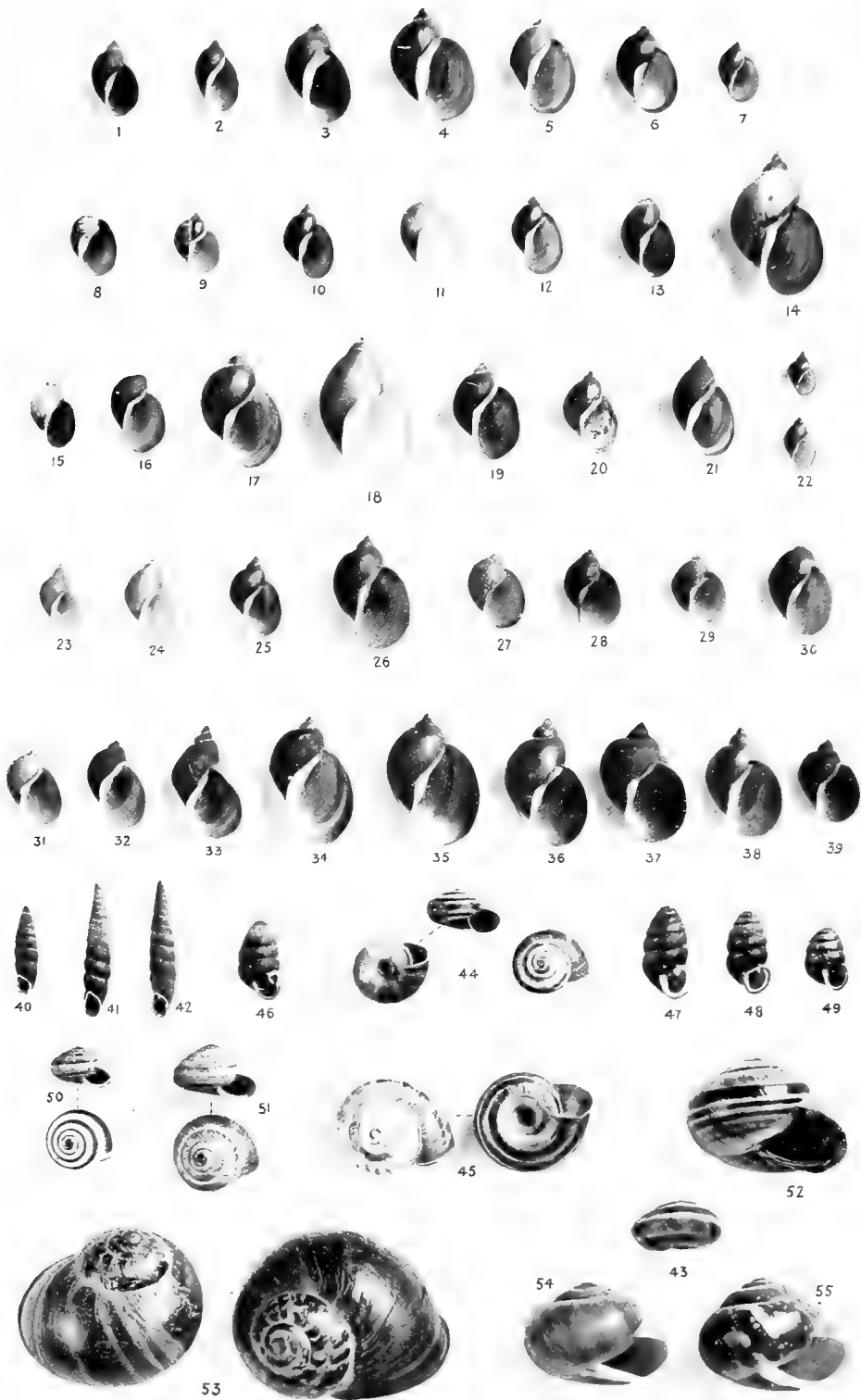
*R. Welch. Photo*

The 1,000-foot path on Croaghmore, the head-quarters of the Land Mollusca.

CLARE ISLAND SURVEY — STELFOX: LAND AND FRESH-WATER MOLLUSCA.







R. J. WELLS



HYMENOPTERA.

By CLAUDE MORLEY, F.Z.S., F.E.S., &c.

Read NOVEMBER 13. Published DECEMBER 7, 1911.

INTRODUCTION.

THE following list of Hymenoptera is the result of one visit to Clare Island and the Louisburgh district by myself, and of a good deal of work in all parts of the area—Clare Island, Achill Island, Curraun Achill, Mulranny, Louisburgh, Belclare, and Westport, by other collectors, notably Rev. W. F. Johnson and Mr. Halbert. My own work extended over a fortnight in the middle of July, 1910, the first week being spent at Louisburgh in company with Mr. Halbert, and the second on the island with a large party, of whom Mr. P. E. Grimshaw, who was investigating the Diptera, worked with me most of the time. The weather during this visit was of the usual western type, with a good deal of wind, some rain, and but little sun, not the best weather for the collecting of Hymenoptera. The captures of Mr. Johnson, who, with his wife—also an excellent collector—three times spent a month in the district, at dates ranging from May to September, have added materially to the list.

Our present knowledge of the Hymenoptera of Clare Island and its vicinity goes to show that the district is, as regards its fauna, decidedly below the average of a similar extent of land and sea in England, with which alone I am able to compare it. Among the 324 species enumerated in the following list are very few with claims upon our interest. I have looked somewhat carefully through the local list, both of the species on Clare Island and on the adjacent mainland, and there are recorded in it but twenty species that would not with absolute certainty be found around any English village south of the Humber. The great feature of collecting on Clare Island that struck me when there was the constant occurrence of insects I had only the week before been netting in my own grounds and the adjoining woods in Suffolk; here were mountains of over 2000 feet, the sea-shores and geological formation and climate were totally different, yet the fauna bore none of that individual stamp one so confidently anticipated in so distinct a locality. The only novelties I noticed were among the Trichoptera of the mountain streams.

Of the Aculeata listed below four bees do not occur in the eastern counties of England (with which I can find nothing nearer in latitude to compare the Clare Island fauna); these are *Sphcodes hyalinatus* and *S. ferrugatus*, *Halictus Freyegssneri* (which I have from Somerset), and *Andrena analis*, by no means rare in the New Forest. Of the Sawflies *Abia candens* may be widely distributed, though certainly not common; I have it only from Stradbally. The record of *Croesus Stephensi* represents a most interesting re-discovery of a very dark Croesus, which Rev. F. D. Morice is inclined to think possibly nothing but a melanic form of a common saw-fly; it has not been found since first described many years ago by Edward Newman. *Pontania bella*, *Emphytus carpini*, and *Pachyprotasis antennata* do not occur in the east coast counties of England, though not rare in the south. Of the Ichneumonidae, *Stenichneumon pictus* and *Ctenichneumon fossorius* seem commoner in Scotland than elsewhere; *Ichneumon memorator* was long regarded as doubtfully British, and was previously known only from South Wales; *Amblyteles subsericans* and *Microcryptus subguttatus* are not uncommon, though unknown in Suffolk; *Atractodes salius* may be peculiarly Irish, as Rev. W. F. Johnson's capture is the first since that of Haliday, mentioned in 1839; *Pimpla ovivora*, *Glypta nigrina*, and *Mesoleius maculicollis* are extremely rare everywhere, as far as our present knowledge extends, and I have seen no other *Cremastus albipennis* and *Rhogas bicolor* than those from Clare Island.

Much work remains to be done at the Irish hymenopteran fauna. Except one or two residents in the extreme east of Ireland, notably A. H. Haliday, and an occasional English visitor to the Lakes of Killarney or southern counties, no one has paid much attention to the Irish Hymenoptera, or at least to the parasitic section, which outnumbers the Aculeata by so vast an extent; and I believe the same is true of the Saw-flies.

It should, therefore, be pointed out that every one of the records is of distinct value, especially on account of the extreme western position of the district, and that the list will extend our knowledge of the distribution of the Britannie Hymenoptera considerably.

The series of valuable papers published by Haliday in the "Entomological Magazine" contain many Irish records, and still remain indispensable to students of the smaller parasitic forms of Hymenoptera.

Haliday also compiled a manuscript "Catalogue of Irish Insects," which is now preserved in the Irish National Museum. A very considerable number of species representing all families of Hymenoptera are included in this catalogue; however, very many of them, especially amongst the Saw-flies and larger Ichneumons, do not seem ever to have been definitely published as Irish insects. It is not surprising, therefore, that of the 324 species of Hymenoptera

in the following list about a hundred are now recorded for the first time from the Irish area. The majority of these new records occur amongst the Ichneumonidae.

The aculeate groups, on the other hand, having been much more studied, naturally yield the fewest novelties. In view of the interest taken in these insects, it may be pointed out that six species from the Clare Island district were not previously known to occur in this country. These are:—*Gorytes IV-fasciatus*, *Crabro albilabris*, *Sphecodes hyalinatus*, *Sphecodes ferruginatus*, *Halictus Freydessneri*; the last-named species is represented in the collection by a single injured example, and must be recorded with reserve.

## LIST OF SPECIES.

## HETEROGYNA.—ANTS.

- Formica fusca** Latr.—Clare Island (Johnson and Morley). MAINLAND: ♀ ♀ at Louisburgh in May, 1909 (Halbert), and July, 1910 (Morley); Mulranny and abundant at Achill (Johnson).
- Lasius flavus** DeG.—Common on Clare Island, where all sexes occurred to Halbert, September, 1909. MAINLAND: abundant at Louisburgh (Morley); several ♀ ♀ at Darby's Point (Johnson).
- L. niger** Linn.—Clare Island (Johnson, Halbert, Morley). MAINLAND: abundant about Louisburgh (Morley). Rev. W. F. Johnson found the var. *alienus* Först., on Clare Island.
- Myrmica sulcinodis** Nyl.—Taken by Johnson at Achill Sound; everywhere rare.
- M. ruginodis** Nyl.—Clare Island (Morley) up to 1500 feet (Johnson); two in a Puffin's nest on the Bills rocks in June, 1910 (Praeger). MAINLAND: Mulranny and Achill Sound, common (Johnson); Louisburgh in May, 1909 (Halbert).
- M. scabrinodis** Nyl.—Clare Island (Johnson), in June and September (Halbert). MAINLAND: Croaghpatrick in June (Halbert); abundant at Louisburgh in July (Morley); Achill Sound in June (Johnson).

## FOSSORES—SOLITARY WASPS.

- Pompilus plumbeus** Fab.—MAINLAND: Glendarary (Johnson).
- P. nigerrimus** Scop.—Two at Glendarary, Achill I., June, 1910 (Johnson).

- Salix exaltatus* Fab.—A ♀ beneath a stone on east cliff of Clare Island, July (Morley). MAINLAND: one at Knappagh, near Westport, 3rd August, 1911 (Grimshaw).
- Pemphredon lugubris* Fab.—MAINLAND: one in Old Head wood, July, 1910 (Morley).
- Gorytes mystaceus* Linn.—MAINLAND: one ♀, Knappagh, Westport, August, 1911 (Grimshaw).
- G. quadrifasciatus* Fab.—MAINLAND: Glendarary, Achill Island (Johnson).
- Mellinus arvensis* Linn.—Several nesting in east cliffs of Clare Island, July, 1910 (Morley). MAINLAND: one ♀ at Westport, June, 1909 (Halbert).
- Crabro clavipes* Linn.—MAINLAND: a ♀ at Belclare, in July, 1910 (Halbert).
- C. leucostomus* Linn.—MAINLAND: two at Westport in July, 1911 (Halbert).
- C. palmipes* Linn.—Common. Clare Island in June (Johnson) and July (Morley). MAINLAND: Belclare in July (Halbert); Louisburgh, flying at stone wall, July (Morley); Mulranny in June (Johnson).
- C. albilabris* Fab.—MAINLAND: Mulranny (Johnson).

#### DIPLOPTERA—SOCIAL WASPS.

- Vespa vulgaris* Linn.—MAINLAND: Sraheens Lough (Johnson); Westport, August (Grimshaw).
- V. sylvestris* Scop.—MAINLAND: two ♂♂ captured at Westport and Mount Brown Lough in July, 1911 (Halbert).
- It is worthy of note that wasps are unknown on Clare Island. The islanders know them only through visits to the mainland; to the island children they are quite unfamiliar.
- Odynerus pictus* Curt.—Nine of both sexes on Clare Island (Johnson) and several in their burrows (Morley). MAINLAND: two at Achill Sound, June, 1910 (Johnson).
- O. trimarginatus* Zett.—A pair on Clare Island in 1909 (Halbert).
- O. trifasciatus* Oliv.—Clare Island (Johnson).

#### ANTHOPHILA—BEES.

- Colletes succinctus* Linn.—MAINLAND: a ♀ at Sraheens Lough and another at Achill Sound (Johnson).
- Sphecodes affinis* Hag.—Three ♀♀ on Clare Island, June, 1911 (Johnson).
- S. hyalinatus* Sch.—MAINLAND: two ♂♂, Castlebar, July, 1911 (Halbert).
- S. ferruginatus* Sch.—Clare Island (Johnson).
- Halictus rubicundus*, Chr.—Clare Island (Johnson). MAINLAND: one ♂ at Westport (Halbert).

- Halictus quadrinotatus** Kirb.—A pair at their burrows on Clare Island (Morley). MAINLAND: a ♂ at Mulranny in July, 1910 (Grimshaw).
- H. cylindricus** Fab.—MAINLAND: three ♀ ♀ at Carrowmore Lake in July, 1910 (Morley); a ♂ at Westport in August, 1911 (Grimshaw).
- H. albipes** Kirb.—Common. Many ♀ ♀ on Clare Island in June (Johnson). MAINLAND: several of both sexes at Castlebar and Mount Brown Lough in July (Halbert).
- H. nitidiuseculus** Kirb.—Clare Island (Johnson).
- H. smeathmannellus** Kirb.—MAINLAND: a ♀ at Belclare, July (Halbert).
- H. leucopus** Kirb.—MAINLAND: a ♂ at Westport in July, 1911 (Halbert).
- H. Freydessneri** Alfk.—MAINLAND: a doubtful ♀ at Belclare, July, 1910 (Halbert).
- Andrena denticulata** Kirb.—Three ♀ ♀ flying to a turf wall on Clare Island, July, 1910 (Morley).
- A. coitana** Kirb.—Several ♀ ♀ at their burrows on Clare Island (Morley). MAINLAND: a pair at Belclare and ♂ ♂ at Westport and Mount Brown Lough, in July (Halbert).
- A. minutula** Kirb.—MAINLAND: two ♀ ♀ at Belclare in July, 1910 (Halbert).
- A. analis** Panz.—One pair taken with the last species at Belclare (Halbert).
- Nomada fabriciana** Linn.—One specimen on east cliffs of Clare Island, in July (Morley).
- N. flavoguttata** Kirb.—MAINLAND: a ♀ in Westport demesne, July, 1909 (Halbert).
- Megachile centuncularis** Linn.—MAINLAND: one faded ♂ at Mulranny, July (Grimshaw).
- Psithyrus barbutellus** Kirb.—MAINLAND: a ♀ at Westport, July, 1911 (Halbert).
- P. campestris** Panz.—MAINLAND: a ♀ at Belclare in July, 1910 (Halbert).
- Bombus smithianus** White.—Clare Island and on mainland at Glendarary (Johnson).
- B. venustus** Sm.—Clare Island (Morley, Grimshaw). MAINLAND: Achill Sound (Johnson); Mulranny in July and Westport in August (Grimshaw).
- B. agrorum** Fab.—Clare Island (Grimshaw). MAINLAND: Mulranny, Glendarary, and Achill Sound (Johnson).
- B. hortorum** Linn.—One on Clare Island, June, 1911 (Johnson).
- B. latreillellus** Kirb.—Clare Island, both the type form (Morley) and the var. *distinguendus*, Mor. (Grimshaw).
- B. derhamellus** Kirb.—Clare Island in June and July (Johnson, Grimshaw, Morley). MAINLAND: a ♂ at Mulranny in July, 1910 (Grimshaw).
- B. lapidarius** Linn.—Clare Island and on mainland at Glendarary (Johnson); Westport, August, 1911 (Grimshaw).

**Bombus jonellus** Kirb.—Clare Island and on mainland at Glendarary (Johnson).  
**Apis mellifica** Linn.—No bees are kept on Clare Island, and this species is unknown there. MAINLAND: one at Mulranny in July, 1910 (Grimshaw).

#### CHRYSIDIDAE.

**Chrysis ignita** Linn.—Clare Island in July, 1910 (Morley), and June, 1911 (Johnson).

#### TENTHREDINIDAE—SAW-FLIES.

**Trichiosoma silvatica** Lch.—MAINLAND: Mulranny and Achill Sound; several in June, 1910 and 1911 (Johnson).

**T. tibialis** Lch.—MAINLAND: one at Mulranny in 1910 (Johnson).

**T. Latreillei** Lch.—MAINLAND: four at Mulranny in June, 1910 (Johnson).

**Abia sericea** Linn.—MAINLAND: Glendarary, Achill, in 1910 (Johnson).

**A. candens** Knw.—MAINLAND: one ♀ at Achill Sound, June, 1911 (Johnson).

**Cladius pectinicornis** Fourc.—MAINLAND: one ♂ at Achill in 1909 (Halbert).

**Trichiocampus ulmi** Linn.—MAINLAND: a ♀ at Westport in July, 1911 (Halbert).

**Cryptocampus saliceti** Fall.—MAINLAND: a pair at Achill in June, 1909 (Halbert).

**Croesus Stephensi** Newm. [Possibly a melanic var. of *C. septentrionalis*, Linn.]—  
 One example—the first taken since its description—at Glendarary, 1910 (Johnson, who failed to find more in 1911).

**Pontania leucosticta** Htg.—MAINLAND: one at Achill, 4th June, 1909 (Halbert).

**P. bella** And.—MAINLAND: one ♀ at Achill in June, 1909 (Halbert).

**Pteronus myosotidis** Fab.—MAINLAND: Polranny, one in 1910 (Johnson); a ♂ at Westport in July, 1911 (Halbert).

**P. polyspilus** Först.—MAINLAND: a ♂ at Louisburgh, 17th July, 1910 (Morley).

**Pachynematus clitellatus** Lep.—A ♀ on Clare Island, June, 1909; on the mainland, both sexes at Belclare and Castlebar (Halbert); Old Head Wood and on Carrowmore Hill at 500 feet, July, 1910 (Morley).

**P. albipennis** Htg.—MAINLAND: Keel, Glendarary, Mulranny (Johnson).

**P. vagus** Fab.—MAINLAND: ♀ ♀ at Castlebar and Belclare (Halbert).

**P. obductus** Htg.—MAINLAND: a ♀ of the var. *conductus*, Rthe., at Westport in July, 1911 (Halbert); Croaghpatrick, two ♀ ♀ at 2500 feet (Morley).

**Pristiphora pallidiventris** Fall.—MAINLAND: Westport and Achill in June, 1909 (Halbert); swept at Louisburgh, 17th June, 1910 (Morley).

**Eriocampoides annulipes** Kl.—MAINLAND: three at Glendarary in 1910 (Johnson).



- Tomostethus dubius** Gmel.—MAINLAND: ♀ ♀ at Westport in 1909 and 1910 (Halbert).
- T. luteiventris** Kl.—Clare Island, a ♀ on 9th June, 1909 (Halbert) and June, 1911 (Johnson). MAINLAND: Castlebar and Louisburgh (Halbert).
- Monophadnus albipes** Gmel.—MAINLAND: a ♀ at Belclare, Westport, in July, 1910 (Halbert).
- Athalia lugens** Kl.—MAINLAND: a ♀ at Westport in July, 1911 (Halbert).
- A. lineolata** Lep.—MAINLAND: both sexes at Belclare and Westport (Halbert); Brackloon Wood on 4th August, 1911 (Grimshaw).
- Selandria serva** Fab.—Clare Island (Morley and Halbert). MAINLAND: common; Achill Sound, common; Mulranny (Johnson); Westport, Belclare, and Louisburgh (Halbert); Mulranny (Grimshaw); Louisburgh and Lake Namucka in July, 1910 (Morley).
- S. stramineipes** Kl.—MAINLAND: common; Polranny and Mulranny (Johnson); Belclare (Halbert); and Old Head Wood on 13th July, 1910 (Morley).
- S. morio** Fab.—MAINLAND: a ♀ at Achill on 7th June, 1909 (Halbert).
- Strongylogaster cingulatus** Fab.—MAINLAND: ♀ ♀ at Glendarary, June, 1910 and 1911 (Johnson).
- S. delicatulus** Fall.—MAINLAND: common; Westport Demesne, Belclare, Achill (Halbert); Glendarary (Johnson); Old Head Wood on 13th June, 1910 (Morley).
- Poecilostoma pulverata** Retz.—MAINLAND: a ♀ in Westport Demesne, May, 1909 (Halbert).
- Emphytus calceatus** Kl.—MAINLAND: two at Glendarary (Johnson); Lough Namucka, and two at Carrowmore Lake on 17th June, 1910 (Morley).
- E. tener** Fall.—MAINLAND: one at Achill Sound (Johnson).
- E. carpini** Htg.—MAINLAND: one at Mulranny in 1910 (Johnson).
- Taxonus equiseti** Fall.—MAINLAND: one at Louisburgh on 17th July, 1910 (Morley).
- T. glabratus** Fall.—Clare Island in June, 1911 (Johnson). MAINLAND: a ♂ at Castlebar, June, 1909, and at Westport in July, 1911 (Halbert).
- Dolerus palustris** Kl.—Clare Island, ♀ ♀ on 9th June, 1909 (Halbert). MAINLAND: both sexes at Westport and Belclare (Halbert); Carrowmore Lough on 18th July, 1910 (Morley).
- D. picipes** Kl.—MAINLAND: a ♀ at Castlebar on 17th June, 1909 (Halbert).
- D. nigratus** Müll.—Clare Island, a ♂ on 11th June, 1909; and on the mainland, both sexes at Belclare and to the north-east of Achill (Halbert).
- D. aeneus** Htg.—MAINLAND: Westport Demesne (Halbert); Glendarary and Achill (Johnson).

- Rhogogaster viridis** Linn.—MAINLAND: ♂♂ at Achill, in 1909 (Halbert); abundant at Glendarary and Mulranny in June, 1910 (Johnson).
- Pachyprotasis antennata** Kl.—MAINLAND: two ♀♀ at Mulranny in 1910 (Johnson); both sexes at Belclare in July, 1910 (Halbert).
- P. rapae** Linn.—MAINLAND: two ♂♂ at Belclare in July (Halbert); a ♀ at Darby's Point in Achill in 1910 (Johnson).
- Allantus arcuatus** Fourc.—Abundant on flowers on both island and mainland.
- Tenthredo moniliata** Kl.—MAINLAND: a typical ♂, with the var. *lachlaniana*, at Mulranny in June, 1910 (Johnson).
- T. ferruginea** Schr.—MAINLAND: ♀♀ at Glendarary, Mulranny, and Achill (Johnson).
- T. livida** Linn.—MAINLAND: a ♂ at Westport on 18th June, 1909 (Halbert).
- T. balteata** Kl.—MAINLAND: a ♀ at Belclare, July, 1910 (Halbert); common at Glendarary, Achill, 1910 and 1911 (Johnson).
- T. atra** Linn.—MAINLAND: type form at Achill in 1911 (Johnson); seven of both sexes at Louisburgh (Halbert), and Carrowmore Lough in July, 1910 (Morley). Var. *dispar*, Kl.—Louisburgh, Belclare, Westport (Halbert); Glendarary, Curraun, Mulranny (Johnson); and ♀♀ at Carrowmore Lough with type in July (Morley).
- T. mesomela** Linn.—MAINLAND: two ♀♀ at Belclare (Halbert); one at Mulranny (Johnson).
- Tenthredopsis dorsalis** Lep.—MAINLAND: Old Head, 13th July, 1910 (Morley). Two of the var. *diluta* at Glendarary in 1910 (Johnson).
- T. tiliae** Linn.—MAINLAND: ♀♀ at Achill and Belclare (Halbert); Mulranny (Johnson).
- T. Coqueberti** Kl.—Clare Island, a ♂ in June, 1911 (Johnson).
- T. campestris** Linn.—Clare Island in June; and one at Mulranny (Johnson).

#### ICHNEUMONIDAE—ICHNEUMON-FLIES.

##### Ichneumoninae.

- Stenichneumon pictus** Grav.—MAINLAND: a ♀ at Sraheens Lough, Achill, June (Johnson).
- Cratichneumon rufifrons** Grav.—MAINLAND: common; Castlebar and Westport in 1909 (Halbert); Achill and Mulranny (Johnson); Brackloon, Westport, in 1911 (Grimshaw).
- C. fabricator** Fab.—MAINLAND: Sraheens Lough, Mulranny, Achill Sound (Johnson); Brackloon Wood near Westport, August, 1911 (Grimshaw).
- C. annulator** Fab.—MAINLAND: Brackloon Wood (Grimshaw); Belclare in July, 1910 (Halbert).

- Melanichneumon saturatorius** Linn.—MAINLAND: one at Westport, July, 1911 (Halbert).
- Barichneumon albicinctus** Grav.—MAINLAND: ♂♂ at Achill Sound, June, 1910 (Johnson); a ♀ on Croaghpatrick at 2,500 feet, July, 1910 (Morley).
- B. bilunulatus** Grav.—A ♀ on Clare Island, July, 1910 (Morley).
- B. vestigator** Wesm.—MAINLAND: a ♂ at Mulranny, July, 1910 (Grimshaw).
- Ichneumon deliratorius** Linn.—MAINLAND: two ♂♂ in Brackloon Wood, August (Grimshaw).
- I. latrator** Fab.—MAINLAND: a ♂ on reeds at Carrowmore Lough, July (Morley); a ♀ of the var. *means*, Grav., at Achill (Halbert).
- I. memorator** Wesm.—MAINLAND: a ♂ at Carrowmore Lough, with the last species (Morley; cf. "Entomologist," 1910, p. 172).
- I. suspiciosus** Wesm.—MAINLAND: ♀♀ at Sraheens Lough, June, 1910 (Johnson).
- I. inquinatus** Wesm.—MAINLAND: a small ♀ with the above (Johnson).
- I. extensorius** Linn.—MAINLAND: a ♂ at Mulranny, July, 1910 (Grimshaw).
- I. gracilentus** Wesm.—MAINLAND: a ♀ at Belclare, July, 1910 (Halbert) and at Achill Sound, June, 1910 (Johnson).
- I. confusorius** Grav.—Clare Island, a ♂ on road to chapel (Morley); ♀♀ at 700 and 1,500 feet (Johnson). MAINLAND: ♂♂ at Brackloon Wood and Mulranny (Grimshaw), and a ♀ beneath a sod on Carrowmore Hill, 500 feet, in July (Morley).
- I. emancipatus** Wesm.—MAINLAND: a ♂ at Mulranny, July, 1910 (Grimshaw).
- Chasmias motatorius** Fab.—MAINLAND: ♀♀ at Achill Sound (Johnson) and swept from reeds at Carrowmore Lough in July (Morley).
- Ctenichneumon fossorius** Grav.—MAINLAND: a ♂ at Sraheens Lough, June, 1910 (Johnson).
- Amblyteles palliatorius** Grav.—Clare Island, a ♂ on 27th July, 1910 (Praeger).
- A. subsericans** Grav.—MAINLAND: a ♀ at Westport, July, 1911 (Halbert).
- A. uniguttatus** Grav.—MAINLAND: a ♂ on reeds at Carrowmore Lough (Morley).
- Platylabus pedatorius** Fab.—MAINLAND: a ♀ at Sraheens Lough, Achill, June (Johnson).
- P. pumilio** Holgr.—MAINLAND: a ♂ at Achill in June, 1909 (Halbert).
- P. decipiens** Wesm.—MAINLAND: a ♀ at Achill Sound, June, 1911 (Johnson).
- Phaeogenes ophthalmicus** Wesm.—MAINLAND: a ♂ in Brackloon Wood, Westport (Grimshaw).
- P. impiger** Wesm.—MAINLAND: a ♀ at Sraheens Lough, in June, 1910 (Johnson).
- P. stimulator** Grav.—MAINLAND: ten ♂♂, probably referable to this species,

- captured in Brackloon Wood, near Westport, 4th August, 1911 (Grimshaw).
- Phaogenes coryphaeus** Wesm.—MAINLAND: a ♀ at Louisburgh, July, 1910 (Halbert).
- Dicaelotus rufilimbatus** Grav.—Clare Island, several in July, 1910 (Morley).  
MAINLAND: common; Darby's Point in September and the Curraun sand-hills (Johnson); Mulranny (Grimshaw); several at Carrowmore Hill and Lough on reeds, &c., July (Morley).
- Colpognathus celerator** Grav.—MAINLAND: a ♀ at Belclare in July, 1910 (Halbert).
- C. divisus** Thoms.—Clare Island, several ♂ ♂ (Morley), and a ♀ at 700 feet (Johnson). MAINLAND: a ♂ at Achill (Johnson).
- Centeterus major** Wesm.—Clare Island, ♂ ♂ in 1909 (Halbert) and 1910 (Morley).
- Alomyia debellator** Fab.—Clare Island, ♂ ♂ in June, 1911 (Johnson). MAINLAND: Westport in July, 1911 (Halbert) and on Wild Carrot flower, Carrowmore Lough, 1910 (Morley).

#### Cryptinae.

- Cratocryptus anatorius** Grav.—MAINLAND: a ♀ at Mulranny, June, 1910 (Johnson).
- Cubocephalus brevicornis** Tasch.—MAINLAND: a ♂ at Old Head, 13th July, 1910 (Morley).
- Microcryptus arrogans** Grav.—MAINLAND: a ♂ at Achill Sound, June, 1911 (Johnson).
- M. subguttatus** Grav.—Clare Island, a ♂ in June, 1909 (Halbert).
- M. bifrons** Gmel.—Clare Island, a ♂ (Morley); and Achill, a ♀ (Johnson).
- M. abdominator** Grav.—MAINLAND: Carrowmore Hill, Louisburgh (Morley).
- M. galactinus** Grav.—MAINLAND: a ♀, Croaghpatrick at 2,500 feet (Morley).
- M. nigrocinctus** Grav.—MAINLAND: ♂ ♂ at Louisburgh in July (Morley).
- M. sperator** Müll.—MAINLAND: a ♂ at Louisburgh on 15th July, 1910 (Morley).
- M. brachypterus** Grav.—Clare Island, one ♂ in July (Morley).
- M. micropterus** Grav.—Clare Island, a ♀ on the cliffs (Halbert). MAINLAND: a ♂ at Darby's Point in September (Johnson).
- Acanthocryptus quadrispinosus** Grav.—Clare Island, one ♀ in June, 1911 (Johnson).
- Glyphicnemis profigator** Fab.—Clare Island, several on flowers of *Heracleum Sphondylium* (Morley). MAINLAND: Mulranny and Knappagh Wood (Grimshaw).

- Glyphicnemis brevis** Grav.—Clare Island, a ♂ on *Heracleum* flower; and swept at 500 feet on Carrowmore Hill on mainland (Morley).
- G. erythrogastra** Grav.—MAINLAND: a ♀ at Westport in July (Halbert).
- Phygadeuon variabilis** Grav.—MAINLAND: ♂ ♂ at Mount Brown Lough (Halbert) and on the top of Carrowmore Hill at 500 feet (Morley).
- P. dumetorum** Grav.—Clare Island, a ♀ in July, 1910 (Morley).
- P. exiguus** Grav.—Clare Island, a ♂ with the above (Morley).
- P. nitidus** Grav.—Clare Island, a ♂ in June, 1910 (Johnson). MAINLAND: a ♂ in north-east Achill in June, 1909 (Halbert).
- P. fumator** Grav.—Clare Island, several ♂ ♂ (Morley). MAINLAND: Darby's Point and Achill Sound (Johnson); Carrowmore Hill and Lough (Morley).
- P. dimidiatus** Thoms.—MAINLAND: a ♀ at Lough Namucka in July, 1910 (Halbert).
- Panargyrops aereus** Grav.—MAINLAND: a ♂ in Brackloon Wood, Westport, August (Grimshaw).
- Hemiteles** *sp.*—One undeterminable male on Clare Island in June, 1911 (Johnson).
- Pezomachus Kiesenwetteri** Först.—Clare Island, a ♀ in July, 1910 (Morley).
- P. zonatus** Först.—Clare Island, a ♂ (Morley). MAINLAND: a winged ♂ at Mulranny (Johnson).
- P. anthracinus** Först.—MAINLAND: a ♀ under a stone, Carrowmore Hill (Morley).
- P. fraudulentus** Först.—Clare Island, one ♀ in July, 1910 (Morley).
- P. instabilis** Först.—Clare Island, one ♀ with the above (Morley).
- P. fasciatus** Fab.—MAINLAND: Belclare (Halbert), Louisburgh (Morley), July.
- Atractodes vestalis** Hal.—MAINLAND: Louisburgh on 17th July, 1910 (Morley).
- A. gilvipes** Holgr.—MAINLAND: a ♂ at Westport in July, 1911 (Halbert).
- A. exilis** Hal.—Clare Island, a ♂ (Morley). MAINLAND: ♀ ♀ at the Curraun, sandhills (Johnson), and a ♂ at Louisburgh (Morley).
- A. salius** Hal.—MAINLAND: Sraheens Lough, June, 1910 (Johnson). Very rare.
- Pycnocryptus peregrinator** Linn.—Clare Island, a ♀ (Morley). MAINLAND: a ♂ at Achill Sound (Johnson).
- Spilocryptus abbreviator** Fab.—Clare Island, one ♀ in September, 1910 (Johnson).
- Idiolispa analis** Grav.—MAINLAND: not uncommon; Belclare (Halbert); Achill Sound (Johnson); and Old Head woods (Morley).

- Goniocryptus titillator** Linn.—MAINLAND: Sraheens Lough (Johnson), and Belclare (Halbert).  
**Habrocryptus alternator** Grav.—Clare Island, one ♀ on the cliffs, 1909 (Halbert).

#### Pimplinae.

- Pimpla brevicornis** Grav.—Clare Island, ♀ ♀ in 1910 and 1911 (Johnson).  
 MAINLAND: Polranny (Johnson); Knappagh near Westport (Grimshaw).  
**P. nucum** Ratz.—MAINLAND: a ♀ at Castlebar in July, 1911 (Halbert).  
**P. instigator** Fab.—Clare Island, a ♀ in June, 1911 (Johnson).  
**P. turionellae** Linn.—Clare Island, May, 1909 (Halbert), and September, 1910 (Johnson). MAINLAND: Westport (Grimshaw); and I bred the var. *strigipleuris*, Thoms., on 29th July, 1910, from a pupa of *Characeas graminis*, found under a stone on the top of Carrowmore Hill, Louisburgh, at 500 feet (Morley).  
**P. maculator** Fab.—MAINLAND: a ♂ in Brackloon Wood, 4th August (Grimshaw).  
**P. ovivora** Boh.—MAINLAND: a ♀ at Achill Sound in June, 1911 (Johnson).  
**Polysphincta percentatoria**, Müll.—MAINLAND: a ♂ at Achill, June, 1911 (Johnson).  
**Schizopyga podagrica** Grav.—Clare Island, one ♂ in June, 1911 (Johnson).  
**Clistopyga incitator** Fab.—Clare Island, two ♀ ♀, June, 1911 (Johnson).  
 MAINLAND: a ♀ near Westport in June, 1909 (Halbert).  
**Glypta fronticornis** Grav.—Clare Island, a ♀ in June (Johnson). MAINLAND: Belclare (Halbert); Louisburgh, Carrowmore Lough, and abundant on Carrowmore Hill (Morley).  
**G. nigrina** Desv.—MAINLAND: a ♀ at Achill Sound (Johnson); a ♂ at Carrowmore Lough on reeds in July (Morley).  
**G. parvicaudata** Bridg.—MAINLAND: a ♀ at Sraheens Lough, June, 1910 (Johnson).  
**G. lugubrina** Holmgr.—MAINLAND: Westport (Halbert); Carrowmore Lough, several (Morley).  
**Lissonota parallela** Grav.—Clare Island, a ♂ in July, 1910 (Morley).  
**L. insignita** Grav.—MAINLAND: a ♀ at Carrowmore Lough on reeds (Morley).  
**L. bellator** Grav.—Clare Island, both sexes (Johnson and Morley). MAINLAND: Westport (Halbert); Old Head woods, 13th July, 1910 (Morley).  
**L. nigridens** Thoms.—MAINLAND: Carrowmore Hill, ♀, at 500 feet, July (Morley).  
**L. errabunda** Holmgr.—MAINLAND: Mulranny, one ♀ in July, 1910 (Grimshaw).

- Lissonota dubia* Holmgr.—MAINLAND: Lough Namucka, one ♀ in July, 1910 (Halbert).
- Phytodiaetus coryphaeus* Grav.—MAINLAND: two ♂ ♂ near Westport, July, 1911 (Halbert).
- Lampronota melancholica* Grav.—MAINLAND: a ♂ swept in peat bog, Louisburgh (Morley).
- Oedematopsis scabricula* Grav.—Clare: Island, ♀ ♀ swept at "the wood," Portlea, July (Morley).
- Banchus pictus* Fab.—MAINLAND: a ♂ in the Curraun district, June, 1909 (Halbert).

## Tryphoninae.

- Exochus nitidifrons* Thoms.—MAINLAND: a ♀ at Achill in June, 1909 (Halbert).
- E. pallidipes* Holmgr.—MAINLAND: a ♀ at Achill Sound in June, 1910 (Johnson).
- E. pictus* Holmgr.—MAINLAND: a ♀ at Mulranny in June (Johnson).
- Orthocentrus cubiceps* Thoms.—Clare Island, two ♀ ♀ in July, 1910 (Morley).
- Bassus tricinctus* Grav.—Clare Island, not uncommon (Johnson and Morley).  
MAINLAND: Carrowmore Hill at 500 feet (Morley).
- Homocidus lateralis* Grav.—MAINLAND: a ♀ at Brackloon Wood, 4th August (Grimshaw).
- H. tarsatorius* Panz.—MAINLAND: one of the var. *pulchellus*, Desv., in July, at Belclare (Halbert).
- H. signatus* Grav.—Clare Island, a ♀ in June, 1911 (Johnson).
- Zootrephus rufiventris* Grav.—Clare Island, two in June, 1909 (Halbert).  
MAINLAND: both sexes somewhat common at Louisburgh, July (Morley).
- Promethus sulcator* Grav.—MAINLAND: a ♀ at Louisburgh in July (Halbert).
- P. laticarpus* Thoms.—MAINLAND: a ♂ at Achill, 7th June, 1909 (Halbert).
- P. dorsalis* Holmgr.—MAINLAND: a ♂ at Louisburgh, 17th July, 1910 (Morley).
- P. albicoxa* Thoms.—MAINLAND: Achill in June, 1909 (Halbert).
- Mesoleius semicaligatus* Grav.—MAINLAND: a ♀ at Achill, June, 1911 (Johnson).
- M. armillatorius* Grav.—MAINLAND: a ♂ at Carrowmore Lough on reeds (Morley).
- M. maculicollis* Steph.—MAINLAND: one at 500 feet on Carrowmore (Morley).
- M. aulicus* Grav.—Clare Island; and on mainland on Carrowmore Hill (Morley).
- Tryphon brunniventris* Gr.—MAINLAND: twenty specimens, all ♀ ♀ were taken flying to the door and doorposts—which were very hot in a blazing sun—of the chapel at the extreme top of Croaghpatrick, 2,510 feet, on 14th July,

1910; there were great numbers of them, and one can only suppose them to have been carried up by an air-current, since the single other specimen seen was swept from reeds at Carrowmore Lough on 18th (Morley).

- Tryphon trochanteratus** Holmgr.—MAINLAND: a ♂ at Louisburgh in July (Morley).
- T. vulgaris** Holmgr.—MAINLAND: a ♂ at 500 feet on Carrowmore Hill (Morley).
- Exenterus aurifluus** Hal.—MAINLAND: a ♂ swept at Carrowmore Lough, July, 1910 (Morley).
- E. hostilis** Holmgr.—MAINLAND: one at Louisburgh on 17th July (Morley).
- Mesoleptus ruficornis** Grav.—MAINLAND: a ♂ at Brackloon Wood, Westport, August (Grimshaw).
- Nerispudus sulphuratus** Grav.—MAINLAND: a ♂ at Louisburgh, 17th July (Morley).
- Euryproctus chrysostomus** Grav.—MAINLAND: a ♂ at Lough Namucka, July, 1910 (Halbert).
- Perilissus flicornis** Grav.—MAINLAND: July at Westport (Halbert) and Mulranny (Grimshaw).
- P. naevius** Gmel.—Clare Island, one specimen in July, 1910 (Morley).
- Polyblastus rivalis** Holmgr.—MAINLAND: a ♂ near Westport in July, 1911 (Morley).
- P. Westringi** Holmgr.—MAINLAND: a ♀ in Brackloon Wood, August, 1911 (Grimshaw).

#### Ophioninae.

- Ophion luteus** Linn.—Clare Island, ♀ ♀ in September, 1910, and June, 1911 (Johnson).
- Schizoloma amicta** Fab.—MAINLAND: Knappagh near Westport, 1911 (Halbert and Grimshaw).
- Anomalon cerinops** Grav.—Clare Island, one ♀ in September, 1910 (Johnson).
- Paniscus tarsatus** Brisch.—MAINLAND: a ♂ in Brackloon Wood, August (Grimshaw).
- Campoplex falcator** Thunb.—MAINLAND: ♀ at Sraheens Lake, June, 1910 (Johnson).
- C. tenuis** Först.—MAINLAND: a ♂ at Louisburgh, 15th July, 1910 (Morley).
- Casinarina orbitalis** Grav.—Clare Island, one specimen in July (Morley).
- Limnerium alienatum** Grav.—MAINLAND: a ♀ at Carrowmore Lough, 18th July (Morley).
- L. cylindricum** Brisch.—Clare Island, one female in July (Morley).
- Eophora fuscipes** Holmgr.—MAINLAND: a ♀ swept from reeds, Carrowmore Lough (Morley).



- Omorga tumidula** Grav.—MAINLAND: a ♂ at Louisburgh, swept from herbage, July (Morley).
- O. lugubrina** Holmgr.—Clare Island, a couple of ♀ ♀ swept from grass (Morley).
- Olesicampa fulviventris** Gmel.—MAINLAND: a pair at Darby's Point (Johnson); Lough Namucka (Halbert); Louisburgh and Carrowmore Lough (Morley).
- O. longipes** Müll.—Clare Island, a single pair swept in July (Morley).
- Meloboris rufiventris** Grav.—Clare Island, not uncommon; several at Louisburgh and Carrowmore Lough (Morley).
- M. crassicornis** Holmgr.—MAINLAND: Lough Namucka (Halbert); several ♂ ♂ at Louisburgh and Carrowmore Hill (Morley).
- Angitia parvula** Grav.—Clare Island, several of both sexes in July (Morley).
- A. fenestralis** Holmgr.—MAINLAND: a ♀ swept at Louisburgh, 15th July (Morley).
- A. vestigialis** Ratz.—MAINLAND: a ♂ swept at Louisburgh, 15th July (Morley).
- A. elishae** Bridg.—Clare Island, several ♀ ♀; and both sexes commonly at Louisburgh and Carrowmore Hill (Morley).
- A. tibialis** Grav.—Clare Island, two pairs swept from herbage (Morley).
- A. rufipes** Grav.—Clare Island, two ♀ ♀ with the last species (Morley).
- Cremastus albipennis** Zett.—Clare Island, two ♀ ♀ taken in September, 1910 (Johnson).
- Mesochorus thoracicus** Grav.—MAINLAND: a ♀ at Achill in June, 1909 (Halbert)
- M. fuscicornis** Brisch.—Clare Island, a ♂ swept in July, 1910 (Morley).
- Megastylus mediator** Schiöd.—MAINLAND: a ♂ at Sraheens Lough, in June (Johnson).

#### BRACONIDAE.

- Bracon minutator** Fab.—MAINLAND: a ♀ at Achill Sound (Johnson).
- B. fulvipes** Nees.—MAINLAND: Westport (Halbert); Carrowmore Lough, and at 2,500 feet on Croaghpatrick (Morley).
- B. nigratus** Wesm.—MAINLAND: a ♀ on Croaghpatrick on 14th July (Morley).
- B. erraticus** Wesm.—Clare Island, one ♂ in July (Morley).
- B. triangularis** Nees.—Clare Island, two ♀ ♀; Carrowmore Lough, one (Morley).
- B. Roberti** Wesm.—Clare Island, one ♂ in July (Morley).
- B. epitriptus** Marsh.—Clare Island, one ♀ in July (Morley).
- B. discoideus** Wesm.—Clare Island, a ♀ in June, 1909 (Halbert)
- B. variator** Nees.—Clare Island, one ♂ in July (Morley)
- B. anthracinus** Nees.—MAINLAND: a ♂ at Louisburgh, 15th July, 1910 (Morley).
- Colastes braconius** Hal.—Clare Island, one ♂ in July (Morley).

- Rhogas gasterator** Jur.—Clare Island, a ♂ in June (Johnson). MAINLAND: Belclare (Halbert), and both sexes on reeds at Carrowmore Lough (Morley), in July.
- R. bicolor** Spin.—MAINLAND: a ♀ of the var. *ater*, Curt., with the above (Morley).
- R. circumscriptus** Nees.—Common; Clare Island (Johnson and Morley); Knappagh and Brackloon Wood (Grimshaw); Achill (Johnson and Halbert).
- Chelonus inanitus** Linn.—Clare Island, one ♀ in July, 1910 (Morley).
- C. dispar** Marsh.—Clare Island, one ♂ in July (Morley).
- C. catulus** Marsh.—Clare Island, three ♀ ♀; Old Head wood, 13th July (Morley).
- Apanteles sericeus** Nees.—Clare Island, one ♂ in July (Morley).
- A. spurius** Wesm.—Clare Island, common; and common at Louisburgh (Morley).
- A. impurus** Nees.—MAINLAND: common; Croaghpatrick at 2,500 feet, Carrowmore Hill at 500 feet, and Louisburgh (Morley).
- A. octonarius** Ratz.—MAINLAND: a pair at Louisburgh, 15th July (Morley).
- A. abjectus** Marsh.—MAINLAND: a ♂ at Bouris near Louisburgh, July (Morley).
- A. triangulator** Wesm.—MAINLAND: Carrowmore Lough, 18th July (Morley).
- A. pallidipes** Rheinl.—Clare Island, a pair (Morley). MAINLAND: Mulranny (Grimshaw); Lough Namucka (Halbert); Louisburgh and Old Head (Morley).
- A. callidus** Hal.—MAINLAND: a ♂ on Carrowmore Hill, 18th July (Morley).
- Microplitis sordipes** Nees.—MAINLAND: ♀ ♀ on reeds at Carrowmore Lough (Morley).
- M. globatus** Nees.—MAINLAND: Belclare (Halbert); Achill Sound (Johnson); and Carrowmore Lough (Morley).
- M. tibialis** Nees.—Clare Island, June, 1909; Achill and Belclare (Halbert).
- Earinus nitidulus**, Nees.—MAINLAND: Sraheens Lough in June, 1910 (Johnson).
- Microdus tumidulus** Nees.—MAINLAND: a ♂ at Mulranny, July, 1910 (Grimshaw).
- Orgilus obscurator** Nees.—Clare Island, a ♂ (Morley). MAINLAND: Carrowmore Lough (Morley).
- Perilitus aethiops** Nees.—MAINLAND: a ♀ at Carrowmore Hill, 500 feet (Morley).
- Meteorus chrysophthalmus** Nees.—MAINLAND: Polranny and Mulranny, June (Johnson).
- M. confinis** Ruthe.—MAINLAND: a ♀ on rocks at Roonah Quay, 20th July (Morley).

- Meteorus pulchricornis** Wesm.—Clare Island, a ♂ in September, 1910 (Johnson).
- M. unicolor** Wesm.—MAINLAND: a ♀ at Achill in June, 1909 (Halbert).
- M. leviventris** Wesm.—MAINLAND: a ♂ at Louisburgh, 17th July, 1910 (Morley).
- Diospilus oleraceus** Hal.—Clare Island, a ♂ in July (Morley).
- D. capito** Nees.—Clare Island, a ♀ in July (Morley).
- Coelinius gracilis** Hal.—MAINLAND: ♂ ♂ at Louisburgh and Carrowmore Lough (Morley).
- Chaeon anceps** Curt.—Common: Clare Island in June, 1909 (Halbert), and June, 1911 (Johnson); on mainland at Belclare (Halbert), and Louisburgh (Morley).

#### CHALCIDIDAE.

- Isosoma petiolata** Walk.—Clare Island, a ♂ in July, 1910 (Morley).
- Torymus erucarum** Schr.—Clare Island; and Carrowmore Lough on mainland in July (Morley).
- T. nigricornis** Walk.—Clare Island, on the cliffs (Halbert). MAINLAND: Belclare and Castlebar in July (Halbert).
- T. chloromerus** Walk.—Clare Island, a ♀ in June, 1909 (Halbert).
- Lamprotatus** spp.—Clare Island, several in July (Morley); Westport, July (Halbert).
- Micromelus pyrogaster** Walk.—MAINLAND: a ♀ in woods near Westport, July (Halbert).
- Pteromalus** spp.—Clare Island, several species common (Morley); Westport (Halbert).
- Eulophus** spp.—Clare Island, three specimens; and a ♀ at Louisburgh (Morley).

#### PROCTOTRYPIDAE.

- Gonatopus distinctus** Kief.—Clare Island, one specimen in June, 1911 (Johnson).
- Antaeon indivisus** Chitty.—MAINLAND: a ♂ on Carrowmore Hill, 16th July (Morley).
- A. nigroclavatus** Chitty.—MAINLAND: a ♂, Carrowmore Lough, 18th July (Morley).
- A. filicornis** Chitty.—Clare Island, two ♂ ♂ in July, 1910 (Morley).
- Proctotrypes fuscipes** Hal.—Clare Island; and Carrowmore Hill on mainland (Morley).
- P. niger** Panz.—Clare Island, ♀ ♀ in July (Morley). MAINLAND: Brackloon Wood (Grimshaw).

- Proctotrypes pallidipes* Jur.—Clare Island, three ♀ ♀ in June, 1911 (Johnson).  
*Cinetus gracilipes* Curt.—Clare Island, both sexes swept in July, 1910 (Morley).  
*C. politus* Thoms.—Clare Island, one ♂ in July (Morley).  
*Trichosteresis nitida* Thoms.—MAINLAND: one specimen at Achill, June (Halbert).  
*Pantoclis brevis* Nees.—MAINLAND: a ♀ at Louisburgh, 17th July, 1910 (Morley).  
*Diapria* spp.—Clare Island, a ♂ and ♀ of different species in July (Morley).  
*eratropia* (*Diapria*) sp.—MAINLAND: a ♀ of this sub-genus at Westport, 1911 (Halbert).  
*Teleas* sp.—Clare Island, a single male of this difficult genus, July (Morley).

#### CYNIPIDAE.

- Rhodites eglanteriae* Htg.—MAINLAND: a ♀ at Westport on 15th June, 1909 (Halbert).  
*Figites scutellaris* Rossi.—Clare Island, ♀ ♀ in July (Morley and Johnson).  
*Anarcharis tincta* Walk.—Clare Island; and a couple at Louisburgh, July (Morley).  
*Cothonaspis nigricornis* Cam.—A ♂ on carrot flower, Carrowmore Lough, July (Morley).  
*Allotria curvicornis* Cam.—Clare Island, a single female on herbage (Morley).

DIPTERA.

By PERCY H. GRIMSHAW, F.R.S.E., F.E.S.

Read NOVEMBER 11. Published DECEMBER 9, 1912.

INTRODUCTION.

THE following list of the Diptera of Clare Island and the surrounding mainland is the result of the examination and determination of over 4,000 specimens. In addition to the material obtained by myself during a few days' visit to the island in July, 1910, and a sojourn of about a fortnight in the neighbourhood of Westport exactly a year after this date, I have had the advantage of working through collections made by other entomologists, notably Mr. J. N. Halbert, Mr. Claude Morley, and the Rev. W. F. Johnson. In the list which follows, the name of the collector is indicated in every case within parentheses, and to all those who have thus assisted me I hereby tender my hearty thanks.

Of the 519 species here recorded no fewer than 160, or more than 30 per cent., appear to be new to the Irish fauna. These additions are indicated by an asterisk (\*), while five species which are new to Britain have their names preceded by a double asterisk (\*\*). In this connexion I must here express my great indebtedness to Professor G. H. Carpenter, who lent me one of Verrall's Lists of British Diptera, marked and most generously placed at his disposal by Col. J. W. Yerbury, showing what species were already recorded for Ireland. Without this help I should have found it a very troublesome task to ascertain which of the following species were new to the country.

With regard to the summarizing of results I feel it to be somewhat premature to pronounce any definite opinions on the question of distribution. Our knowledge of the Dipterous fauna of Ireland is very far behind, and with prolonged periods of collecting any conclusions now formed might be entirely upset. The following remarks are therefore only to be taken as suggestive. In the first place, our knowledge of Irish Diptera is in the main drawn from the records of A. H. Haliday, who appears to have collected chiefly in the eastern counties. The only paper of any importance dealing with the western counties is that by Colonel Yerbury on the Diptera of

Cork and Kerry ("Irish Naturalist," vol. xi, pp. 74-93), in which 312 species are recorded. Up to the present, something like 1050 species have been recorded for Ireland as a whole, which number the present list increases to 1210. Of this total number, about 43 per cent. have been discovered in the district covered by the present Survey, and about 13 per cent. have not been recorded beyond it. This appears to me to show a somewhat large percentage of peculiarity; but whether this is due to insufficiency of knowledge or to an actual feature in distribution it is not yet possible to say.

My method of collecting has been to pin every specimen which fell to the net, be the species common or otherwise. The detailed figures given for each species and locality may therefore have a certain amount of value as indicating roughly the abundance or scarcity of the species concerned.<sup>1</sup> But against this must be set the fact that while several days were spent on Clare Island, other localities show only the result of a single day's, or perhaps half a day's, collecting. The area richest in Diptera seems to be the Demesne at Westport, whence 148 species were obtained. This may be accounted for by its varied character—woodland, marsh, sea-coast, and open ground of various kinds all occurring within its limits. Belclare and Louisburgh come next, with 145 and 113 species respectively, while in a single forenoon at Mulranny 105 species were obtained.

Regarding the Dipterous fauna of Clare Island itself as compared with the mainland, little is worthy of note. The following figures indicate the results of the Survey, and are pretty much what one would expect:—

Total number of species in the whole area investigated	. 519
Number of species found on mainland	. . . . . 476
Species found on mainland only	. . . . . 308
Species common to mainland and Clare Island	. . . . . 168
Number of species found on Clare Island	. . . . . 211
Species found on Clare Island only	. . . . . 43

Of the species new to the British fauna one belongs to the Tendipedidae (Chironomidae), two are Empidæ, and two are Anthomyiidae. They are as follows:—

*Metricnemus modestus* Mg. (*nec* Verrall), *Mydaea anceps* Ztt.  
*Hilara lasiopyga* Lundbeck, *Limnophora nigriventris* Ztt.  
*Tachydromia albocapillata* Flin.

A word remains to be said as to the nomenclature used in this paper. In the main I have followed the "Katalog der Paläarktischen Dipteren" of

<sup>1</sup> In the case of many common species of general distribution in Britain I have merely stated the localities whence examples were obtained.

Becker, &c., but have also adopted the names recently resuscitated by Hendel and other authors from the long-lost paper of Meigen's entitled "Nouvelle classification des mouches à deux ailes (Diptera L.)." This paper has given rise to a good deal of discussion and controversy; but as the International Commission on Zoological Nomenclature has decided (Opinion 28, October 1910) that the generic names there used must take precedence (when found valid) over those used in Meigen's later works, I have decided to use such names without question, following Hendel's opinion (Verhandl. der k. k. zool.-bot. Gesellschaft in Wien, 1908, pp. 43-69) as regards validity or otherwise. In pursuing such a course I fear many portions of the list possess an unfamiliar appearance; but to obviate difficulties I have inserted within parentheses the names used in Verrall's List in each case where there is an alteration.

To save space the following contractions are used:—CI., Clare Island; M., Mainland; (H.), J. N. Halbert; (M.), Claude Morley; (J.), Rev. W. F. Johnson; and (G.), Percy H. Grimshaw.

## LIST OF SPECIES.

### ORTHORRAPHA NEMATOCERA.

#### Family Lycoriidae (*Sciaridae*).

- Lycoria (Sciara) flavipes** Mg.—M.: Louisburgh, one ♂ (H.); Brackloon Wood, one ♂ and one ♀ (G.).—A woodland species, distinguished by its large size, slender build, and light colour.
- L. thomae** L.—M.: Castlebar Lough, one ♀ (G.); Westport, one ♀, riverside (G.).—A large and conspicuous species, easily recognized by its smoky wings, and, in the ♀, by the yellow stripe down each side of the abdomen.

[Besides the above, over thirty specimens of this difficult genus were taken, two on Clare Island and the rest on various parts of the adjacent mainland. Several species are represented; but I have not succeeded in identifying any of them.]

#### Family Fungivoridae (*Mycetophilidae*).

- \***Mycomya (Sciophila) trilineata** Ztt.—M.: Achill, one ♂ of what I believe is this species, taken by Mr. Halbert.
- Boletina analis** Mg.—CI.: one (G.). M.: Louisburgh, one (M.).
- Leia (Glaphyroptera) fascipennis** Mg.—M.: Belclare, one ♂ (H.).
- Fungivora (Mycetophila) signata** Mg.—M.: Brackloon Wood, two (G.).

Family **Bibionidae**.

- \**Scatopse tristis* Ztt.—CI.: one (G.).  
*Anarete candidata* Hal.—M.: Knappagh, one ♀ (G.).  
*Biblio johannis* L.—M.: Louisburgh, one ♂.  
 \**B. lacteipennis* Ztt.—M.: Belclare, one ♂ and three ♀ (H.).—This species is closely allied to the preceding, but easily distinguished in the ♂ sex by its milky-white wings.  
 \**Philia (Dilophus) femorata* Mg.—M.: Achill N.E., one ♀ (H.).

Family **Tendipedidae (Chironomidae)**.

- Tendipes (Chironomus) annularis* Deg.—M.: Achill N.E., two ♂ and one ♀ (H.).  
 \**T. aprilius* Mg.—M.: Westport Demesne, two ♂ (G.); Lough near Westport, three ♂ and one ♀ (G.).  
 \**T. brevitibialis* Ztt.—M.: Glendarary, two ♀ (G.); Westport, one ♀ in garden and two ♂ in Demesne (G.); near Westport, one ♀ (G.); Castlebar Lough, two ♀ (G.).—A small delicate species, of the same group as *T. viridis* Mcq., and characterized by its extremely short front tibiae.  
 \**T. dispar* Mg.—M.: Knappagh, two ♂ (G.); near Westport, one ♂ and two ♀ (G.).  
 \**T. dorsalis* Mg.—CI.: two ♂ (H.). M.: Westport, one ♀ in garden (G.).—A variable but common species. The longitudinal stripes on the thorax vary from light chestnut brown to black. The transversely banded abdomen serves to distinguish it from its allies. Size: 6–7.5 mm.  
 \**T. ferrugineovittatus* Ztt.—M.: a single ♀ of what I take to be this species was captured by me in the Westport Demesne on 28th July, 1911. It is very similar to the common *T. plumosus* L.; but the thoracic stripes are reddish-brown, the metathorax is dark brown with a distinctly yellow base, and the whole insect is smaller and more greenish in tinge.  
 \**T. nigrimanus* Staeg.—M.: Westport, one ♂ in garden (G.).  
 \**T. nubeculosus* Mg.—M.: Westport, twenty-six ♂ and five ♀ in the Demesne, two ♀ in garden, and one ♀ on riverside (G.).  
*T. pedellus* Deg.—M.: Westport and Louisburgh (H.); Belclare (H. and G.); Castlebar Lough and Knappagh (G.).  
 \**T. pictulus* Mg.—M.: Belclare, two ♀ (H.).  
*T. plumosus* L.—M.: Louisburgh, one ♂ (H.); Belclare and Westport, one ♂ in garden (G.).



- \***T. prasinatus** *Staeg.*—M.: Achill, two ♂ (H.); Lough near Westport, one ♀ (G.).
- \***T. psittacinus** *Mg.*—M.: Glendarary, one ♂, and Achill N.E., two ♀ (H.) Clogher, one ♂ and two ♀ (G.). This species has hitherto been regarded as doubtfully British.
- \***T. pusillus** *L.*—M.: Knappagh, four ♂ (G.). The name of this tiny species is given in italics in Verrall's "List" as being only "reputed" British. I have specimens taken in Edinburgh. No doubt it is constantly overlooked on account of its small size (2 mm.). It is bright green, with three shining black stripes on the thorax, the middle one of which is distinctly double behind. The front tibia is shorter than both the femur and the metatarsus.
- T. riparius** *Mg.*—M.: Glendarary, one ♀ (H.); Westport, one ♂ and four ♀ in the Demesne and one ♀ in garden (G.).
- \***T. rufipes** *L.*—M.: Glendarary, one ♂ and one ♀ (H.).
- T. tentans** *Fab.*—CI.: two ♂ and two ♀ (H.). M.: Lough near Westport, one ♂ and four ♀ (G.).
- T. viridis** *Mcq.*—M.: Clogher, two ♂ (G.). A species belonging to the group characterized by having a green thorax, with reddish-yellow longitudinal stripes. It is distinguished from many of its allies by having the front femora and tibiae of approximately equal length.
- \***Cricotopus bicinctus** *Mg.*—M.: Westport, one ♂ in garden and one ♂ in Demesne (G.); Lough near Westport, one ♀ (G.).
- C. motitator** *L.*—M.: Louisburgh, one ♀ (H.).
- C. silvestris** *Fab.*—M.: Westport, four ♂ and one ♀ in Demesne (G.) Lough near Westport, one ♀ (G.); Belclare, one ♂ (G.). This species has the femora, with the exception of the tip, whitish, the thorax yellow, with three shining black longitudinal stripes, and the abdomen velvety black, with whitish edges to the segments, and usually broad, yellowish transverse bands on the first, fourth, and fifth segments.
- \***C. tibialis** *Mg.*—CI.: two ♂ (H.); one ♂ (G.). M.: Lough near Westport, two ♂ and two ♀; Clogher, two ♂ and one ♀; Knappagh, one ♀ (G.). One of the plainest-looking species of this interesting genus. Distinguished by its wholly dark tarsi and broad, obscurely whitish band on the tibiae. The female is similar to the male; but the shining black on the dorsum of the thorax is broken up by the yellow ground-colour into three more or less distinct longitudinal stripes.
- \***C. trifasciatus** *Panz.*—M.: Mulranny, one ♀ (G.). Var. **tricinctus** *Mg.*—M.: Clogher, five ♂ and one ♀ (G.); Lough near Westport, one ♀ (G.). A well-marked species, with the first, fourth, and seventh segments

of the abdomen yellow. In the var. *tricinctus* the femora are less extensively yellow, and the longitudinal black stripes on the thorax broader.

*Cricotopus* sp.—M.: a single ♀ taken on the shores of a lough near Westport (G.) represents a tiny species only 1 mm. in length, which I am not able to identify.

\**Orthocladius sordidellus* Ztt.—CI. (G.). M.: Achill and Belclare (H.); Mulranny, Westport, Lough near Westport, and Castlebar Lough (G.). An abundant and very variable species.

\**Tanytarsus flavipes* Mg.—M.: Westport, one ♂ in garden (G.). A very distinct species of this hairy-winged genus. Thorax and abdomen black, the latter with long, pale yellow hairs; legs pale yellow, and hairy.

*T. punctipes* Wied.—M.: Lough near Westport, one ♂ (G.). Distinguished by its uniformly black thorax, scutellum, and metathorax, light green abdomen, whitish wings, and pale legs, with a small black dot on the extreme tip of the middle and hind tibiae.

\**T. pusio* Mg.—M.: Achill, one ♂ (H.); Lough near Westport, one ♂ (G.). A light green, neat little species (2.5–3 mm.), with three shining black longitudinal stripes on the thorax, the middle one of which is divided by an extremely fine line of ground-colour. The genitalia are pale yellowish and conspicuous.

*T. sp.*—CI.: one ♂ and one ♀ (G.). A species with entirely black thorax, and the front metatarsus half as long again as the tibia. This may be *gmundensis*, Egger, but the condition of the specimens renders this identification doubtful.

\**Metriocnemus fuscipes* Mg.—M.: Knappagh, three ♂ and one ♀; Belclare, one ♂ and one ♀; Clogher, one ♂; Lough near Westport, three ♂ (G.). An easily recognized little species, black throughout, with hairy wings, strongly hairy abdomen, and hairy legs. Size: 3–4 mm. The colour of the halteres, *as a rule*, is black in the ♂ and dirty white in the ♀. Three of the ♂ recorded above, however, have the halteres the same colour as those of the ♀. I am convinced that they are all of one species; and hence must regard the colour of the organs in question as variable.

\*\**M. modestus* Mg.—M.: Lough near Westport, one ♂, and Belclare, one ♂ (G.). This is a species new to the British list, and is not the *M. modestus* of Walker's "Insecta Britannica" (vol. iii, p. 190), nor of Verrall's "List," since Walker placed his species in the group characterized by having the "fore tibia longer than the fore metatarsus by two-thirds." Walker's description (as is so often the case) is useless; and in the determination

of the specimens before me I have been guided mainly by Strobl (Mitth. Ver. Steiermark, 1894, pp. 189-190) and Van der Wulp (Dipt. Neerlandica, p. 291). Strobl considers that *incomptus*, V. d. Wlp. and *seitenstettensis*, Strobl, are synonyms of *modestus*, Mg., while *incomptus*, Ztt., is a variety of the same species.

In view of the difficulties connected with the proper determination of this species I have thought it advisable to prepare, from the specimens before me, the following short description, as an aid to future workers:—

♂. Antennae dark brown, fully as long as head and thorax together. Dorsum of thorax distinctly shining, of a dirty yellow colour, with three broad black longitudinal stripes, the yellow ground-colour with distinct light grey sheen, especially when seen from the front; scutellum dirty yellow; metathorax black, slightly shining. Abdomen shining black, with narrow transverse yellowish bands at the apical margin of each

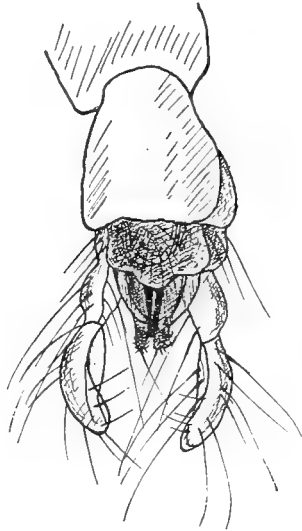


FIG. 1.—Male genitalia of *Metriocnemus modestus* Mg.

segment; the whole abdomen covered with yellowish hairs which are about as long as the abdomen is broad; halteres light yellowish, with dark knob. Legs yellowish-brown, femora darker, tibiae and tarsi lighter, tibiae, especially of the middle and hind legs, with a black dot at the tip; front tibiae and metatarsi of approximately equal length.

Genitalia (see figure) conspicuous and hairy, consisting of a pair of distinctly two-jointed claspers, with three short, slender processes between them.

Length: 4 mm.

- Diamesa ammon** Hal. — CI.: one ♀ (H.). This is an interesting find. The species was originally described from Ireland (Down, Cork, and Kerry) in 1856, but I am not aware of any subsequent record, either in Britain or on the Continent. The genus *Diamesa* (as now restricted) is characterized by having the fourth joint of the tarsus heart-shaped and shorter than the fifth. In *D. ammon* the antennae of the ♀ have eight joints, the wings are milky-white (notwithstanding the fact that Haliday described them as hyaline in this sex), and the thorax obscurely yellowish-brown, with three longitudinal darker brown stripes, the middle one of which is double, while the whole thorax is covered with a distinct whitish tomentum.
- Prodiamesa obscurimana** Mg.—CI.: two ♂ (H.) and one ♂ (G.). M.: Louisburgh, two ♀ (M.). This genus differs from *Diamesa* (*sens. str.*) in having the fourth tarsal joint longer than the fifth. *P. obscurimana* is not an uncommon species.
- \***Procladius nervosus** Mg.—M.: Belclare, two ♀ (H.). A large, shining black species, with pitchy legs. It is the only British representative of the genus, which differs from *Pelopia* (*Tanypus*, *sens. str.*) in having bare wings.
- \***Pelopia (Tanypus) culiciformis** L.—M.: Westport, one ♂ in Demesne; Lough near Westport, four ♀; Clogher, six ♂ and two ♀; Knappagh, one ♂, and Belclare, one ♀. This is a true *Pelopia* (*Tanypus*) in the restricted sense, having hairy wings, the fork of the fifth longitudinal vein petiolated, and the subcostal vein bifurcated at its extremity.
- P. sp.**—M.: a single ♀ of a pretty little species, which I cannot refer to any described form, was taken by me at Castlebar Lough on the last day of July, 1911. It measures only 2 mm. in length, has an almost white thorax with very distinct black longitudinal bands, the abdomen black with whitish incisures, legs pale, with the tips of the tibiae, the tip of the first tarsal joint, and the rest of the tarsus blackish.
- Ablabesmyia nebulosa** Mg.—CI.: one ♀ (H.); two ♂ (G.). M.: Glendarary, one ♂ and one ♀, and Achill N.E., one ♀ (H.); Mulranny, one ♀ (G.). A well-marked species, belonging to a genus characterized by having hairy wings, with sessile fork of the fifth longitudinal vein, and the subcostal vein with bifurcated tip.
- \***A. phatta** Egger.—M.: Knappagh, one ♀, and Belclare, one ♀ (G.). A pretty species, with mottled wings and annulated legs as in *A. monilis* L., but differing from that species in having the front tarsus in the male bearded.

- \***A. pygmaea** *V. d. Wlp.*—**M.** : Knappagh, one ♂ (G.). A tiny species (only 2 mm.), easily recognized by its light grey thorax with three conspicuous black longitudinal bands and banded abdomen.
- \***Helea (Ceratopogon) rostrata** *Winn.*—**CI.** : Two ♂ and one ♀. **M.** : Castlebar Lough, one ♀ ; Belclare, a pair (♂ and ♀) in cop. and one ♀ ; Lough near Westport, one ♀ ; and Knappagh, one ♂ and two ♀ (G.). This species is not uncommon, and is easily recognized by the unusual length of the proboscis, which is fully as long as the depth of the head. The wings are practically bare in the ♂, but distinctly (though only partially) hairy in the ♀.
- Culicoides pulicaris** *L.*—**CI.** : one ♂ (G.). **M.** : Castlebar Lough, one ♂ ; and Lough near Westport, one ♂ (G.). A common species. The genus *Culicoides* differs from *Helea* in the absence of a distinct empodium, this structure never attaining half the length of the claws. *C. pulicaris* has elegantly spotted wings, and is easily recognized.
- Palpomyia flavipes** *Mg.*—**CI.** : one ♀ (H.); one ♀ (G.). **M.** : Belclare, one ♂ and one ♀ (H.); Louisburgh, three ♀ (M.); Westport and Lough near Westport, one ♀ at each (G.). This species is distinguished by the following characters : Thorax shining black, front femora alone armed with spines up to about eight in number, hind femora yellowish with the apical third blackish. The genus *Palpomyia*, containing about half a dozen British species, has been recently separated by Kieffer, the following being some of the characters : some or all of the femora spined beneath, none of them thickened, empodia absent.
- Serromyia femorata** *Fab.*—**CI.** : one ♀ (H.). **M.** : Glendarary, one ♂ (H.). The only British species of the genus, which is characterized by the strongly thickened and spined hind femora.

Family **Culicidae.**

- Anopheles bifurcatus** *L.*—**M.** : Westport, one ♀ at riverside (G.).
- Culex pipiens** *L.*—**CI.** : one ♀ (H.). **M.** : Westport, one ♀ at riverside (G.). The "Common Gnat," of universal distribution in Britain.
- Sayomyia (Corethra) plumicornis** *Fab.*—**CI.** : three ♂ and one ♀ (G.). **M.** : Glendarary, one ♂ and two ♀, and Belclare, one ♀ (H.); Clogher, two ♂ and one ♀ (G.). The character given by Theobald (*Mon. Culicidae*, vol. ii, p. 300) for distinguishing this species from *culiciformis*, Deg., viz. the position of the posterior cross-vein, is variable, and hence of no value for this purpose. Moreover, K. Grünberg, in "Die Süswasserfauna Deutschlands—Diptera, p. 94 (1910), places *culiciformis*, Deg. along with *velutina*, Ruthé in the genus *Corethra*, Mg. (sens. str.), which is

characterized by having the basal joint of the tarsus only about one-fifth the length of the second.

Family **Liriopidae** (*Ptychopteridae*).

- Liriope** (**Ptychoptera**) *albimana* *Fab.*—CI.: one ♀ (J.); one ♂ (G.).  
**L. lacustris** *Mg.*—M.: Belclare one ♀ (H.).  
**L. paludosa** *Mg.*—M.: Westport, one ♂ in demesne; Louisburgh, one (? sex) (M.).  
**L. scutellaris** *Mg.*—CI.: one ♂; M.: Lough near Westport, one ♀ (G.).

Family **Dixidae**.

**Dixa aestivalis** *Mg.*—CI.: one ♂ and one ♀, Creggan (H.). This species is distinguished from its allies by its entirely clear (unspotted) wings and its bright yellow thorax, which is adorned with three conspicuous dark brown longitudinal stripes.

Family **Melusinidae** (*Simuliidae*).

- \***Melusina** (**Simulium**) *argyreatum* *Mg.*—M.: Louisburgh, one ♂ (M.).  
 \***M. latipes** *Mg.*—M.: Glendarary, one ♀ of what I believe to be this species (H.).  
**M. reptans** *L.*—CI.: one ♂ and one ♀ (G.). M.: Mulranny, one ♀ (H.); Belclare, one ♀ (H.).

Family **Psychodidae**.

- Ulomyia fuliginosa** *Mg.*—M.: Belclare, one ♂ (G.).  
 \***Pericoma cognata** *Eaton.*—M.: Westport, three ♂ in garden (G.).  
 \***P. notabilis** *Eaton.*—M.: Westport, one (? sex).

Family **Phrynidae** (*Rhyphidae*).

- Phryne** (**Rhyphus**) *fenestralis* *Scop.*—M.: Westport, two ♀ in garden (G.).  
 A common fly, often found on windows (hence its specific name).  
**P. punctata** *Fab.*—CI.: (G.). M.: Westport (H. & G.); Lough near Westport (G.); Belclare, and Louisburgh (M.).

Family **Itonididae** (*Cecidomyiidae*).

**Hormomyia** *sp.*—M.: Louisburgh, one (M.).

[Two other species of this family are in the collection, but I am unable to determine them.]

Family **Limoniidae** (*Limnobiidae*).

- Dicranomyia autumnalis** *Staeg.*—M.: Belclare, one ♀ (H.). This, is, I believe, the species given in Verrall's list as *stigmatica*, Mg. In the determination of the name I have followed Osten-Sacken (Berl. Ent. Zeitschr., xxxix, 1894, pp. 251-253). I have not seen a ♂, but the species is already recorded from Ireland, so that I have little hesitation in applying the name to the present specimen.
- \***D. goritiensis** *Mik.*—CI., one ♂ (? H.), and one ♂ (G.). Of this species I know no definite British records, although it has a place in Verrall's List.
- D. lutea** *Mg.*—M.: Westport, one ♀ in garden (G.).
- \***D. mitis** *Mg.*—CI.: one ♂ near lighthouse (? H.), and one ♂ (G.). M.: Belclare, one ♂ (G.).
- D. morio** *Fab.*—CI.: one ♂ (G.).
- Limonia (Limnobia) bifasciata** *Schrk.*—M.: Glendarary, one ♀ (? H.).
- L. quadrinotata** *Mg.*—M.: Brackloon Wood, one ♂; and Belclare, one ♂ (G.).  
A handsome species. The thorax is shining ochreous, with four dark longitudinal stripes; the wings are elegantly spotted in the costal half only.
- L. tripunctata** *Fab.*—M.: Westport, one ♀ in Demesne (? H.).
- \***Rhypholophus nodulosus** *Mcq.*—CI.: one ♂ (G.). M.: Brackloon Wood, one ♀ (G.).
- Molophilus ater** *Mg.*—M.: Louisburgh, one ♂ (H.).
- \***M. biflatus** *Verr.*—CI.: one ♂ (? H.). M.: Glendarary, one ♂ (? H.).
- \***M. obscurus** *Mg.*—CI.: two ♂ (G.). M.: Louisburgh, one ♀ (H.); Lough near Westport, one ♂ (G.).
- \***M. ochraceus** *Mg.*—CI.: (G.). M.: Castlebar Lough, Knappagh, Brackloon Wood, Lough near Westport, and Belclare (G.).
- \***M. propinquus** *Egg.*—M.: Lough near Westport, one ♂ (G.).
- \***Erioptera flavescens** *L.*—M.: Belclare, two ♂ (H.); Knappagh, two ♂ (G.).
- \***E. fuscipennis** *Mg.*—CI.: two ♀ (H.); five ♂ and two ♀ (G.). M.: Lough near Westport, two ♂ and one (? sex); Belclare, one ♂ and one ♀; and Clogher, one ♂ and two ♀ (G.).
- E. trivialis** *Mg.*—CI.: one ♂ (H.) and one ♂ (G.).
- Symplecta stictica** *Mg.*—M.: Westport, four ♂ and one ♀ in Demesne (G.).
- Gonomyia tenella** *Mg.*—CI.: two ♂ and two ♀ (G.). M.: Castlebar Lough, one ♂; Clogher, one ♂; and Belclare, one ♀ (G.).
- \***Empeda nubila** *Schum.*—M.: Westport, three ♂ and two ♀ in garden (G.).
- Ephelia marmorata** *Mg.*—CI.: one ♀.

- \**Limnophila discicollis* Mg.—CI. : one ♂ (G.). M. : Castlebar, one ♂ (? collector).
- L. ferruginea* Mg.—CI. : one ♂, N. side (H.). M. : Louisburgh, one ♂ (H.); Lough near Westport, one ♂, and Knappagh, two ♂ (G.).
- \**L. lineolella* Verr.—M. : Brackloon Wood, one ♀ (G.).
- \**L. meigenii* Verr.—CI. : one ♂ (G.).
- L. nemoralis* Mg.—M. ; Lough near Westport, one ♂, and Brackloon Wood, one ♀ (G.).
- L. ochracea* Mg.—CI. : one ♂ (G.). M. : Westport, one ♀ at riverside, and Brackloon Wood, one ♂ and four ♀ (G.).
- Amalopsis littoralis* Mg.—CI. : two ♂ of this fine species were found resting under the arch of a small bridge over a stream on the south side (G.).

## Family Tipulidae.

- \**Prionocera turcica* Fab.—M. : Belclare, five ♂ (G.). This is the *Tipula diana* of Verrall's List. The genus *Prionocera* is separated from *Tipula* on account of the thick, serrated antennae. The species was confirmed as British in 1892, and since then has been taken in a few widely separated localities.
- Tipula fulvipennis* Deg. (*lutescens* Fab.)—M. : Mulranny, one ♂ and one ♀ (G.); Brackloon Wood, two ♂ and one ♀ (G.).
- T. lateralis* Mg.—CI. : one ♂ and one ♀ (G.). M. : Castlebar Lough, six ♂ and one ♀ ; near Westport, one ♂ ; Belclare, one ♂ ; and Knappagh, three ♂ (G.).
- T. longicornis* Schum.—M. : Westport, one ♂ (? collector).
- T. maxima* Poda (*gigantea* Schrk.)—M. : Belclare, one ♀ (H.), and one ♀ (G.); near Westport, one ♀ ; and Mulranny, one ♂ (G.).
- T. ochracea* Mg.—M. : Mulranny, one ♀ (G.); Belclare, one ♂ (H.).
- T. oleracea* L.—CI. : (Milne and G.). M. : Louisburgh (H.); Westport, Clogher, Knappagh, and Mulranny (G.).
- \**T. rufina* Mg.—CI. : one ♀ (? collector); three ♂ (G.). M. : Achill, one ♂ (J.); Glendarary, one ♂ (? H.).
- \**T. scripta* Mg.—CI. : one ♂ (G.). M. : Belclare, one ♂, Knappagh, one ♂, and Brackloon Wood, one ♂ (G.).
- T. variicornis* Schum.—M. : Glendarary, one ♂ (? collector). This is the *Pachyrrhina annulicornis* of Verrall's List.
- T. variipennis* Mg.—M. : Curraun District, one ♂ (Scharff); Belclare, one (H.).



- Pachyrrhina lineata** Scop. (*histrion* Fab.)—CI.: one ♂ and two ♀ (G.). M.: Curraun District, one ♂ (S.); Westport, one ♀ in Demesne (? H.); Mulranny, one ♀ (G.).
- \***P. quadrifaria** Mg.—M.: Westport, one ♀ in Demesne (H.).
- P. scalaris** Mg. (*imperialis* Mg.)—M.: Mulranny, one ♂ and one ♀ (G.); Westport, one ♀ in garden (G.).

### ORTHORRAPHA BRACHYCERA.

#### Family Stratiomyidae.

- Nemotelus nigrinus** H.—M.: Louisburgh, one ♂ (H.).
- \***N. notatus** Ztt.—M.: Mulranny, one ♂ and four ♀ (G.).
- N. uliginosus** L.—M.: Westport, in Demesne, one ♂ (G.), and two ♀ (H.).
- Hermione (Oxycera) pygmaea** Fln.—CI.: one ♂ (G.); five ♂ and two ♀ (M.).
- H. trilineata** Fab.—M.: Westport, one ♀ in Demesne (H.).
- Hoplodonta (Odontomyia) viridula** Fab.—CI.: one ♀ (G.). M.: Louisburgh, one ♂ (M.) and one ♀ (H.); Mulranny, two ♂ and one ♀ (G.); Westport, one ♀ in Demesne (H.).
- Sargus flavipes** Mg.—M.: Belclare, one ♀ (H.).
- S. iridatus** Scop.—M.: Belclare, one ♀ (H.).
- \***S. minimus** Ztt.—M.: Belclare (H.). This represents what I take to be Verrall's species under this name.
- Chloromyia formosa** Scop.—M.: Westport, one ♂ and one ♀ (? H.); Louisburgh, one ♂ and one ♀ (H.).
- Microchrysa cyaneiventris** Ztt.—M.: Belclare, one ♂ (H.).
- M. polita** L.—CI.: one ♂ (M.). M.: Belclare, one ♀ (H.).
- Beris chalybeata** Forst.—M.: Westport, one ♀.
- \***B. fuscipes** Mg.—M.: Westport, one ♂ and one ♀ in Demesne.
- B. vallata** Forst.—CI.: two ♀ (G.). M.: Westport, one ♂ in Demesne (? collector); Louisburgh, one ♀ (M.); Belclare, one ♀ (H.); Darby's Point, Achill Island, one ♂ and two ♀ (J.); Glendarary, one ♀, Mulranny, one ♂ and three ♀, and Polranny, one ♀ (J.).

#### Family Tabanidae.

- Chrysops relictus** Mg.—M.: Belclare, one ♀ (H.); Louisburgh, one ♂ and nine ♀ (M.); Laghta, Louisburgh, one ♀ (? collector).
- Chrysozona (Haematopota) crassicornis** Wahlbg.—CI.: two ♂ and one ♀ (G.). M.: Laghta, Louisburgh, one ♂ and one ♀ (? collector).
- C. pluvialis** L.—CI.: (G.). M.: Belclare (H.); Louisburgh (M.); Croaghpatrick (H. and M.); Mulranny, Westport, and Lough near Westport (G.).

**Tabanus (Therioplectes) solstitialis** *Mg.*—CI.: one ♀ (M.). M.: Louisburgh, five ♀ (M.); Croaghpatrick, one ♀ (M.); Laghta, Louisburgh, two ♀.

Family **Leptididae.**

**Leptis lineola** *Fab.*—M.: Belclare, two ♂ (H.); Louisburgh, one ♂ (M.); Old Head, Louisburgh, one ♀ (H.).

**L. scolopacea** *L.*—CI.: one ♂ and one ♂. M.: Achill, one ♀ (J.) and one ♂ (? collector); Curraun District, one ♂ (? collector); Croaghpatrick, one ♂ (H.), one ♂ and one ♀ (M.); Louisburgh, one ♂ and one ♀ (M.).

**Chrysopilus cristatus** *Fab.*—CI.: one ♂ (? collector); four ♂ and two ♀ (G.). M.: Louisburgh, one ♂ and two ♀ (M.); Brackloon Wood, one ♂ and one ♀ (G.).

Family **Empididae.**

**Noeza (Hybos) culiciformis** *Fab.*—M.: Belclare, one ♂ (H.); Westport, two ♂ in Demesne, and Brackloon Wood, one ♂ and six ♀ (G.). This is the species standing in British Lists as *grossipes* L., but is distinguished from that species by the yellow colour of the notopleural and postalar bristles, likewise the yellow colour of the bristles on the margin of the scutellum, the very large genitalia, and the absence of long hairs on the front tibiae and tarsi of the ♂. (See Lundbeck, "Diptera Danica," Part iii, p. 15, and Carter, *Ent. Mo. Mag.*, 1912, pp. 59-60).

**N. femoratus** *Müll.*—CI.: six ♂ and three ♀ (G.). M.: Louisburgh, one ♂ (H.), one ♂ and four ♀ (M.); Croaghpatrick, one ♂ (M.); Belclare, one ♂ (H.); Clogher, one ♀, Knappagh, one ♀, and Brackloon Wood, one ♂ (G.).

**Bicellaria (Cyrtoma) nigra** *Mg.*—M.: Glendarary, two ♂ (H.).

**B. spuria** *Fln.*—M.: Westport, one ♂ and one ♀ in Demesne (G.).

**Rhamphomyia flava** *Fln.*—M.: Castlebar Lough, one ♀ (G.).

**R. variabilis** *Fln.*—CI.: one ♂ (G.). (It should be noted that *R. tenuirostris*, *Fln.* is regarded by Lundbeck as identical with this species.)

\***Empis aestiva** *Lw.*—M.: Westport, one ♀ in Demesne (G.).

**E. borealis** *L.*—M.: Croaghpatrick, one ♀ (H.).

\***E. grisea** *Fln.*—M.: Belclare, one ♀ (H.).

**E. livida** *L.*—CI.: three ♂ and one ♀ (G.). M.: Westport, one ♂ in Demesne (? H.); Louisburgh, one ♂ and ♀ (M.); Belclare, one ♀ (H.); Clogher, one ♀ (G.).

**E. stercorea** *L.*—CI.: one ♂ (G.). M.: Westport, one ♀ in Demesne (? H.); Belclare, one ♀ (H.).

**E. tessellata** *Fab.*—CI.: two ♂ and two ♀ (G.). M.: Mulranny, one ♂ and one ♂ (G.); Louisburgh, one ♀ (M.).

- Hilara chorica** *Fln.*—CI.: seven ♂ and eighteen ♀ (G.). M.: Mulranny, Westport, Lough near Westport, Clogher, Belclare, Knappagh, and Castlebar Lough (G.).
- \***H. cinereomicans** *Strobl.*—M.: Westport, one ♂ (G.). The specimen here recorded agrees in nearly every respect with Strobl's description, and I am tolerably certain of the identification. The fork of the cubical vein, however, appears to be somewhat wider than his description indicates. On the other hand, the arrangement of the hairs and bristles on the legs, especially those of the front tibiae and tarsi, is very characteristic, and agrees exactly.
- H. flavipes** *Mg.*—M.: Louisburgh (M.); Belclare (H.); Lough near Westport, Knappagh, and Castlebar Lough (G.). Verrall, in his List, followed Schiner in relegating this species to a distinct genus (*Oreogeton*), but it is now generally considered to be a true *Hilara*.
- \*\***H. lasiopyga** *Lundbeck.*—M.: Westport, nineteen ♂ and one ♀ in Demesne, July, 1911 (G.). This interesting species, hitherto unrecorded from the British Isles, was described as new by Lundbeck, in his "Diptera Danica" (Part iii, pp. 178-180) in 1910. It is easily distinguished, as Lundbeck states, "by the erect hairs at the end of the abdomen, and by the, to be sure small, but, however, very characteristic dilatation at the base of the middle metatarsi." Our Irish specimens agree with the original description in every respect, save that the front metatarsus appears to me to be broader than shown in Lundbeck's figure, while I can only see *one* bristle—not a pair—at the apex of the same joint.
- H. litorea** *Fln.*—M.: Belclare, one ♂ and three ♀ (H.); Brackloon Wood, one ♂ and ♀ (G.).
- \***H. quadrivittata** *Mg.*—M.: Belclare, one ♂ (H.).
- H. sp.**—Two ♂ and four ♀ of a species which I cannot determine were taken by me in the Demesne at Westport, July, 1911.
- Trichina clavipes** *Mg.*—CI.: two ♂ and two ♀ (G.). M.: Glendarary, one ♂ (H.); Louisburgh, one ♂ (M.).
- Ocydromia glabricula** *Fln.*—M.: Glendarary, one ♂ (H.); Westport, one ♂ (? collector); Brackloon Wood, one ♀ (G.).
- Kowarzia (Clinocera) bipunctata** *Hal.*—M.: Belclare, one ♀ (G.).
- Heleodromia fontinalis** *Hal.*—M.: Croaghpatrick, one ♂ (M.); Belclare three ♂ (G.).
- Hemerodromia oratoria** *Fln.*—M.: Glendarary, one ♀ (H.); Achill, one ♀.
- H. precatoria** *Fln.*—CI.: one ♂ (H.). M.: Westport, one ♀ in Demesne (H.).
- Chelipoda (Lepidomyia) melanocephala** *Fab.*—CI.: two ♂ and ♀ (G.). M.: Glendarary, one ♀, and Belclare, one ♂ and one ♀ (H.).

**Drapetis aterrima** Curt.—M.: Westport, twelve specimens in Demesne and one in garden; Lough near Westport, one specimen (G.). According to Lundbeck ("Diptera Danica," Part iii, p. 255) this is the same as *nervosa* Lw. and *nigritella* Ztt.

**Tachista arrogans** L.—M.: Westport, one ♀ in Demesne (H.).

**\*Tachydromia albocapillata** Flin.—M.: Westport, four ♂ and eight ♀ in Demesne, and Knappagh, one ♂ (G.). This species is new to the British fauna. It is closely allied to *T. albisetata* Pz., but distinguished therefrom by several important characters. The third joint of the antenna is longer, the whole antenna (without the arista) being about as long as the head, while the arista is only about as long as the third joint. The legs are entirely black, except for some obscure brownish about the knees, while the wings have the cubital vein more curved.

**\*T. calceata** Mg.—M.: Belclare, one ♂ (H.); Knappagh, one ♀ (G.).

**\*T. cothurnata** Mcq.—M.: Westport, one ♂ and two ♀ in garden (G.).

**T. flavipes** Fab.—M.: Belclare, one ♂ (H.); Westport, one ♀ in Demesne (G.).

**\*T. fulvipes** Mg.—CI.: one ♀ (G.). M.: Roonah, one ♀ (? collector); Mulranny, two ♂ and eight ♀ (G.); Westport, one ♀ in Demesne (G.). This species varies much in the colour of the legs. Most of the specimens from Mulranny have the legs entirely yellow, while the Westport example shows the other extreme. But I have little doubt of their representing the same species.

**T. longicornis** Mg.—M.: Westport, one pale (immature) ♀ in Demesne (G.).

**T. minuta** Mg.—CI.: one ♀ (G.).

**\*T. pallidiventris** Mg.—CI.: one ♂ and two ♀ (G.). M.: Mulranny one ♂; Westport, two ♂ in Demesne; Castlebar Lough, one ♂ and ♀; and Knappagh, one ♂ (G.).

#### Family Dolichopodidae.

**Sciapus (Psilopus) platypterus** Fab.—CI.: one ♀ (G.). M.: Westport, one ♂ in Demense (? collector); Belclare, one ♂ (H.) and one ♀ (G.); Brackloon Wood, one ♀ (G.).

**Eutarsus aulicus** Mg.—M.: Westport, one ♀ on riverside (G.).

**\*Dolichopus arbustorum** Stann.—M.: Belclare, one ♀ (H.).

**D. atratus** Mg.—CI.: two ♂ (H.); two ♂ (no data); four ♂ and four ♀ (G.). M.: Achill, one ♂ (no data); Louisburgh, six ♂ and two ♀ (M.); one ♀ (H.).

**D. atripes** Mg.—CI.: (G.). M.: Louisburgh (M. and H.); Mulranny, Belclare, Knappagh, and Lough near Westport (G.).

- Dolichopus brevipennis** Mg.—M.: Curraun District, two ♂ (Scharff).
- \***D. claviger** Stann.—M.: Westport, one ♀ in Demesne (G.).
- D. discifer** Stann.—M.: Brackloon Wood, two ♂, and Clogher, one ♀ (G.).
- \***D. longitarsis** Stann.—CI.: one ♀ (G.). M.: Lough near Westport, one ♀ (G.).
- D. nitidus** Fln.—M.: Westport, Castlebar Lough, Belclare, and Clogher (G.).
- D. nubilus** Mg.—M.: Mulranny (G.); Westport in Demesne (G.).
- D. plumipes** Scop.—CI.: (G.). M.: Westport, in Demesne (H. and G.) and on riverside (G.); Lough near Westport, and Clogher (G.); Louisburgh (H. and M.); Mulranny (G.).
- D. popularis** Wied.—M.: Westport, one ♂ (? collector) and one ♂ in Demesne (? collector); Belclare, two ♂ and one ♀ (H.); Louisburgh, four ♀ (M.).
- D. simplex** Mg.—CI.: (G.). M.: Westport (? collector), five ♂ and five ♀ in Demesne (G.); Curraun District (Scharff); Mulranny (G.); Louisburgh (M. and H.); Belclare (H.); Castlebar Lough, Clogher, and Lough near Westport (G.).
- D. trivialis** Hal.—CI.: one ♂ (G.). M.: Louisburgh (M.); Mulranny (G.); Belclare (H.); Westport, in Demesne (H. and G.); Lough near Westport (G.).
- D. ungulatus** L.—CI.: (G. and M.). M.: Castlebar (? collector); Mulranny (G.); Westport, in Demesne (G.).
- D. vitripennis** Mg.—CI.: (G.). M.: Louisburgh (M. and H.): Lough near Westport, and Knappagh (G.).
- \***D. wahlbergi** Ztt.—M.: Brackloon Wood, one ♂ and one ♀ (G.).
- Tachytrechus notatus** Stann.—M.: Knappagh, one ♀ (G.).
- Hercostomus nigripennis** Fln.—CI.: one ♂ (? collector); seven ♂ and five ♀ (G.). M.: Louisburgh, two ♂ and one ♀ (M.).
- \***Hypophyllus discipes** Ahr.—M.: Westport, one ♂ caught in garden (G.). This species is not only new to Ireland, but is evidently rare in the British Isles generally. I know of only three previous records, viz., two in England and one in Scotland.
- H. obscurellus** Fln.—M.: Westport, one ♂ and four ♀ in garden, and two ♀ in Demesne (G.); Brackloon Wood, one ♀ (G.).
- Gymnopternus aerosus** Fln.—CI.: (G.). M.: Mulranny (G.); Belclare (H. and G.); Westport, Clogher, Castlebar Lough, Knappagh, Lough near Westport, and Brackloon Wood (G.).
- Chrysotus cilipes** Mg.—CI.: (G.). M.: Mulranny, Westport, Castlebar Lough, Belclare, Knappagh, and Clogher (G.).
- C. gramineus** Fln.—CI.: (G.). M.: Louisburgh (M. and H.); Belclare (H.);

Castlebar Lough, Westport in Demesne and on riverside, Knappagh, Clogher, Lough near Westport (G.).

*Chrysotus neglectus* Wied.—CI.: one ♀ (H.); eight ♀ (G.).

\**C. pulchellus* Kow.—CI.: five ♀ (G.).

*Argyra argentina* Mg.—CI.: one ♂ (M.); and one ♂ (G.). M.: Louisburgh, one ♂ (M.).

*A. diaphana* Fab.—M.: Achill, one ♀ (? collector).

*A. leucocephala* Mg.—M.: Louisburgh, two ♂ (M.); Croaghpatrick, one ♂ (H.); Westport, one ♂ on riverside; Clogher, one ♂ and two ♀, and Brackloon Wood, three ♂ (G.).

*Leucostola vestita* Wied.—M.: Westport, three ♂ (G.).

*Rhaphium longicorne* Fln.—CI.: one ♀ (G.). M.: Glendarary, one ♂ (H.); Louisburgh, one ♀ (M.).

*Porphyrops consobrina* Ztt.—M.: Westport, two ♀ in Demesne (G.).

*Syntormon monilis* Wlk.—CI.: three ♂ (G.).

*S. pallipes* Fab.—M.: Westport, three ♂ and six ♀ in Demesne, and one ♀ on riverside (G.); Castlebar Lough, one ♀ (G.).

*S. pumilus* Mg.—CI.: one ♂ and one ♀ (G.).

*S. tarsatus* Fln.—M.: Belclare, one ♀ (G.).

*Xiphandrium brevicorne* Curt.—M.: Clogher, one ♂ (G.).

*X. caliginosum* Mg.—M.: Clogher, one ♂ (G.).

*X. monotrichum* Liv.—CI.: one ♂ (H.).

\**Medeterus dendrobaenus* Kow.—CI.: one ♂ and one ♀ (G.). M.: Westport, one ♀ (G.).

*Liancalus virens* Scop.—CI.: one ♀ (M.); and one ♀ (G.).

*Campsicnemus curvipes* Fln.—M.: Westport, one ♂ and one ♀ in garden; Brackloon Wood, one ♂ and four ♀, and Belclare, one ♀ (G.).

*C. loripes* Hal.—CI.: three ♂ and three ♀ (G.). M.: Westport, two ♀ in Demesne, Lough near Westport, one ♂, Knappagh, one ♂, Brackloon Wood, six ♂ and three ♀, Clogher, one ♀, and Belclare, one ♀ (G.).

*Ectomus alpinus* Hal.—CI.: one ♀ (G.).

*Teuchophorus spinigerellus* Ztt.—M.: Westport, one ♂ and one ♀ in Demesne (G.).

*Sympycnus annulipes* Mg.—CI.: (H. and G.). M.: Achill (H.); Mulranny (G.); Louisburgh (H. and M.); Castlebar Lough, Westport, Clogher, Knappagh, Belclare, and Lough near Westport (G.).

*S. cirrhipes* Wlk.—CI.: three ♂ (G.).

*Anepsiomyia flaviventris* Mg.—CI.: one ♂ (G.).

*Schoenophilus versutus* Wlk.—M.: Knappagh, one ♀ (G.).

*Aphrosylus celtiber* Hal.—M.: Roonah, Louisburgh, one ♀ (M.). A

maritime species, previously recorded from Cornwall, Devonshire, and Co. Kerry.

Family **Musidoridae** (*Lonchopteridae*).

- Musidora** (*Lonchoptera*) *flavicauda* *Mg.*—CI.: one ♂ and ♀ (G.). M.: Louisburgh, one ♀ (M.).
- M. lutea** *Panz.*—M.: Westport, one ♂ and one ♀ in garden, five ♀ in Demesne (G.); Castlebar Lough, two ♀, Clogher, one ♀, Knappagh, one ♀, and Lough near Westport, three ♀ (G.).
- M. trilineata** *Ztt.*—CI.: one ♂ (G.). M.: Belclare, one ♀ (H.); Mulranny, one ♀, Westport, one ♂ and two ♀ in garden, and one ♂ in Demesne, and Lough near Westport, one ♀ (G.).

[I cannot convince myself of the distinctness of the above three species, and believe they are mere colour-varieties.]

**CYCLORRHAPHA.**

Family **Syrphidae.**

- Paragus tibialis** *Fln.*—M.: Achill, one ♂ (no data); Castlebar Lough, one ♂ (G.).
- Pipizella flavitarsis** *Mg.*—M.: Westport, one ♂ (? collector); Louisburgh, one ♀ (M.).
- P. virens** *Fab.*—M.: Glendarary, one ♂ (H.); Louisburgh, one ♀ (M.).
- Pipiza noctiluca** *L.*—M.: Castlebar, one ♂ and one ♀ (H.).
- Liogaster metallina** *Fab.*—CI.: (H., M., & G.). M.: Curraun District (? collector); Mulranny (G.); Louisburgh (M.); Knappagh (G.).
- Chrysogaster chalybeata** *Mg.*—CI.: three ♂ and one ♀ (G.). M.: Mulranny, two ♀, and Westport, two ♂ in Demesne (G.).
- C. hirtella** *Lw.*—CI.: one ♂ and three ♀ (G.). M.: Belclare, one ♂ (H.); Louisburgh, four ♀ (M.).
- C. macquarti** *Lw.*—M.: Clogher, one ♂ (G.).
- C. solstitialis** *Fln.*—M.: Knappagh, two ♀ (G.).
- C. splendens** *Mg.*—M.: Louisburgh, one ♂ (M.); Clogher, one ♀ (G.).
- \***Chilosia bergenstammi** *Becker.*—M.: Castlebar, one ♀ (? collector); Lough near Westport, one ♂, and Clogher, one ♀ (G.).
- C. illustrata** *Harris*—M.: Mulranny, one ♂ and one ♀ (G.); Westport, two ♀ on riverside (G.).
- \***C. intonsa** *Lw.*—M.: Clogher, one ♀ (G.).
- C. pagana** *Mg. (pulchripes Lw.)*—M.: Mulranny, one ♀ (G.).
- Platychirus albimanus** *Fab.*—CI.: (H. & G.). M.: Mulranny, Castlebar, Lough, Lough near Westport, Clogher, and Belclare (G.).

- P. angustatus** Ztt.—CI.: two ♀ (G.).
- P. clypeatus** Mg.—CI.: (G.). M.: Mulranny (G.); Belclare (H.); Louisburgh (M.); Westport, in Demesne, and on riverside; Lough near Westport, Knappagh, and Clogher (G.).
- \***P. immarginatus** Ztt.—M.: Westport, one ♂ (? collector); Lough near Westport, one ♂, and Belclare, one ♂ (G.).
- P. manicatus** Mg.—CI.: (G.). M.: Achill (? collector); Curraun District (Scharff); Mulranny, and Castlebar Lough (G.).
- P. peltatus** Mg.—M.: Louisburgh, one ♂ (M.); Belclare, one ♀ (H.); Brackloon Wood, one ♂ (G.).
- P. perpallidus** Verr.—M.: Clogher, one ♀, and Lough near Westport, one ♀ (G.).
- \***P. scambus** Staeg.—CI.: one ♂ (G.).
- Pyrophaena granditarsa** Forst.—M.: Westport, one ♂ and one ♀ in Demesne (? collector), one ♂ on riverside (G.); Louisburgh, one ♀ (M.); Lough near Westport, one ♀ (G.).
- P. rosarum** Fab.—CI.: four ♂ (G.) and one ♀ (M.). M.: Louisburgh, one ♂ (M.), and one ♀ (H.); Belclare, one ♀ (H.); Lough near Westport, two ♂ (G.).
- Melanostoma mellinum** L.—CI.: (G.). M.: Sraheens Lough (J.); Curraun District (? collector; Achill (? collector); Glendarary (H.); Mulranny (G.); Louisburgh (M.); Westport, Castlebar Lough, Lough near Westport, Clogher, and Knappagh (G.).
- M. scalare** Fab.—M.: Sraheens Lough, one ♀ (J.); Glendarary, one ♀ (H.); Louisburgh, one ♀ (H.); Westport, one ♀ in Demesne; Clogher, two ♂, and Brackloon Wood, one ♂ (G.).
- Leucozona lucorum** L.—M.: Westport, one ♂ on riverside (G.).
- Ischyrosyrphus glaucius** L.—M.: Westport, three ♀ on riverside (G.).
- I. laternarius** O. F. Müll.—M.: Louisburgh, one ♂ (M.).
- Didea intermedia** Lw.—M.: Knappagh, one ♀ (G.).
- Lasiophthicus (Catabomba) pyrastris** L.—CI.: two ♀ (G.). M.: Mulranny, one ♀ (G.).
- Syrphus albostrigatus** Fln.—M.: Mulranny, two ♀ (G.).
- S. balteatus** Deg.—M.: Brackloon Wood, one ♂ (G.).
- S. cinctellus** Ztt.—M.: Westport, one ♂ and two ♀ on riverside; Castlebar Lough, one ♂; Knappagh, two ♀; and Brackloon Wood, three ♂ (G.).
- S. corollae** Fab.—CI.: one ♂ (G.). M.: Mulranny, two ♀ (G.); Westport, one ♂ in Demesne (G.).
- S. grossulariae** Mg.—M.: Westport, one ♀ in Demesne (G.).



- \**Syrphus latifasciatus* Mcq.—M.: Mulranny, one ♂ (G.); Castlebar Lough, one ♂ (G.).
- S. luniger* Mg.—M.: Clogher, one ♀ (G.).
- S. ribesii* L.—CI.: two ♀ (G.). M.: Belclare, one ♀ (H.); Westport, one ♂ and two ♂ on riverside; Knappagh, one ♀; and Lough near Westport, one ♀ (G.).
- S. vitripennis* Mg.—CI.: one ♀ (G.). M.: Mulranny, one ♀; Westport, one ♂ and one ♀ in Demesne; Castlebar Lough, one ♂; and Knappagh, one ♀ (G.).
- Sphaerophoria menthastri* L.—CI.: one ♀ (H.), and one ♂ (G.). M.: Glendarary, one ♂ (H.); Mulranny, one ♂ (G.); Louisburgh, one ♀ (M.); Belclare, one ♀ (H.); Castlebar Lough, one ♀; and Lough near Westport, one ♂ and four ♀ (G.).
- Baccha obscuripennis* Mg.—M.: Brackloon Wood, one ♀ (G.).
- Sphegina clunipes* Fln.—M.: Sraheens Lough, one ♀ (J.); Brackloon Wood, one ♂ (G.).
- Neoscia (Ascia) floralis* Mg.—CI.: one ♂ and two ♀ (H.); one ♀ with pale anterior legs [? *dispar* Mg.] (G.). M.: Westport, two ♀ (? collector); Louisburgh, two ♂ (M.); Belclare, one ♀ (H.); and one ♂ (G.); Castlebar Lough, one ♂; and Knappagh, one ♂ and one ♀ (G.).
- Rhingia campestris* Mg.—CI.: (G.). M.: Belclare (H.); Louisburgh (M.); Mulranny, Clogher, and Lough near Westport (G.).
- Volucella bombylans* L.—CI.: two ♀ (G.). M.: Westport, one ♀ on riverside (G.).
- V. pellucens* L.—M.: Knappagh, one ♀ (G.).
- Eristalis aeneus* Scop.—CI.: one ♂ (H.); two ♀ (G.).
- E. arbustorum* L.—CI.: (Milne, J., and G.). M.: Louisburgh (J.); Mulranny (G.); Belclare, Westport, Castlebar Lough, Lough near Westport, and Clogher (G.).
- E. horticola* Deg.—CI.: (G.). M.: Achill (? collector); Mulranny (G.); Belclare (H.); Louisburgh, one ♀ *var.*, with quite clear wings (M.); Westport and Knappagh (G.).
- E. intricarius* L.—CI.: two ♀ (G.). M.: Glendarary, two ♂ (J.); Louisburgh, one ♀ (M.).
- E. nemorum* L.—CI.: one ♂ (G.).
- E. pertinax* Scop.—CI.: (G.). M.: Mulranny, Westport, Knappagh, and Brackloon Wood (G.).
- E. sepulchralis* L.—CI.: one ♂ (G.).
- E. tenax* L.—CI.: (Milne, Praeger, and G.). M.: Mulranny and Westport (G.).

- Tubifera (Helophilus) lunulata* Mg.—CI.: one ♀ (M.). M.: Belclare, one ♂ (H.).
- T. pendula* L.—CI.: (Milne and G.). M.: Mulranny (G.); Belclare (H.); Westport, Lough near Westport, and Knappagh (G.).
- \**T. transfuga* L.—M.: Westport, one ♂ (? collector).
- Myiatropa florea* L.—M.: Westport, one ♂ and three ♀ on riverside (G.).
- Syritta pipiens* L.—M.: Darby's Point, Achill Island (J.); Mulranny (G.); Belclare (H.); Westport, Clogher, and Knappagh (G.).
- Arctophila mussitans* Fab.—M.: Knappagh, one ♀ (G.).
- Cinxia (Sericomylia) borealis* Fln.—CI.: one ♂, "between 700 and 800 feet up the mountain" (J.); one ♂ (M.); three ♂ and one ♀ (G.). M.; Achill, one ♂ (? collector); Mulranny, three ♂ (G.); Louisburgh, one ♂ (M.); Westport, one ♂ on riverside; Knappagh, one ♂; and Belclare, one ♂ (G.).
- C. lappona* L.—CI.: one ♂ (G.). M.: Glendarary, one ♂ (H.); Knappagh (G.).

Family **Dorylaidae** (*Pipunculidae*).

- Dorylas (Pipunculus) varipes* Mg.—M.: Belclare, one ♀ (H.).
- Verrallia aucta* Fln.—M.: Belclare, one ♀ (H.).

Family **Phoridae**.

- \**Spiniphora dorsalis* Becker.—M.: Brackloon Wood, one ♂ (G.).
- \**Stenophora unispinosa* Ztt.—M.: Westport, one ♀ in garden (G.).
- \**Aphiochaeta campestris* Wood.—M.: Knappagh, one (G.).
- \**A. rata* Collin.—M.: Brackloon Wood, one (G.).
- Trineura aterrima* Fab.—M.: Glendarary, one (H.).

Family **Larvaevoridae** (*Tachinidae*).

- Echinomyia fera* L.—M.: Mulranny, one ♀ (G.).
- E. grossa* L.—CI.: one ♀ (G.): M.; Mulranny, one ♀ (G.); Westport, one ♀ on riverside (G.).
- Ernestia (Erigone) radicum* Fab.—CI.: one ♂ (G.); M.: Castlebar Lough, one ♀; and Knappagh, four ♂ and ♀ (G.).
- \**Carcelia gnava* Mg. (*Sisyropa lucorum*).—M.: Knappagh, one ♂ (G.).
- \**C. lota* Mg.—CI.: one ♂ and one ♀ (G.).
- Crocota (Siphona) geniculata* Deg.—CI.: (H.; M. and G.); M.: Achill (? collector); Mulranny, Westport, Castlebar Lough; Clogher, Lough near Westport, and Knappagh (G.).
- Eriothrix rufomaculatus* Deg. (*Oliviera lateralis* F.)—M.: Westport, one ♂ in Demesne (G.); Lough near Westport, one ♀ (G.).

- Thelaira nigripes** *Fab.*—CI.: four ♂ and three ♀ (G.). M.: Belclare one ♂ (H.); Westport, one ♂ on riverside and one ♀ in Demesne, (G.).
- Dexiosoma caninum** *Fab.*—M.: Brackloon Wood, eight ♂ and six ♀ (G.).
- Sarcophaga carnaria** *L.*—M.: Belclare (H.); Westport; Castlebar Lough, Knappagh, and Clogher (G.).
- \***S. haemorrhoidalis** *Flu.*—M.: Clogher, one ♂ (G.).
- \***Brachycoma devia** *Flu.*—M.: Castlebar Lough, two ♂, and Knappagh, one ♂ (G.).
- Miltogramma punctatum** *Mg.*—CI.: one ♂ (G.).
- Pollenia rudis** *Fab.*—CI.: (G.). M.: Belclare (H.); Mulranny; Westport, Lough near Westport, Knappagh; and Brackloon Wood (G.).
- P. vespillo** *Fab.*—M.: Mulranny, four ♂ and five ♀ (G.); Castlebar Lough, one ♂ (G.); Knappagh, three ♂; and Belclare, one ♂ (G.).
- Lucilia caesar** *L.*—M.: Mulranny, one ♂ and one ♀; Westport, one ♂ in Demesne and three ♀ on riverside; Knappagh, two ♀; and Brackloon Wood, one ♂ (G.).
- L. sericata** *Mg.*—M.: Westport, one ♂ and one ♀ on riverside (G.).
- Calliphora erythrocephala** *Mg.*—CI.: one ♂ (Welch); one ♀ (? collector); two ♂ and one ♀ (G.). M.: Mulranny, two ♀ (G.).
- C. vomitoria** *L.*—CI.: one ♂ and three ♀ (G.). M.: Mulranny, two ♂, and Westport, three ♀ on riverside (G.).
- Onesia cognata** *Mg.*—M.: Westport, one ♀ on riverside, and Lough near Westport, one ♂ (G.).
- \***O. sepulchralis** *Mg.*—CI.: (G.). M.: Belclare (H.); Louisburgh (M.); Westport, Castlebar Lough, and Knappagh (G.).

Family **Anthomyidae.**

- \***Graphomyia caerulescens** *Wahlbg.*—M.: Westport, one ♂ on riverside (G.); Lough near Westport, one ♂ (G.). I believe that this species, which has hitherto gone under the name of *picta*, Ztt., is merely a colour variety of the better-known *G. maculata*, Scop.
- G. maculata** *Scop.*—M.: Mulranny, one ♂ (G.); Castlebar Lough, one ♀ (G.); Knappagh, two ♀ (G.).
- Morellia hortorum** *Flu.*—CI.: two ♂ and one ♀ (G.). M.: Mulranny, one ♂ (G.); Belclare, one ♂ (H.); Westport, five ♂ on riverside; Lough near Westport, one ♀, and Knappagh, one ♂ and one ♀ (G.).
- \***M. simplex** *Lw.*—M.: Mulranny, two ♂ and three ♀; Westport, one ♂ and one ♀ on riverside; Castlebar Lough, one ♂; and Lough near Westport, one ♂ (G.).

- Musca domestica* L.—CI.: one ♂ and one ♀ (G.).
- \**Pyrellia eriophthalma* Meq.—M.: Brackloon Wood, one ♂ (G.).
- Pseudopyrellia (Euphoria) cornicina* Fab.—CI.: (J.), (Milne), and (G.).  
M.: Belclare (Praeger); Mulranny (G.); Louisburgh (M.); Westport, Castlebar Lough, Lough near Westport, and Clogher (G.).
- Mesembrina meridiana* L.—M.; Mulranny, one ♀, Knappagh, one ♂, and Brackloon Wood, one ♀ (G.).
- Haematobia stimulans* Mg.—CI.: four ♂ and three ♀ (G.). M.: Mulranny, one ♂, and Westport, one ♀ on riverside (G.).
- \**Polietes albolineata* Fln.—M.: Lough near Westport, one ♀ (G.).
- \**Phaonia (Hyetodesia) basalis* Ztt.—CI.: one ♂ (M.). M.: Knappagh, four ♂ and seven ♀, and Clogher, one ♀ (G.).
- \**P. errans* Mg.—M.: Westport, one ♂ (? collector); Brackloon Wood, one ♂ (G.).
- P. incana* Wied.—CI.: (G.). M.: Achill (? collector); Glendarary (H.); Curraun District (Scharff); Mulranny (G.); Louisburgh (H.); Clogher Knappagh, and Lough near Westport (G.).
- \**P. pallida* Fab.—M.: Belclare, one ♂ (H.); Brackloon Wood, four ♀ (G.).
- \**P. perdita* Mg.—CI.: two ♂ (G.). M.: Louisburgh, one ♀ (H.).
- \**P. scutellaris* Fln.—M.: Brackloon Wood, one ♀ (G.).
- \**P. signata* Mg.—M.: Mulranny, one ♀ (G.).
- Drymeia hamata* Fln.—CI.: (Milne), (G.), and (M.). M.: Mulranny (G.); Louisburgh (M.); Belclare (H. and G.); Castlebar Lough, Westport, Knappagh, and Lough near Westport (G.).
- \**Hebecnema (Mydaea) nigricolor* Fln.—M.: Brackloon Wood, one ♂ (G.).
- \**H. (Hyetodesia) umbratica* Mg.—CI.: one ♀ (G.). M.: Mulranny, two ♂; Westport, one ♂ and one ♀ on riverside; Castlebar Lough, one ♂; Lough near Westport, one ♀ and one ♀, and Clogher, one ♀ (G.).
- \*\**Mydaea (Spilogaster) anceps* Ztt.—M.: Lough near Westport, one ♂ (G.).  
If I am correct in the identification of this species, this is a new record for Britain. It is distinguished from *M. duplicata*, Mg. by the longitudinal lines on the thorax being narrower, the wing-veins more clouded (especially the posterior transverse), and by the presence of a long median bristle on the posterior surface of the front tibiae.
- \**M. depuncta* Fln.—M.: Westport, one ♀ in Demesne (G.); Brackloon Wood, five ♀ (G.).
- \**M. duplicata* Mg.—CI.: (Welch and G.). M.: Curraun District (Scharff); Mulranny (G.); Belclare (H.); Westport, Lough near Westport, and Clogher (G.).

- Mydaea impuncta** *Fln.*—M.: Belclare, one ♂ (H.); Westport, one ♀ on riverside (G.).
- \***M. (Hyetodesia) lucorum** *Fln.*—CI.: (G.). M.: Achill (? collector); Mulranny (G.); Belclare and Louisburgh (H.); Clogher and Brackloon Wood (G.).
- M. (Myiospila) meditabunda** *Fab.*—M.: Louisburgh, one ♂ (M.); Mulranny, four ♂ and four ♀, Lough near Westport, three ♂, and Clogher, one ♀ (G.).
- M. pagana** *Fab.*—M.: Westport, one ♀ in Demesne (? collector).
- M. (Spilogaster) quadrum** *Fab.*—CI.: one ♂ and two ♀ (G.). M.: Mulranny, one ♂ and two ♀ (G.).
- \***M. separata** *Mg.*—M.: Westport, one ♀ in Demesne (G.).
- \***M. urbana** *Mg.*—CI.: one ♂ and two ♀ (G.). M.: Westport, one ♂ on riverside, and Lough near Westport, one ♀ (G.).
- \***Hydrotaea albipuncta** *Ztt.*—CI.: one ♂ (G.).
- H. dentipes** *Fab.*—CI.: (Welch and G.). M.: Mulranny and Brackloon Wood (G.).
- H. irritans** *Fln.*—M.: Mulranny, Westport, Castlebar Lough, Lough near Westport, Knappagh, and Brackloon Wood (G.).
- H. militaris** *Mg.*—M.: Belclare, one ♂ (H.); Brackloon Wood, thirty-one ♀ (G.).
- \***Fannia (Homalomyia) aërea** *Ztt.*—CI.: two ♂ (G.). M.: Louisburgh, one ♀ (H.); Mulranny, one ♀, Westport, one ♀ in Demesne, and Brackloon Wood, five ♀ (G.).
- F. canicularis** *L.*—CI.: one ♂ (? collector); one ♂ and three ♀ (Welch); one ♂ (G.).
- \***F. coracina** *Lw.*—M.: Westport, one ♂ in Demesne (G.).
- \***F. fuscula** *Fln.*—M.: Westport, one ♀ in Demesne (G.).
- \***F. genualis** *Stein.*—CI.: one ♂ (G.). M.: Belclare, one ♂ (H.); Mulranny, one ♂, and Lough near Westport, one ♀ (G.).
- \***F. scalaris** *Fab.*—M.: Castlebar Lough, one (G.).
- \***F. serena** *Fln.*—CI.: (G.). M.: Louisburgh (M.); Mulranny, Westport, Lough near Westport, and Brackloon Wood (G.).
- \***F. sociella** *Ztt.*—M.: Westport, two ♀ on riverside, and Brackloon Wood, one ♀ (G.).
- \***Azelia cilipes** *Hal.*—CI.: one ♂ (G.). M.: Belclare, one ♂ (H.); Westport, one ♂ and one ♂ in garden (G.).
- \***A. macquarti** *Staeg.*—M.: Westport, one ♂ on riverside (G.).
- \***A. zetterstedti** *Rond.*—CI.: five ♂ and four ♀ (G.). M.: Mulranny, two ♂ and two ♀ (G.).

- \**Limnophora litorea* *Fln.*—CI.: one ♂ (G.). M.: Achill, one ♂ (? collector).
- \*\**L. nigriventris* *Ztt.*—M.: Mulranny, four ♂ and five ♀, and Westport, four ♀ in Demesne (G.). This is, I believe, a new record for Britain. It is recognized in the ♀ sex by the highly-polished area on the frons.
- \**Hydrophoria ambigua* *Fln.*—M.: Belclare, one ♂ (H.); Castlebar Lough, one ♂, and Brackloon Wood, four ♀ (G.).
- \**H. brunneifrons* *Ztt.*—M.: Clogher, one ♀ (G.).
- \**H. ruralis* *Mg.*—M.: Brackloon Wood, two ♂ (G.). This is the *H. anthomyia* Rond. of Meade's papers and Verrall's List.
- \**Hylemyia brunneilinea* *Ztt. (seticrura, Rond.)*.—CI.: one ♀ (? collector); one ♂ and one ♀ (G.). M.: Westport, three ♂ and two ♀ in Demesne, Lough near Westport, one ♂ and four ♀, and Clogher, one ♀ (G.). The colour of the frontal stripe in the ♀ is not constant in this species, being in some specimens entirely black, and in others black tinged with red in front. Meade says: "frontal stripe wide and rufous," but this is not accurate.
- \**H. puella* *Schin. (nec Mg.)*.—M.: Brackloon Wood, three ♂ and one ♀ (G.). This is a rare and little-known species. It is distinguished by its pale legs, long-haired arista, and two-striped thorax.
- \**H. pullula* *Ztt.*—M.: Knappagh, one ♂ (G.).
- H. strigosa* *Fab.*—M.: Westport, one ♀ in Demesne (? collector), three ♂ and three ♀ in Demesne and two ♀ on riverside (G.); Belclare, three ♂, Knappagh, one ♀, and Brackloon Wood, twenty-two ♂ and two ♀ (G.).
- \**H. tristriata* *Stein (? cinerella Meade)*.—M.: Brackloon Wood, one ♂ (G.).
- \**H. variata* *Fln.*—CI.: one ♀ (Milne); two ♂ and one ♀ (G.). M.: Westport Demesne, one ♀ (H.), one ♂ and one ♀ (G.); Lough near Westport, two ♀ (G.).
- Pegomyia bicolor* *Wied.*—CI.: one ♂ (G.). M.: Westport, one ♀ on riverside and one ♂ in garden, and Clogher, three ♂ (G.).
- \**P. flavipes* *Fln. var. diluta, Stein.*—M.: Belclare, one ♂ (H.).
- \**P. rufipes*, *Fln.*—M.: Belclare, one ♂ (H.); Brackloon Wood, one ♀ (G.).
- Chortophila (Phorbia) cilicrura* *Rond.*—CI.: two ♂ (G.). M.: Mulranny, two ♀, and Knappagh, one ♂ (G.). [See remarks under *C. trichodactyla*].
- C. discreta* *Mg.*—CI.: one ♂ (G.). M.: Mulranny, one ♂, Westport, one ♂ on riverside, Lough near Westport, one ♂, and Clogher, one ♂ (G.).
- C. trichodactyla* *Rond.*—CI.: one ♂ and four ♀ (G.). M.: Mulranny, four ♂ and one ♀; Westport, two ♂ and two ♀ in garden, and Knappagh, one ♂ (G.). The ♀ of this species may be distinguished from that of

*C. cilicrura*, Rond., to which it bears a very close resemblance, by the following character, which, I believe, has not been hitherto noticed. In *C. trichodactyla* the two rows of acrostichal bristles are much closer to each other than to the dorso-central row on either side, while the surface of the thorax between the rows is absolutely bare. In *C. cilicrura*, on the other hand, the two rows of acrostichal bristles are as widely apart (or nearly so) as the distance of each from the dorso-central row, while there are always a few fine and tiny scattered bristles between them.

- \**Anthomyia aestiva* Mg. (*sulciventris* Ztt.)—CI. : (Milne and G.). M. : Mulranny, (G.), Louisburgh (M. and H.); Belclare (H.); Castlebar Lough, Westport, Lough near Westport, Clogher, and Knappagh (G.).
- A. radicum* L.—M. : Mulranny, Westport, Clogher, Knappagh, and Brackloon Wood (G.).
- \**Macrorchis intermedia* Fln.—M. : Louisburgh, one ♂ (H.); Belclare, one ♂ and four ♀ (H.); Westport, two ♂ and ten ♀ in Demesne, and one ♀ on riverside (G.).
- \**Coenosia geniculata* Fln.—CI. : one ♂ (G.). M. : Westport, one ♂ in Demesne, Castlebar Lough, one ♂, and Lough near Westport, one ♂ (G.).
- C. pumila* Fln.—M. : Castlebar Lough, one ♂ (G.). This species has been recorded as British under the name of *C. albicornis* Mg.
- \**C. sexnotata* Mg.—M. : Belclare, two ♂ (H.); Westport, two ♀ in Demesne (H.).
- C. tigrina* Fab.—M. : Westport, one ♀ (? collector); one ♀ in Demesne, one ♀ and two ♂ on riverside (G.); Castlebar Lough, one ♂ and two ♀; Belclare, one ♀, Clogher, four ♂ and four ♀, Knappagh, four ♂ and two ♀, and Lough near Westport, four ♂ and one ♀ (G.).
- C. tricolor* Ztt.—M. : Achill N.E., one ♂ (H.). This is the species recorded in British lists as *C. infantula* Rond.; but, as Stein has pointed out, the two names are probably synonymous, and Zetterstedt's name has the priority.
- Schoenomyza litorella* Fln.—CI. : one ♂ (M.); four ♂ and four ♀ (G.). M. : Castlebar Lough, three ♀, and Westport, one ♀ in Demesne (G.).
- Fucellia fucorum* Fln.—CI. : six ♂ and one ♀ (G.). M. : Mulranny, one ♂ (G.).
- F. maritima* Hal.—CI. : one ♀ (? collector); ten ♂ and fourteen ♀ (G.). M. : Mulranny, three ♀; Louisburgh, one ♀ (M.). Judging from the number of specimens taken, this species appears to be quite as abundant as the previous species, or even, perhaps, more so.

Family Scatomyzidae (*Cordyluridae*).

- Cordylura pudica* Mg.—M.: Westport, one ♂ (? collector), one ♀ on riverside (G.); Belclare, one ♀, Castlebar Lough, one ♂ and one ♀, and Lough near Westport, one ♂ (G.).
- Scopezuma (Scatophaga) litorea* Fln.—CI.: (Milne, Welch, G., and M.). M.: Croaghpatrick (H.); Louisburgh (M.); Mulranny, Westport, and Belclare (G.).
- S. lutaria* Fab.—M.: Castlebar, one ♀, and Westport, one ♀ (? collector).
- S. scybalaria* L.—M.: Clogher, one ♂ (G.).
- S. squalida* Mg.—CI.: one ♀ (? collector), three ♂ and two ♀ (G.). M.: Achill, one ♀ (? collector); Croaghpatrick, one ♂ and two ♀ (M.), one ♂ (H.); Louisburgh, one ♂ (H.).
- S. stercoraria* L. (+ *merdaria* Fab.)—CI.: (Milne and G.). M.: Curraun District (Scharff); Achill (? collector); Louisburgh (M.); Mulranny (G.); Westport, Castlebar Lough, Clogher, Lough near Westport, Knappagh, Belclare, and Brackloon Wood (G.). In the above records I have included many specimens which would be referred by some authors to *merdaria* Fab., but I am convinced that this name should rank as a synonym only.
- S. suilla* Fab.—CI.: (G.). M.: Mulranny (G.); Croaghpatrick (M.); Louisburgh (M.); Belclare (H. and G.); Castlebar (? collector); Castlebar Lough (G.); Westport, Clogher, Lough near Westport, and Knappagh (G.).
- \**S. villipes* Ztt.—CI.: one ♀ (G.). M.: Achill, one ♂ and one ♀ (? collector); Mulranny, two ♂ and two ♀ (G.).
- Norellia spinimana* Fln.—M.: Westport, one ♂ on riverside and one ♂ in garden (G.).
- \**Pogonota hircus* Ztt.—M.: Lough near Westport, one ♂ (G.).
- Tricopalpus punctipes* Mg.—M.: Castlebar Lough, one ♂ and one ♀; Clogher, one ♂, and Knappagh, one ♀ (G.).

Family Coelopidae (*Phycodromidae*).

- Malacomysia (Phycodroma) sciomyzina* Hal.—CI.: one ♀ (M.).
- Oedoparea buccata* Fln.—CI.: one ♂ (H.); one ♂ (G.); three ♂ (M.). M.: Glendarary, one ♂ and two ♀ (H.); Louisburgh, one ♂ and one ♀ (M.); Belclare, one ♀ (H.).
- Fucomysia frigida* Fln.—CI.: one ♂ (Welch); five ♂ and one ♀ (G.). M.: Achill, one ♂ (? collector); Mulranny one ♂ (G.); Louisburgh, one ♀ (H.).



**Fucomyia parvula** *Hal.*—CI.: two ♂ and six ♀ (G.). M.: Mulranny, one ♂ (G.). I do not feel very sure about my identification of the two species of this genus. The females appear to differ in nothing but size.

Family **Cypselidae** (*Borboridae*).

**Cypselia** (*Borborus*) **equina** *Fln.*—CI.: one ♀ (H.); seven ♂ and six ♀ (G.). M.: Mulranny, one ♀ (G.); Clogher, one ♂ and one ♀ (G.).

**C. nitida** *Mg.*—M.: Brackloon Wood, one ♂ (G.).

**Oolina** (*Borborus*) **geniculata** *Mcq.*—CI.: one ♂ (H.); one ♂ (M.); three ♂ and nine ♀ (G.). M.: Louisburgh, one ♂ (M.); Westport, four ♂ in Demesne; Clogher, one ♂ and one ♀; and Lough near Westport, one ♀ (G.).

**Sphaerocera subsultans** *Fab.*—M.: Westport, one ♀ in garden, and Castlebar Lough, one ♂ (G.).

**Limosina fontinalis** *Fln.*—CI.: two (G.). M.: Westport, two in garden, and Belclare, two (G.).

**L. limosa** *Fln.*—M.: Castlebar Lough, nineteen; Westport, four in garden, four on riverside, and two in Demesne; Lough near Westport, one; and Clogher, three (G.).

\***L. rufilabris** *Stenh.*—M.: Achill, one ♀ (H.).

**L. sylvatica** *Mg.*—M.: Louisburgh, one ♀ (M.).

Family **Dryomyzidae**.

**Dryomyza flaveola** *Fab.*—M.: Westport, one ♀ in garden (G.).

Family **Helomyzidae**.

**Helomyza bicolor** *Ztt. (zetterstedti, Lw.)*.—M.: Glendarary, one ♂ (H.).

**H. similis** *Mg.*—M.: Louisburgh, one ♂ and ♀ (? collector); Westport, one ♀ on riverside; and Brackloon Wood, twelve ♂ and thirteen ♀ (G.).

**Leria** (*Blepharoptera*) **inscripta** *Mg.*—M.: Westport, one ♂ and one ♀ in garden (G.).

\***L. modesta** *Mg.*—M.: Glendarary, one ♂ (H.).

\***Heteromyza commixta** *Collin.*—CI.: one ♂ (G.).

**Tephrochlamis canescens** *Mg.*—CI.: one ♀ (M.).

Family **Sciomyzidae**.

\***Sciomyza griseola** *Fln.*—M.: Louisburgh, one ♀ (M.).

**S. nana** *Fln.*—M.: Castlebar Lough, one, and Lough near Westport, one (G.).

\***Colobaea** (*Sciomyza bifasciella* *Fln.*—M.: Castlebar Lough, one (G.).

**Ditaenia** (*Sciomyza*) **einerella** *Fln.*—CI.: one ♀ (G.). M.: Curraun District, one ♀ (Scharff).

- \**Renocera striata* Mg.—M.: Lough near Westport, one ♂ and one ♀ (G.).  
This species was only added to the British List in June, 1910, on the evidence of specimens taken in Scotland (see Collin, *Ent. Mo. Mag.*, 1910, pp. 127–128).
- Tetanocera elata* Fab.—M.: Westport, one ♂ in garden and one ♂ on river-side; Lough near Westport, one ♀ (G.).
- T. ferruginea* Fln.—M.: Louisburgh, one ♂ (M.); Knappagh, one ♂ (G.).
- T. laevifrons* Lw.—Cl.: one ♂ (H.). M.: Louisburgh, two ♂ and one ♀ (M.).
- T. robusta* Lw.—M.: Louisburgh, one ♀ (M.); Westport, one ♀ on riverside, and Castlebar Lough, one ♀; Knappagh, one ♂; Clogher, one ♂ and three ♀; and Lough near Westport, one ♂ and two ♀ (G.).
- T. unicolor* Lw.—Cl.: one ♂ (G.). M.: Louisburgh, one ♀ (M.); Lough near Westport, one ♂; and Clogher, one ♀ (G.).
- Dictya (Tetanocera) umbrarum* L.—Cl.: two ♀ (H.); one ♀ (G.).
- Trypetoptera (Tetanocera) punctulata* Scop.—M.: Westport, one ♀ (? collector).
- Pherbina (Tetanocera) coryleti* Scop.—Cl.: one ♂ (G.). M.: Achill, one ♂ (? collector); Westport, one ♂ (? collector); Belclare, one ♀ (H.); Knappagh, one ♂ and one ♀; Clogher, two ♂ and one ♀; and Lough near Westport, three ♀ (G.).
- Elgiva albiseta* Scop.—M.: Belclare, one ♀ (H.); Castlebar Lough, four ♂ and four ♀, Westport, one ♀ on riverside, Clogher, one ♂ and three ♀, Lough near Westport, one ♂, and Knappagh, one ♂ (G.).
- E. lineata* Fln.—M.: Louisburgh, one ♀ (M.); Belclare, one ♂; and Knappagh, one ♀ (G.).
- Hydromyia (Elgiva) dorsalis* Fab.—Cl.: one ♂ (M.) and one ♀ (G.).
- Limnia unguicornis* Scop.—M.: Achill, one ♀ (? collector).
- Sepedon sphegeus* Fab.—M.: Clogher, one ♀ (G.).

## Family Sapromyzidae.

- \**Sapromyza apicalis* Lw.—Cl.: two ♀ (G.).
- \**S. decipiens* Lw.—M.: Westport, one ♂ on riverside (G.).
- \**S. illota* Lw.—Cl.: one ♂ and one ♀ (G.). M.: Glendarary, one ♀ (H.).
- \**S. longiseta* Lw.—M.: Belclare, one ♀ (H.).
- S. lupulina* Fab.—M.: Lough near Westport, one ♀ (G.).
- \**S. opaca* Becker.—M.: Belclare, one ♀ (H.); Lough near Westport, one ♀ (G.).
- \**S. plumicornis* Fln.—M.; Belclare, one ♀ (H.).
- S. praeusta* Fln.—M.: Glendarary, one ♂ (H.); Westport Demesne, three ♀ (H.); Belclare, one ♀ (H.) and one ♂ (G.).

- Sapromyza rorida** *Fln.*—M.: Glendarary, one ♂ (H.); Westport, one ♂ and eleven ♀ in garden (G.).
- S. trispina** *Rond.*—M.: Achill N.E., one ♀ (H.); Mulranny, one ♂ and seven ♀ (G.). This species has already been obtained in Ireland, although but recently. (See Collin, *Ent. Mo. Mag.*, 1910, p. 170.)
- Peplomyza litura** *Mg. (wiedemanni Lw.)*.—M.; Belclare, one ♀ (H.).

## Family Lonchaeidae.

- Palloptera saltuum** *L.*—M.: Westport, one ♀ (? collector).

## Family Ortalidae.

- Tetanops myopina** *Fln.*—M.: Mulranny, one ♀ (J.).
- Herina (Pteropaectria) frondescentiae** *L.*—CI.: three (G.); and one (M.) M.: Westport, one (? collector); Belclare, one, and Louisburgh, one (H.); Louisburgh, six (M.); Croaghpatrick, one (M.); Castlebar Lough, four (G.). This is the commonest species of the family.

Family Euribiidae (*Trypetidae*).

- Acidia heraclei** *L.*—M.: Westport, one ♀ Roman Island (H.).
- Euribia (Trypeta) cylindrica** *Rob. Dsv. (onotrophes Bouché Lw.)*.—CI.: one ♀ (M.). M.: Belclare, two ♀ (H.).
- Urophora solstitialis** *L.*—CI.: one ♀ (G.). M.: Louisburgh, one ♀ and one (? sex) (? collector); one ♂ Old Head; Belclare, one ♂ (H.).
- \***U. stylata** *Fab.*—M.: Louisburgh, one ♂ (M.).
- Oxyphora flava** *Geoffr. (miliaria Schrk.)*.—M.: Belclare, one ♂ and one ♀ (H.).
- Tephritis conura** *Lw.*—M.: Westport, one ♂ on riverside, and Lough near Westport, one ♀ (G.).

## Family Sepsidae.

- Sepsis cynipsea** *L.*—CI.: (G.). M.: Mulranny (G.); Belclare (H.); Westport, Castlebar Lough, and Lough near Westport (G.).
- Sepsis violacea** *Mg.*—M.: Westport, one ♂ and one ♀ (? collector); Knappagh, one ♀ (G.).
- Enicita annulipes** *Mg.*—M.: Westport, one ♂ on riverside (G.).
- Themira minor** *Hal.*—CI.: one ♂ (H.); three ♂ and seven ♀ (G.). M.: Mulranny, one ♀, and Clogher, one ♂ and three ♀ (G.).
- T. putris** *L.*—CI.: one ♀ (G.).
- T. superba** *Hal.*—M.: Clogher, one ♂; Castlebar Lough, one ♂; and Knappagh, one ♂ (G.).

*Nemopoda cylindrica* Fab.—CI.: one ♂ (H.); two ♀ (G.). M.: Westport, one ♀ in Demesne (H.), and one ♂ in garden (G.) Mulranny, two ♀; Lough near Westport, one ♀; and Knappagh, one ♀ (G.).

\**Piophila vulgaris* Fln.—M.: Knappagh, one (G.).

#### Family Psilidae.

*Psila atra* Mg.—M.: Westport, one ♂ in Demesne (H.).

*P. debilis* Egger—M.: Belclare, three ♂ (H.).

\**P. humeralis* Ztt.—CI.: one ♀ (G.).

*P. nigricornis* Mg.—M.: Louisburgh, one ♀ (H.); Mulranny, one ♀ (G.).

*P. rosae* Fab.—M.: Belclare, one ♀ (H.).

*Loxocera aristata* Pz. (*elongata* Mg.)—M.: Sraheens, one ♀ (J.); Roonah, one ♂; Mulranny, one ♂ (J.); Achill, one ♀ (♀ collector); Belclare, one ♀ (H.); Louisburgh, three ♂ (M.), one ♂ and one ♀ (H.); Lough near Westport, one ♀ (G.).

#### Family Chloropidae.

*Centor myopinus* Lw.—M.: Westport, two ♂ in Demesne and one ♂ on riverside (G.).

\**C. nudipes* Lw.—CI.: one ♀ (M.), two ♂ and one ♀ (G.). M.: Croaghpatrick, one ♀ (M.); Louisburgh, three ♂ and five ♀ (M.), and one ♀ (H.).

*Melanum* (*Chlorops*) *lateralis* Hal.—M.: Westport, ten specimens in Demesne (G.).

*Diptotoxa messoria* Fln.—CI.: one (G.). M.: Castlebar Lough, one (G.).

\**Meromyza laeta* Mg.—M.: Westport, one in Demesne (G.).

*M. saltatrix* L.—M.: Louisburgh, two (M.); Westport, one in Demesne (G.).

\**Chlorops didyma* Ztt.—CI.: one (M.). M.: Old Head, Louisburgh, one (no data); Louisburgh, one (M.); Belclare, one (H.); Westport, four in Demesne (G.).

\**C. hypostigma* Mg.—CI.: one (G.). M.: Louisburgh, one (M.); Westport, two in Demesne (H.); Belclare, one, and Brackloon Wood, three (G.).

*C. taeniopa* Mg.—M.: Louisburgh, one (M.), and two (H.); Westport, six in Demesne; Lough near Westport, one, and Clogher, one (G.).

\**C. umbelliferarum* Schrk. (*nasuta* Schrk.)—M.: Castlebar Lough, four (G.).

*Crassiseta cornuta* Fln.—M.: Westport, one ♀ on riverside (G.).

#### Family Ephydriidae.

*Notiphila annulipes* Stenh.—M.: Belclare, two ♀ (H.); Westport, one ♀ on riverside (G.); Lough near Westport, one ♂ and one ♀ (G.).

- Notiphila cinerea** *Fln.*—CI. : five ♀ (G.). M. : Mulranny, one ♂ and ♀ (G.); Louisburgh, five ♀ (Morley); Westport, one ♀ on riverside, Castlebar Lough, two ♀, Lough near Westport, one ♂ and one ♀, Belclare, one ♂ and three ♀, Clogher, six ♀, and Knappagh, three ♀ (G.).
- Trimerina madizans** *Fln.*—M. : Westport, one in Demesne (G.).
- Ephygrobia (Psilopa) leucostoma** *Mg.*—M. : Westport, one in Demesne (G.).
- Hydrellia albiceps** *Mg.*—CI. : one (G.). M. : Achill, one (H.); Louisburgh, one (M.); Lough near Westport, one; Clogher, three, and Knappagh, eight (G.).
- H. griseola** *Fln.*—CI. : (H. and G.). M. : Louisburgh (M.); Mulranny, Westport, Lough near Westport, Knappagh, Clogher, Belclare, and Brackloon Wood (G.).
- H. nigripes** *Ztt.*—M. : Westport, one ♂ in Demesne (G.).
- \***H. obscura** *Mg. (discolor, Stenh.)*—CI. : one (H.). M. : Knappagh, one (G.).
- H. ranunculi** *Hal.*—M. : Mulranny, one (G.).
- \***Philhygria vittipennis** *Ztt.*—M. : Knappagh, one (G.).
- Ochthera mantis** *Deg.*—M. : Louisburgh, one (M.); Lough near Westport, one (G.).
- Pelina aenea** *Fln.*—M. : Westport, one in Demesne (G.).
- Parydra coarctata** *Fln.*—CI. : three (G.). M. : Mulranny, one (G.); Westport, one in garden (G.).
- P. fossarum** *Hal.*—M. : Castlebar Lough, seven, and Belclare, one (G.).
- P. pusilla** *Mg.*—M. : Belclare, one (G.).
- Scatella stagnalis** *Fln.*—CI. : one (H.); one (M.); five (G.). M. : Westport, one in Demesne, and Belclare, one (G.).

Family **Drosophilidae.**

- Drosophila melanogaster** *Mg.*—CI. : two (G.).
- D. phalerata** *Mg.*—M. : Westport, two in garden (G.).
- Scaptomyza flaveola** *Mg.*—M. : Roonah, Louisburgh, one (no data); Louisburgh, one (H.).
- S. graminum** *Fln.*—CI. : seven (G.). M. : Westport, one on riverside, and one in Demesne (G.); Croaghpatrick, one (M.).

Family **Geomyzidae.**

- \***Diastata unipunctata** *Ztt.*—M. : Louisburgh, one (M.).
- Opomyza germinationis** *L.*—CI. : N.E. cliffs, one ♀ (no data); one ♂ (H.); two ♂ (G.). M. : Louisburgh (no data); Louisburgh (M.); Croaghpatrick (M.); Westport, Castlebar Lough, Lough near Westport, Belclare, Knappagh, and Brackloon Wood (G.).

*Balioptera combinata* L.—M.: Westport, one in Demesne (H.).

*B. tripunctata* Fln.—M.: Louisburgh, one (H.); Westport, one in Demesne (G.).

*Anthomyza gracilis* Fln.—M.: Westport, two (? collector); Westport, one in Demesne and one on riverside (G.); Louisburgh, one (H.); Lough near Westport, one (G.).

\**Paranthomyza nitida* Mg.—M.: Westport, four in garden (G.).

#### Family Ochthiphilidae.

*Ochthiphila aridella* Fln.—M.: Westport, five in Demesne, and Lough near Westport, one (G.).

*O. juncorum* Fln.—M.: Westport, one in Demesne (G.).

#### Family Milichidae.

*Phylomyza securicornis* Fln.—Cl.: one ♂ (G.).

#### Family Agromyzidae.

*Agromyza flaveola* Fln.—M.: Glendarary, one (H.); Westport, one, and Brackloon Wood, two (G.).

*A. nigripes* Mg.—M.: Westport, one on riverside (G.).

\**A. reptans* Fln.—M.: Westport, one in garden (G.).

*Cerodonta (Ceratomyza) denticornis* Panz.—M.: Louisburgh, two (M.); Belclare, one (H.); Westport, one in Demesne (G.).

#### Family Phytomyzidae.

*Phytomyza affinis* Fln.—Cl.: one (G.) M.: Belclare, one (H.); Lough near Westport, one (G.).

*P. flava* Fln.—M.: Westport, one in Demesne (H.), one in garden and one in Demesne (G.); Knappagh, one (G.).

\**P. flavicornis* Fln.—M.: Westport, six in garden (G.).

*P. obscurella* Fln.—M.: Louisburgh, one (H.).

*P. populicola* Fln.—M.: Westport, three on riverside and one in Demesne; Belclare, one (G.).

*Napomyza lateralis* Fln.—Cl.: one (H.).

#### Family Conopidae.

*Conops quadrifasciata* Deg.—M.: Knappagh, three ♂ (G.).

*Oecemyia atra* Fab.—M.: Westport, one in Demesne (H.).

*Sicus ferrugineus* L.—Cl.: one ♂ (M.) M.: Mulranny, one ♂, and Lough near Westport, one ♂ (G.).

LEPIDOPTERA.

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INTRODUCTION.

THE list of Lepidoptera here presented is arranged so as to show, by means of representative symbols, captures on Clare Island itself, followed by mainland localities on the shores of Clew Bay; and in the case of a few interesting species other records from more distant parts of Mayo are added. Though a great deal of work was done during the last three summers by Mr. Greer, Mr. Bonaparte Wyse, and myself, the results are disappointing, chiefly for the following reasons:—First, the enormous tracts of very wet bog, peculiarly barren of herbage and heather, that stretch for miles in every direction in Co. Mayo seem, in my experience, peculiarly devoid of Lepidopterous life. The vast moorlands that clothe the sides of the mountains yield a fauna peculiar and interesting, but monotonous and restricted in species. Secondly, the coasts of Clew Bay are wanting in the wide margins of sand-dunes with their peculiar flora and abundant fauna which form such a feature of the western coast which faces the Atlantic. Thus a copious list of sand-hill species also fails to be represented. Thirdly, the general absence of woodlands, except the small stretch of plantations and scrub at Glendarary, Achill Island, and some promising wooded slopes near Belclare, and woods at Westport. And lastly, with the exception of the summer of 1911, the frequent rainfall, the high winds that so frequently prevail, and the chilly fall in temperature toward evening that characterized the western coast even in the hot summer of 1911, and proves so disastrous to the flight of moths, are too well known to the entomologist in that part of Ireland. Moreover scarcely any of the numerous species which emerge from March to May swell the numbers of the list, nor the large host of autumnal species that are to be taken on ivy blossom in October and November. This is due to the impossibility of getting research carried on at these periods of the year, in so remote a district, characterized by so considerable a rainfall. The few spring insects catalogued were taken by Mr. Greer in May. The results here tabulated are chiefly records of moorland species, mixed with a fair proportion of such as inhabit cultivated lowlands, rocky hillsides clothed with scrub, and species which have an almost universal Irish distribution. But the absence

of certain groups which might have been almost certainly expected is as remarkable as the presence of others of great rarity in Ireland. For instance, several evenings were spent on Clare Island watching for Dianthoeciae at flowering tufts of *Silene maritima*, a plant which undoubtedly is plentiful on the precipices on the northern side of the island. Neither *D. capsophila*, *D. cucubali*, nor *D. nana*, which are so common on the Irish littoral, was seen, nor any others of the genus. Moreover, at the proper season, careful and widespread examination of the capsules of *Silene* proved that none of the genus were bred on it—an almost unprecedented experience to me on the Irish coast. The only result of this examination was the discovery of larvae of *Eupithecia oblongata*. Further disappointment was caused by the almost complete failure of the light-house lantern to attract night-flying moths, which was attributed by the light-house keeper (who was familiar with this method) to the constant high winds which sweep the lofty cliffs on which the buildings stand. *Dicranura vinula*, *Saturnia pavonia*, *Arctia caja*, and a few common Noctuae were the only captures at the lamp. On the mainland such woodland species as were taken came from the demesne of Glendarary, near Achill Sound, where several specimens of *Macroglossa bombyliformis* were captured; from the woods of Old Head near Louisburgh; and from some woods beside the town of Westport and near Belclare. Unfortunately the old oak-woods belonging to the Marquess of Sligo were too far away from Westport to be examined. The most interesting forest-lands in Mayo fringe the south-eastern shores of Lough Conn and Lough Cullin, some fifteen miles as the crow flies to the north-west of Westport. These extensive woodlands stretch from Muckersnav to Pontoon. I found them rich in Lepidoptera. The locality is too distant to be included in this report, but among the rarities taken there may be mentioned the following:—*Cymatophora* or, in some plenty, of dark coloration; *Acronycta euphorbiae* var. *montivaga*, not very rare; *Lobophora halterata*, fairly abundant: and Mr. Bonaparte Wyse was fortunate in taking *Cleoceris viminalis* at Pontoon—a rare and very local moth in this country—and also *Eucosmia undulata*, which is scarce in Ireland generally, but fairly plentiful at Glendarary, Achill Island. Here *Hadena glauca* was taken by Mr. Greer.

It will be noted that the fauna of the limestone district of Mayo on the eastern side of the Partry Mountains, along the shores of Lough Mask and Lough Carra, is not represented here. That area seems never to have been explored by the entomologist. I have observed specimens of *Zygaena pilosellae* (the Galway Burnet) on the limestone terraces by Lough Mask, and probably such species as *Phothedes captiuncula*, *Setina irrorella*, and *Lithosia luridcola*, so characteristic of that formation in Galway and Clare, may



also occur there. But there is no limestone outcrop of this sort within a considerable distance of Westport, and our research was necessarily circumscribed.

The captures on Clare Island, taken in the order of classification, may be shortly recapitulated first. Among the butterflies *Vanessa cardui*, with its powerful flight, visits the island, and perhaps breeds in suitable seasons as well as *V. io*. *Satyrus semcle*, though in sparse numbers, frequents the rocky headlands. The "blues" were represented by *Lycaena icarus* and *L. minima*, and two of the Sphinges occur, *Chaerocampa elenor* and *Smerinthus populi*. The four handsome moths *Nemeophila russula*, *Bombyx quercus*, *B. rubi*, and *Saturnia pavonia* were found on their moorland haunts; and the Puss-moth, *Dicranura vinula*, probably feeds on *Salix repens*, as well as other species of willow that grow in scrubland found in sheltered hollows on the eastern side of the island. *Notodonta ziczag* also breeds there. Such Noctuae as were taken are of small interest and almost universally distributed through Ireland. Two species of *Agrotis* which breed on sand-hills were found on a small patch of that deposit on the shore close to the harbour, *Agrotis vestigialis* and *A. tritici*, both of normal type. *Cucullia umbratica* was extremely plentiful and flew to flowers at dusk. Both species of *Habrostola* were taken, *H. triplasi* and *H. tripartita*. Among the Geometers the most notable was *Dasydia obfuscaria*, which fell to the lot of Professor Carpenter, of the Royal College of Science, Dublin, who, when turning over a stone in search of Springtails, discovered a freshly emerged specimen of it extended on its surface. This rare insect will be referred to later on. Of other Geometridae the following may be mentioned:—*Scodiona belgiaria*, which is a frequenter of flat wet bogs in the west of Ireland, but in my experience is never abundant; *Larentia caesiata* and *L. salicata*, both of which inhabit mountain moors, the former sometimes very abundant, but only a few were seen on Clare Island; *Eupithecia oblongata*, *E. satyrata* var. *callunaria*, and *E. nanata*, the latter frequent on bogs; *Phibalapteryx vittata*, one, frequents marshes, and, except in some localities, is somewhat rare; *Platyptilia isodactylus*, a very local plume-moth feeding on *Senecio aquaticus*; the only western localities where I have taken it hitherto are Markree Castle, Co. Sligo, and Moycullen in Connemara.

Of the Microlepidoptera, which seem certainly scarce on Clare Island, the following are interesting:—*Crambus uliginosellus*, not hitherto recorded from Ireland; *Sericoris (Olethreutes) micana*, also new; *Mixodia palustrana*, of which there are only two Irish records; *Hypermercia augustana* and *Argyrolepis (Phalonia) badiana*, also new Irish records. Of Tineae, *Plutella maculipennis* is new to Ireland, and *Bryotropha politella* hitherto recorded only from the Belfast district. Very little research on this group of insects has hitherto been done in Ireland.

Of captures on the mainland the following species invite comment. *Vanessa io*, formerly for many years scarcely to be met with in the northern half of Ireland, probably extirpated by a series of inclement summers, has now re-established itself in Ulster, and was seen in some numbers on Clare Island as well as on the mainland littoral. Such Lepidoptera, susceptible to comparatively trifling climatic changes, must have been introduced to this country since its climate has become stable and temperate. Visits to Croaghpatrick were made during the first half of June in 1909 and 1910 in the hope of again finding the alpine butterfly *Erebia epiphron*, recorded by Birchall in 1854; but though the locality indicated by him was carefully and exhaustively examined by Mr. Wyse and myself, no specimen was seen. The sunless weather and chilly wind probably account for our failure. My capture of a specimen on Nephin on the 9th June, 1897, however, proves its survival on the Mayo mountains, but it only flies in bright sunshine. *Plusia bractea* was taken at Old Head, Louisburgh, in some numbers.

The occurrence of *Dasydia obfuscaria* at Clare Island calls for a fuller notice. Birchall, in his Catalogue of Irish Lepidoptera, gave Wicklow as a habitat, and Mr. Bristow as the captor; but that gentleman kindly informed me that the record was erroneous. Subsequently Kerry was given as a locality on Mr. Birchall's authority; but no Irish specimen was known until 1898, when Mr. G. P. Farran took an example at Dowros Head, Co. Donegal. The insect is a native of Scotland, where it has been taken in the island of Arran, on the moors of Rannoch, and at Ardrossan. The moths most nearly allied to it of the genus *Gnophos* as well as *Dasydia* have every one an alpine or sub-Arctic distribution. It is found on the Continent in Finland, Sweden, Norway, Livonia, and on alpine heights even so far south as near Larche in the Basses-Alpes. Its food-plants are said to be species of *Genista* and Vetch. The Clare Island specimen is unusually dark, and may be referred to Hübner's *ab. canaria*. This species, then, forms, with *Larentia flavicinctata* at Ballycastle, Co. Antrim, an additional link between the fauna of Ireland and that of Scotland and Scandinavia. Its introduction to this country may of course have come about by flight with a favouring wind. But it certainly is remarkable that the list here given is chiefly composed of moths which inhabit Finland, as will be seen by the numerous asterisks appended to Finnish species in the list below. However, one of the Geometers inhabiting Achill provides a distributional problem of more complexity, which may be suitably discussed here.

*Nyssia zonaria*, Schiff, has been for some years known to exist on the sand-hills of Dugort, Achill Island; the Rev. W. F. Johnson, during the progress of this survey, has added those of Keel in Achill, and Mulranny on

the mainland, to its habitats; and Mr. A. W. Stelfox that of Belmullet, further to the north. This moth has an apterous female of very bulky proportions in comparison with the male; and besides its inability to fly, it is very sluggish on foot. Hence a colony of these insects is extremely localized, being able to extend its distribution only on foot during the fortnight or three weeks' life of the female, as it wanders in search of its food-plant for the purpose of oviposition. Its looper larvae can similarly progress in search for food; but the caterpillars of Geometers are usually very sluggish, having protective conformation, and they assume not only the pattern but the attitude of twigs, and their movements are accordingly very deliberate. These peculiarities have resulted in a very isolated and discontinuous distribution for this moth in the British Islands as well as through the European continent. It is, however, numerous where found, and is easily reared. Its European distribution is as follows:—Armenia, Ural Mountains, S. W. Russia, Hungary, Switzerland, N. Central France, Germany, Sweden. Thus, without being a member of the alpine fauna, it is found on the slopes of mountains, and in Sweden, as well as in the warmer temperate climates of Armenia and S. W. Russia, in such localities as the banks of the Seine near Paris, and in poor pastures suited for the growth of its low-growing food-plants, such as trefoil, *Achillea Millefolium*, *Centaurea Jacea*, *Salvia pratensis*, &c. Such soils are generally of sandy or stony, and barren nature, and, like sand-hills, are poor in nitrogen and such materials as are required by more luxuriant vegetation. Temperature therefore does not seem an important factor in determining its distribution so much as the requirements of its food-plants. The phenomenon of both alpine and maritime habitats for certain plants as well as insects is thus explicable. Its wide but discontinuous European distribution warrants us in attributing a very great antiquity to an insect with such limited powers of locomotion. A parallel in the vegetable world would be a plant which was devoid of seeds and could only spread by rhizomes. Let us examine its distribution in the British Islands—for though the difficulties appear to be accentuated, the facts when set out before us may narrow the problem to be elucidated. It has not been found in Scotland. In England, which has been well examined by lepidopterologists, only one station is known, namely, sand-hills in Cheshire, not far from Birkenhead. About twenty years ago Mr. D. C. Campbell, of Londonderry, found the larvae at Ballycastle, Co. Antrim, which I identified; and the moths were subsequently found in good numbers on the sand-hills there. A few years afterwards Mr. Sheridan, of Dugort, Achill, sent a male specimen which he caught flying on the sand-hills at that place.

In the year 1896 Mr. Halbert, of the National Museum, Dublin, in company with Mr. Dillon and myself, found a numerous colony at Slyne Head,

and again at Roundstone in Galway Bay, on extensive sand-dunes. During the progress of the Clare Island researches Rev. W. F. Johnson met with the insect on sand-hills at Keel, which is also in Achill, and on the mainland at Mulranny, and on sand-hills at the southern entrance of Achill Sound; and, as stated above, Mr. Stelfox took it on sand-hills near Belmullet. In the British Islands, therefore, the insect has hitherto been taken exclusively on sand-hills. In Ireland the length of the coast-line from Ballycastle to Roundstone, without counting indentations and narrow-mouthed bays, may be stated roundly as 230 to 250 miles. If we are to postulate that this puny insect crept along the shore, and was obliged to follow all the indentations of this extremely broken coast-line, much of it rock and precipice, as well as the banks of rivers which debouch into the sea, the suggestion is plainly an impossible one. Its isolated stations along the shore might be reached if the female could be transported by water. But a coast-wise dispersal thus on the storm-tossed waves of the north and west of Ireland is unthinkable. Geologists are now almost agreed that neither the ancient fauna nor flora of Ireland could have survived the Ice Age. And we will not here discuss the land-connexions of this island with Scotland and Scandinavia, nor with England and the Continent. But if we predicate its arrival, perhaps *via* England, at an early epoch, at a time when the Boulder-clay was being broken down by frost and alternating temperatures, the scanty and eager herbage which could grow on the stony and barren débris would be widespread, and as in the course of ages the soil became more fertile in humus, a richer and more aggressive flora would drive the weaker plants to the banks of streams, the sides of hills, and the sea-shore, and with it the insects that were dependent on them for nourishment. Hence isolated colonies would be found in such localities, having radiated in all directions from central districts now become unsuitable. But it may be said that of some twelve moths, which also have apterous females, Ireland reckons nine as indigenous. Do not the same problems present themselves in their case? The reply is a simple one, and, moreover, seems to indicate that they arrived overland before this country was insulated. The nine others are tree-feeders, and the caterpillars, hung by a silken web, are blown from tree to tree, and the females are active and climb the trunks in winter. They therefore accompanied the bushes and trees on arrival: Moreover, with the exception of one which is polyphagous, all are in flight as imagines in the winter or early months of the year. The females, being apterous, are therefore not blown away from their food-plant, as would be the case with such weak fliers as are the males. Perhaps *Nyssia* has reaped a similar advantage on the wind-swept heights and shores it inhabits. But to return to the list:—

*Larentia salicata*, which is usually a local species, occurs on Clare Island

as well as on Achill. *Melanippe hastata* is numerous at Glendarary on Achill, and occurs also at Doo Lough and at Pontoon. On the margins of Roonah Lough below Louisburgh *Acentropus niveus* was taken in sparing numbers, a very local species, whose caterpillar feeds under water. And among the Pyralidae the handsome but local *Ennychia octomaculata* was in fair numbers at Mulranny, where I secured a good series; it also occurs on Achill.

The few Microlepidoptera of any interest have been already alluded to. For the identification of them I am indebted to Mr. Bower, of Chiselhurst, and Mr. Durant, of the British Museum. But my chief thanks are due to Mr. Greer and Mr. Bonaparte Wyse, whose work in the field both at night and in the day added so greatly to the hard-earned success that I have to record. Aid was also given by Rev. W. F. Johnson, Mr. P. E. Grimshaw, and others.

## LIST OF SPECIES.

LOCALITIES—Cl. Clare I., A. Achill, M. Mulranny, L. Louisburgh, Cp. Croaghpatrick, W. Westport. \* denotes natives of Finland.

## RHOPALOCERA.

*Pieris brassicae* L. Cl. A. L. W. \*  
*rapae* L. L. \*  
*napi* L. Cl. L. Cp. \*  
*Argynnis paphia* L. L. \*  
*Vanessa urticae* L. Cl. A. W. L. \*  
*io* L. A. M. L. W. \*  
*cardui* L. Cl. A. \*  
*Erebia epiphron* Knoch. Cp. Nephin.  
*Pararge egeria* L. Cl. L. \*  
*megaera* L. Cl. L. W.  
*Satyrus semele* L. Cl. L. \*  
*Epinephele janira* L. Cl. L. W. \*  
*a ♀ approaching var. hispulla.*  
 Nephin.  
*hyperanthus* L. L. \*  
*Coenonympha tiphon* Rott. A. Doo L.  
*pamphilus* L. A. L. W. \*  
*Thecla rubi* L. A. M. \*  
*Polyommatus phlaeas* L. Cl. A. M. \*  
*Lycæna icarus* Rott. Cl. L. W. \*  
*argiolus* L. A. \*  
*minima* Fues. Cl. A. M. \*

## HETEROCCERA.

*Chaerocampa elpenor* L. Cl. M. \*  
*Smerinthus populi* L. Cl. \*  
*Macroglossa bombyliformis* Och. A. \*  
*Zygaena filipendulae* L. Cl. M. \*  
*Nudaria mundana* L. A. L. W. \*  
*Euchelia jacobaeae* L. A. L.  
*Nemeophila russula* L. Cl. A. Pontoon. \*  
*plantaginis* L. A. Nephin. \*  
*Arctia caja* L. Cl. A. \*  
*Spilosoma fuliginosa* L. Cl. A. Doo L. \*  
*lubricipeda* Esp. Cl. A.  
*menthastri* Esp. Cl. A. \*  
*Hepialus humuli* L. Cl. L. A. \*  
*velleda* Hb. A. \*  
*hectus* L. A. Pontoon. \*  
*Orgyia antiqua* L. L.  
*Bombyx rubi* L. Cl. A. \*  
*quercus* L. Cl. Cp. \*  
*var. callunae.* Nephin.  
*Odonestis potatoaria* L. Cl. \*  
*Saturnia pavonia* L. Cl. A. L. Doo L. \*  
*Drepana lacertinaria* L. W.

*Dicranura vinula* L. Cl. L.  
*Notodonta dictaeoides* Esp. A. \*  
*ziczag* L. Cl. \*  
*Thyatira batis* L. A. \*  
*derasa* L. Pontoon.  
*Macroglossa bombyliformis* Och. A. \*

## NOCTUAE.

*Acronycta psi* L. W. \*  
*rumicis* L. Cl. A. \*  
*Leucania impura* Hb. L.  
*pallens* L. L. \*  
*Hydroecia nictitans* Bork. L. W. \*  
*Axylia putris* L. M.  
*Xylophasia rurea* Fb. W. \*  
*lithoxylea* Fb. A. \*  
*sublustris* Esp. Cl.  
*monoglypha* Hufn. Cl. A. W. \*  
*var. aethiops* Pontoon.  
*Charaeasgraminis* L. Cl. A. L. W. \*  
*Mamestra brassicae* L. Cl. A. W. \*  
*furva* Hb. W. \*  
*Apamea basilinea* Fb. Cl. M. W. \*  
*gemina* Hb. Cl. A. M. W. \*  
*didyma* Esp. Cl. L. A. W. \*  
*Miana fasciuncula* Haw. M.  
*Caradrina alsines* Brahm. L. \*  
*taraxaci* Hb. L. \*  
*quadripunctata* Fb. Cl. M. A. W. \*  
*Agrotis vestigialis* Hufn. Cl. \*  
*exclamationis* L. Cl. A. \*  
*tritici* L. Cl. L. \*  
*strigula* Thnb. Pontoon. \*  
*lucernea* L. Cl. \*  
*Noctua plecta* L. Cl. A. \*  
*umbrosa* Hb. L. W.  
*baia* Fb. L. \*  
*xanthographa* Fb. L. W.  
*Triphaena ianthina* Esp. L.  
*fimbria* L. L.  
*comes* Hb. L. W.  
*pronuba* L. M. L. W. \*

*Mania maura* L. L.  
*Pachnobia rubricosa* Fb. L. Cp. \*  
*Taeniocampa gothica* L. L. Cp. \*  
*incerta* Hufn. L. Cp. \*  
*stabilis* View. L. Cp.  
*gracilis* Fb. L. Cp.

## HADENIDAE.

*Cleoceris viminalis* Fb. Pontoon. \*  
*Euplexia lucipara* L. A. \*  
*Phlogophora meticulosa* L. A. W. \*  
*Hadena adusta* Esp. A. \*  
*glauca* Hb. A. \*  
*dentina* Esp. Cl. A. \*  
*oleracea* L. Cl. A. \*  
*pisi* L. A. L. Doo L. \*  
*thalassina* Rott. A. \*  
*Xylocampa areola* Esp. L. Cp.  
*Calocampa vetusta* Hb. L. Cp. \*  
*Cucullia umbratica* L. Cl. \*  
*Gonoptera libatrix* L. A. W. \*  
*Habrostola tripartita* Hufn. Cl.  
*triplasia* L. Cl. \*  
*Plusia chrysis* L. L. \*  
*bractea* Fb. L. \*  
*pulchrina* Haw. L.  
*gamma* L. Cl. A. L. \*  
*interrogationis* L. Nephin. \*  
*Anarta myrtilli* L. A. \*  
*Euclidia glyphica* L. Cp. W. \*  
*Hypena proboscidalis* L. L. \*

## GEOMETRAE.

*Rumia luteolata* L. Cl. A. \*  
*Metrocampa margaritaria* L. A. Cp.  
*Selenia bilunaria* Esp. Cp. Doo L.  
*Odontopera bidentata* Clerck. A. \*  
*Nyssia zonaria* Schiff. Achill (Keel,  
 Dugort, Curraun, Mulranny,  
 Belmullet.)  
*Dasydia obfuscaria* Hb. Cl. \*  
*Iodis lactearia* L. Cp. W. \*  
*Acidalia dimidiata* Hufn.  
 A. W. Pontoon. \*

*Cabera pusaria* L. Cl. A. W. \*  
*Bapta temerata* Hb. A.  
*Scodiona belgiaria* Hb. Cl. A. Cp. \*  
*Ematurga atomaria* L. Cl. A. L. etc. \*  
*Aspilates strigillaria* Hb. A. M.  
*Abraxas grossulariata* L. Cl. A. \*  
*Lomaspilis marginata* L. Cl. A. L. W. \*  
*Larentia caesiata* Lang. Cl. Cp.  
     Nephin. (Croaghmore 1000 ft.)  
     *salicata* Hb. Cl. A.  
     *viridaria* Fb. A. \*  
*Emmelesia albulata* Schiff.  
     Cl. A. M. L. \*  
*Eupithecia oblongata* Thnb. Cl. A. \*  
     *satyratea* var. *callunaria* Sta.  
     A. Doo L.  
     *nanata* Hb. Cl. A. W. Nephin. \*  
     *absinthiata* Clerk. L. \*  
     *minutata* Gn. L. W. \*  
     *rectangulata* L. L. \*  
*Thera variata* Schiff. A. \*  
*Hypsipetes ruberata* Frr. L. \*  
     *trifasciata* Bork. A. \*  
     *sordidata* Fb. L. W. \*  
*Melanthia bicolorata* Hufn. L. \*  
     *albicillata* L. A. L. W. Pontoon. \*  
*Melanippe hastata* L.  
     A. W. L. Doo L. Pontoon. \*  
     *sociata* Bork. Cl. A. L. W. \*  
     *montanata* Bork.  
     Cl. A. L. W. Doo L. \*  
     *galiata* Hb. M. W.  
     *fluctuata* L. Cl. A. L. \*  
*Coremia unidentaria* Haw. A. W. \*  
*Camptogramma bilineata* L. Cl. M.  
     and a very dark form L. \*  
*Phibalapteryx vittata* Bork. Cl. \*  
*Eucosmia undulata* L. A. Pontoon. \*  
*Cidaria truncata* Hufn. A. Nephin. \*  
     *immanata* Haw. A. L. Nephin. \*  
     var. *marmorata* L. W.  
     *testata* L. A. \*

*Cidaria populata* L. A. \*  
*Pelurga comitata* L. L. A. \*  
*Eubolia limitata* Scop. L. etc. \*

## PYRALIDES.

*Scoparia ambigua* Tr. Cl. A. L.  
*Pyrausta purpuralis* L. A. M.  
*Herbula cespitalis* Schiff. A. L. W.  
*Ennychia octomaculata* Fb. A. M.  
*Botys fuscalis* Schiff. A.  
     *ruralis* Scop. L.  
*Ebulea crocealis* Hb. L.  
*Pionea forficalis* L. L.  
*Hydrocampa nympheata* L. L. A.  
     *stagnata* Don. Cl. L. W.  
*Acentropus niveus* Oliv. L.

## PTEROPHORI.

*Chrysocoris festaliella* Hb. A.  
*Platyptilia isodactylus* Zell. Cl.  
*Mimaeseoptilus plagiodyctylus* Sta.  
     Cl.  
*Aciptilia tetradyctyla* L. L. Pontoon.  
     *pentadyctyla* L. W.  
*Alucita hexadyctyla* L. W.

## CRAMBI.

*Crambus pratellus* L. Cl. A.  
     *pascuellus* L. A.  
     *sylvellus* Hb. A.  
     *uliginosellus* Zell. Cl. A. L.  
     *margaritellus* Hb. W. Nephin.  
     *perlellus* Scop. A.  
     *tristellus* Fb. L. W.  
     *culmellus* L. Cl. L. A.  
*Aphomia sociella* L. Cl. L.

## TORTRICES.

*Tortrix (Archips) rosana* L. Cl.  
     *viburnana* Fb. Cl. \*  
     *viridana* L. L. Pontoon.  
*Penthina dimidiana* Tr. A.

- |  |   |
|--|---|
| Sericoris ( <i>Olethreutes</i> ) <i>fasciana</i> <i>Hw.</i> L.               | <i>Argyrolepia</i> ( <i>Phalonia</i> ) <i>hartmanniana</i><br><i>Clerck.</i> A. |
| <i>cespitana</i> <i>Hb.</i> A.   |   |
| <i>Sericoris lacunana</i> <i>Dup.</i> Cl.                                    | <i>badiana</i> <i>Hb.</i> Cl.   |
| <i>micana</i> <i>Frol.</i> Cl.   | TINEAE.   |
| <i>Mixodia schulziana</i> <i>Fb.</i> Cp. Nephin. *                           | <i>Incurvaria muscalella</i> <i>Fb.</i> A.                                      |
| <i>palustrana</i> <i>Zell.</i> Cl. *   | <i>Micropteryx calthella</i> <i>L.</i> A.                                       |
| <i>Cnephasia</i> ( <i>Ophelia</i> ) <i>osseana</i> <i>Sc.</i> L. *           | <i>aureatella</i> <i>Scop.</i> Cl.  |
| <i>Bactra lanceolana</i> <i>Hb.</i> Cl. A.                                   | <i>Plutella maculipennis</i> <i>Crt.</i> Cl.                                    |
| <i>Phoxopteryx unguicella</i> <i>L.</i> Cl. A. L.                            | <i>Harpipteryx xylostella</i> <i>L.</i> W.                                      |
| <i>Hypermezia</i> ( <i>Euarmonia</i> ) <i>angustana</i><br><i>Hb.</i> Cl. A. | <i>Depressaria nervosa</i> <i>Hw.</i> L.  |
| <i>cruciana</i> <i>L.</i> Cl.  | <i>heracleana</i> <i>De Geer.</i> Cl.   |
| <i>Batodes angustiorana</i> <i>Haw.</i> Cl. L.                               | <i>Gelechia ericetella</i> <i>Hb.</i> Cl. A. Cp.<br>Carrowmore.                 |
| <i>Dichrorampha plumbana</i> <i>Scop.</i> Cl.                                | <i>Bryotropha terrella</i> <i>Hb.</i> Cl. A.                                    |
| <i>Catoptria</i> ( <i>Eucosmia</i> ) <i>ulicetana</i> <i>Hw.</i><br>A.       | <i>politella</i> <i>Sta.</i> Cl.  |
| <i>cana</i> <i>Hw.</i> L.  | <i>Lita marmorea</i> <i>Hw.</i> Cl.   |
| <i>Eupoecilia angustana</i> <i>Hb.</i> Cl.                                   | <i>Borkenhausenia pseudospiretella</i> <i>Stn.</i><br>Cl.                       |
| <i>Xanthosetia hamana</i> <i>L.</i> L.                                       | <i>Glyphipteryx thrasonella</i> <i>Scop.</i> Cl. A.                             |

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NEUROPTERA.

By J. N. HALBERT.

Read JUN 24. Published September 11, 1912.

THE present report contains a short account of the Neuroptera of the Clare Island district. It is concerned with such insects as the dragonflies, mayflies, caddisflies, and other insects comprising the Neuroptera of the older classifications.

Our knowledge of most of the entomology of the district prior to the present Survey was practically *nil*, if we except a few groups such as the moths and beetles. In the case of the Neuroptera, however, a considerable amount of collecting had already been done by Mr. J. J. F. X. King, who had selected the Westport and Newport districts for part of the field-work which it was necessary to carry out in the preparation of his catalogue of the Irish Neuroptera published in 1889.<sup>1</sup>

In order to secure a complete report on this interesting section of the fauna, it was hoped that Mr. King would be able to continue his work in the district; unfortunately neither he nor Mr. K. J. Morton could spare time for the undertaking. In these circumstances the attention given to the Neuroptera during the Survey was very limited, so that there are comparatively few additional species to record. They include, however, a few notable insects, such as the mayfly *Leptophlebia vespertina* and the caddisfly *Limnophilus fuscinervis*.

As a result of the collecting carried on both before and during the Survey we have now records of 124 species of Neuroptera from the neighbourhood of Clare Island, or almost exactly half the number recorded in the general Irish list published about two years ago.<sup>2</sup> The local list is made up as follows:—

Dragonflies, 14 species	Psocidae, 18 species
Mayflies, 11 „	Planipennia, &c., 13 „
Stoneflies, 5 „	Caddisflies, 63 „

There is no doubt that these do not represent the complete neuropterous fauna of the district; yet the group is numerically a small one, and it is hardly likely that many species remain to be discovered there.

In spite of an abundance of suitable habitats, the district is comparatively poor in aquatic species. The dragonflies, for instance, are few, but in this

<sup>1</sup> A Contribution towards a Catalogue of the Neuropterous Fauna of Ireland. Glasgow, 1889.

<sup>2</sup> J. J. F. X. KING and J. N. HALBERT: A list of the Neuroptera of Ireland. Proc. R.I. Acad., xxviii, Sect. B, No. 2. 1910.

respect the district shares a characteristic of the rest of Ireland, there being only twenty-three kinds recorded from this country.

Among the rarer dragonflies are *Sympetrum scoticum*, which occurs both on Clare Island and on the adjacent mainland. The local *Brachytron pratense* occurred on the wooded hillside at Belclare, and Mr. King had previously taken it near the convent at Westport. A much rarer species is the little *Ischnura pumilio*, which Mr. King found many years ago on the Carrowbeg River. One hot day in July I also met with a specimen flying over marshy ground by a small lough (Doo Lough) quite close to Louisburgh. According to Mr. Lucas it is a very local British insect, occurring in the south-eastern parts of England. Both of the handsome dragonflies *Calopteryx virgo* and *C. splendens* occur on the wooded banks of streams in the neighbourhood of Westport, the former species being an addition to the local list.

The most interesting insect discovered during the Survey is a caddisfly, *Limnophilus fuscicornis*, which it was my good fortune to capture while collecting on the wooded shores of Lough Lannough, close to Castlebar. This insect proved to be unrecorded from the British Isles.<sup>1</sup> The first specimen, a male, was taken on June 17th, 1909, and on a subsequent visit in July a few females were found in the same place, so that it is probably not uncommon there. It is remarkable that so conspicuous an insect should have been overlooked in these countries, and it is extremely likely that it awaits discovery on some lake-shore in northern Britain. Lough Lannough also yielded a Mayfly, *Leptophlebia vespertina*, which was not previously known to occur in this country.

This district is decidedly poor in stoneflies (*Perlidae*); none of the larger species, *Perla*, *Dictyopteryx*, &c., were found, although there are many streams affording a suitable habitat for these insects.

Apart from those species which are known to be common and widely distributed throughout Europe, there is a decided preponderance of northern over southern species. Amongst forms which may perhaps be included in the latter category are the dragonfly *Ischnura pumilio*, the mayfly *Cloëon simile*, and the caddisfly *Polycentropus Kingi*.

There can be little doubt that most of the twenty-four species taken on Clare Island found their way to that area in former times while it was still joined to the mainland. With few exceptions the Neuroptera are winged, yet the comparatively weak and fitful flight of the majority of these insects would seem to preclude the possibility of their having flown across the three miles of ocean which, at its narrowest part, separates the island from the mainland.

<sup>1</sup>The known Continental range of this caddisfly is northern Lapland, Finland, Sweden, Lithuania, Germany, Saxepta, Denmark; and a variety (var. *solutus* McLarch) has been found in Persia.

The only neuropterous insects which are qualified for this task are the larger-bodied dragonflies of the genera *Sympetrum*, *Libellula*, and *Aeschna*—insects which would have little difficulty in crossing such a sea-barrier.

I am indebted to the Rev. W. F. Johnson and Mr. Claude Morley for notes of their captures, and to Mr. K. J. Morton and Rev. A. E. Eaton for kind help in the identification of some difficult species collected during the Survey.

In the list of species the locality names are indicated by the following letters:—

A = Achill Island.  
B = Inishbofin.  
Bc = Belclare.  
Bm = Belmullet.  
C = Clare Island.  
Cb = Castlebar.

L = Louisburgh.  
M = Mulranny.  
N = Newport.  
R = Mweelrea.  
W = Westport.

## LIST OF SPECIES.

## ODONATA (Dragonflies).

*Sympetrum striolatum* *Charp.*—C, A,  
B, L, M, N, W.

*scoticum* *Don.*—C, W.

*Libellula quadrimaculata* *L.*—C, A, L.

*Brachytriton pratense* *Müll.*—Bc, W.

*Aeschna juncea* *L.*—C, M, R.

*Calopteryx virgo* *L.*—Bc.

*splendens* *Harr.*—W.

*Lestes sponsa* *Hansem.*—L.

*Pyrrhosoma nymphula* *Sulz.*—C, A,  
L, W.

*Isonura pumilio* *Charp.*—L, W.

*elegans* *Van Lind.*—C, A, B, L, W.

*Agrion pulchellum* *Van Lind.*—Bc, W.  
*puella* *L.*—Bc, W.

*Enallagma cyathigerum* *Charp.*—C, A,  
B, L, W.

## EPHEMERIDAE (Mayflies).

*Ephemera vulgata* *L.*—Cb.

*danica* *Müll.*—W.

*Leptophlebia cineta* *Retz.*—W.

*vespertina* *L.*—Cb.

*Caenis halterata* *Fab.*—W.

*Baëtis binoculatus* *L.*—C.

*pumilus* *Burm.*—C.

*Cloëon simile* *Eaton.*—A, N, W

*Cloëon rufulum* *Müll.*—W.

*Ecdyurus insignis* *Eaton.*—W.

*lateralis* *Curt.*—C.

## PERLIDAE (Stoneflies).

*Chloroperla grammatica* *Poda.*—L, W.

*Isopteryx torrentium* *Pict.*—C, A, L,  
W.

*Nemoura cinerea* *Oliv.*—L, W.

*variegata* *Oliv.*—A, Cb, M, W.

*Leuctra Klapálecki* *Kempny.*—W.

## PSOCIDAE.

*Amphigerontia bifasciata* *Latr.*—W.

*Psocus nebulosus* *Steph.*—W.

*longicornis* *Fab.*—W.

*Stenopsocus immaculatus* *Steph.*—W.

*Graphopsocus cruciatus* *L.*—W.

*Mesopsocus unipunctatus* *Müll.*—W.

*Philotarsus flaviceps* *Steph.*—W.

*Elipsocus Westwoodi* *McLach.*—W.

*abietis* *Kolbe.*—W.

*Peripsocus phaeopterus* *Steph.*—W.

*Caecilius fuscopterus* *Latr.*—W.

*flavidus* *Steph.*—W.

*Burmeisteri* *Brauer.*—W.

*perlatus* *Kolbe.*—W.

*Atropos pulsatoria* *L.*—W.

*Hyperetes guestfalicus* *Kolbe.*—W.

*Lepinotus inquilinus* Heyd.—W.

*Troctes divinatorius* Müll.—W.

PLANIPENNIA.

*Sialis lutaria* L.—W.

*Sisyra fuscata* Fab.—A, Bc, W.

*Hemerobius micans* Oliv.—W.

*humuli* L.—W.

*lutescens* Fab.—W.

*marginatus* Steph.—W.

*nervosus* Fab.—W.

*Micromus variegatus* Fab.—W.

*paganus* L.—A.

CHRYSOPIDÆ.

*Chrysopa flava* Scop.—W.

*alba* L.—W.

*flavifrons* Brauer.—W.

CONIOPTERYGIDÆ.

*Coniopteryx lactea* Wesm.—W.

TRICHOPTERA (Caddisflies).

*Phryganea striata* L.—W.

*varia* Hagen.—L, M, W.

*Colpotaulius incisus* Curt.—C, Cb, N, W.

*Glyptotaelius pellucidus* Retz.—W.

*Limnophilus rhombicus* L.—W.

*flavicornis* Fab.—W.

*marmoratus* Curt.—C, A, N, W.

*lunatus* Curt.—C, N, W.

*fuscinervis* Zett.—Cb.

*ignaceus* (Hagen) McLach.—W.

*centralis* Curt.—W.

*vittatus* Fab.—M, W.

*auricula* Curt.—W.

*griseus* L.—A, M, W.

*hirsutus* Pict.—W.

*luridus* Curt.—A, L.

*sparsus* Curt.—C, A, L, M.

*Micropterna lateralis* Steph.—A.

*Sericostoma personatum* Spence.—A, Cb, L, W.

*Goëra pilosa* Fab.—W.

*Silo nigricornis* Pict.—W.

*Lepidostoma hirtum* Fab.—W.

*Beraea pullata* Curt.—L, W.

*maurus* Curt.—C, W.

*Odontocerum albicorne* Scop.—L, W.

*Leptocerum fulvum* Ramb.—A, W.

*senilis* Burm.—N, W.

*albo-guttatus* Hagen.—W.

*aterrimus* Steph.—N, W.

*cinereus* Curt.—N, W.

*albifrons* L.—N, W.

*dissimilis* Steph.—W.

*Mystacides azurea* L.—N, W.

*longicornis* L.—N, W.

*Trianenodes bicolor* Curt.—N, W.

*Oecetis ochracea* Curt.—W.

*furva* Ramb.—W.

*lacustris* Pict.—W.

*testacea* Curt.—W.

*Hydropsyche instabilis* Curt.—W.

*angustipennis* Curt.—W.

*Philopotamus montanus* Donov.—C, A, B, M, P, W.

*Wormaldia occipitalis* Pict.—C, L, W.  
*subnigra* McLach.—W.

*Chimarra marginata* L.—L, N, W.

*Neureclipsis bimaculata* L.—W.

*Plectrocnemia conspersa* Curt.—C, W.

*Polycentropus flavomaculatus* Pict.—C, A, L, N, W.

*multiguttatus* Curt.—W.

*Kingi* McLach.—W.

*Holocentropus dubius* Ramb.—W.

*stagnalis* Albarda.—W.

*picicornis* Steph.—C, W.

*Cyrnustrimaculatus* Curt.—A, L, N, W.

*flavidus* McLach.—W.

*Ecnomus tenellus* Ramb.—W.

*Tinodes Waeneri* L.—N, W.

*aureola* Zett.—C, W.

*Lype phaenopa* Steph.—W.

*Rhyacophila dorsalis* Curt.—W.

*Agapetus fuscipes* Curt.—C, L, W.

*Hydroptila sparsa* Curt.—W.

*Oxyethira costalis* Curt.—W.

TERRESTRIAL COLEOPTERA.

By REV. W. F. JOHNSON, M.A., F.E.S., AND J. N. HALBERT, M.R.I.A.

Read JUNE 24. Published SEPTEMBER, 11, 1912.

INTRODUCTION.

THE district from which Coleoptera were collected had as its centre Clare Island; it included Achill Island, and extended eastwards to Castlebar and southwards to Killary Bay, excluding the Galway side; it thus forms a district of considerable size and variety of surface. Work at the Coleoptera had been done in the district previously to the Survey of 1909-11 by W. E. Sharpe, L. H. Bonaparte Wyse, J. N. Halbert, and Commander Walker,<sup>1</sup> and their records are incorporated in the present list.

The work of the section of the Clare Island Survey devoted to the Coleoptera was carried out by Rev. W. F. and Mrs. Johnson and Mr. J. N. Halbert, with assistance from Messrs. C. Morley, R. Welch, and N. H. Foster. Mr. L. H. Bonaparte Wyse was collecting in the district on his own account, and very kindly sent us a complete list of his captures. We are also indebted to several other workers for specimens collected during the Survey.

With regard to our work in the district, W. F. and Mrs. Johnson collected at Curraun, Achill, and Mulranny in June, 1910; at Clare Island in September, 1910, and in June, 1911. Halbert worked at Clare Island, Achill, and Westport in June, 1909; at Belclare and Louisburgh in July, 1910; and at the Westport district in July, 1911.

As a result we are able to present a list of 521 species of Coleoptera. This cannot be regarded as anything like a complete list of the beetles of the district. Such a list could only be compiled by resident collectors working all the year round for several years in succession. This will at once be understood when we mention that the late Mr. Buckle's list<sup>2</sup> of the beetles of the Foyle district, comprising parts of Donegal and Derry, which was the result of three years' energetic and skilled collecting by one resident continuously in

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<sup>1</sup> *Vide* Johnson, W. F., and J. N. Halbert: A List of the Beetles of Ireland. Proc. R. I. Acad. (3), vol. vi., 1902.

<sup>2</sup> Buckle, C. W.: Beetles collected in Lough Foyle District, Cos. Donegal and Derry. Irish Naturalist, ix., p. 2. 1900.

the district, produced 760 species; but in this list the aquatic species were included, which, in our case, are dealt with in a separate paper (Part 29) by Mr. Balfour Browne. As he has listed 90 species, their addition would bring the present list to a total of 611 species.

The Clare Island district has also some features tending to restrict the number of species. The fierce Atlantic gales are not conducive to beetle-life; the prevalence of turf-bogs is also an adverse factor, as such localities have always a comparatively poor insect fauna; and lastly, the scarcity of woodland, except about Westport, causes a dearth of a large number of species which are connected with trees. Thus there is but one Longicorn represented, —*Grammoptera ruficornis*, a species which is widely spread in Ireland; but Mr. Wyse found *Rhagium inquisitor* and *Strangalia armata* at Pontoon, just outside our district. In spite of these drawbacks the district has several highly interesting species—e.g., *Carabus clathratus*, *C. granulatus* var. *interstitialis*, *Leistus montanus*, *Panagæus crux-major*, *Tachinus proximus*, *Myllaena gracilis*, *Otiorrhynchus blandus*, and others, to which particular reference will be made further on.

The number of species obtained on Clare Island itself is 238. It will be noticed that a few of these are not recorded from the mainland, but there is no reason why they should not occur there. It is remarkable that no species of *Dyschirius* was met with on the island, though there is a suitable locality where their constant companions, *Bembidium pallidipenne* and *Bledius arenarius*, were found. Another absentee was *Cetonia aurata*, which seems to have a great liking for islands, and has been found on the Aran Islands to the south and Tory Island to the north. We were also somewhat surprised not to meet with *Leistus montanus* on Croaghmore. The groups best represented on the island were the Carabidae, the Staphylinidae, and the Aphodii. In connexion with the Aphodii it is interesting to note that *A. contaminatus* was exceedingly abundant in September, being found from the sea-shore to the top of Croaghmore, while in June it was not met with at all. On the other hand, *A. scybalarius* was found in June, but not in September, and *A. lapponum* and *A. ater* were much more abundant in June than in September. We should also like to refer to the very frequent occurrence of such species as *Carabus clathratus*, *Staphylinus caesareus*, and *Otiorrhynchus blandus* on Clare Island.

As regards the manner in which Clare Island has acquired its present coleopterous fauna there is no need to labour the subject. Anyone looking at the map of Clew Bay must be impressed with the feeling that, at no very vast distance in time, that which is now islands and water must have been a continuous land-surface, and that Clare Island formed part of the mainland,

But although we believe that the greater portion of the beetle-fauna arrived at the area which is now Clare Island whilst it was still part of the mainland, yet there is no impossibility in a number of species having been carried over the short distance which now separates the island from the mainland. On a hot spring or summer day beetles fly freely in the sunshine, rising to a considerable height in the air, and with a favourable wind they would easily be wafted from the mainland to the island.

There are sandhills at Keel in Achill, at the southern entrance to Achill Sound, and at Mulranny. These produced several interesting species, but no *Heterocerus* was met with, though the environment was apparently suitable. We may point out that the only record for *Heterocerus* for the west coast of Ireland is Enniscrone, county Sligo, where Johnson obtained it in some numbers.

In the neighbourhood of Westport there are several lakes, also at Castlebar and Louisburgh, and at these several good captures were made. The interesting ground-beetle *Pelophila borealis* Payk., has been taken at Ballyhaunis, which is just outside the boundary of the district, and we hoped to have met with it, but were disappointed; however, there is every reason to expect that it will yet be found in the Clare Island district. In this connexion we would call attention to a few uncommon species which have been taken at Leenane, on the southern side of Killary Bay, just beyond our boundary. These include *Homalota exilis* Er., *Quedius umbrinus* Er., *Cryptobium glaberrimum* Herbst., and *Chrysomela varians* Schall. It is highly probable that further research will disclose the presence of these insects within the district.

As might be expected, several of the species noted are of a western trend in Ireland; among these the following may be mentioned as having no record from the east coast:—*Leistus montanus*,<sup>1</sup> *Dyschirius impunctipennis*, *Panagaeus crux-major*, *Stenolophus vespertinus*, *Aëpus Robinii*, *Cymindis vaporariorum*, *Homalota puncticeps*, *Stenus lustrator*, and *Cryptocephalus aureolus*.

Of species that are of northern distribution the following representatives have occurred, amongst others, in the district:—*Carabus clathratus*, *Nebria Gyllenhali*, *Blethisa multipunctata*, *Patrobus assimilis*, *Aphodius lapponum*, *Otiorrhynchus blandus*, and *O. maurus*. But of those of distinctively southern origin we can only mention *Aëpus Robinii* and *Rhopalomesites Tardyi*. We do not, however, attempt to draw any conclusions from these records, as we

<sup>1</sup> In the Dublin Museum collection there is a handsome dark-green form of this alpine insect taken by Mr. N. H. Foster on Slieve-na-Gloagh in the Mourne Mountains during August, 1902. We have no record, however, of its occurrence on the Leinster range.

do not consider that we are yet acquainted with the whole fauna of the district.

The Bills, which are included in the district, are rocky islets some nine miles north-west of Clare Island. A visit was paid to them by R. Ll. Praeger and R. Welch in June, 1910, and some debris was obtained from old nests of the Puffin and Great Black-backed Gull. The following beetles occurred in this habitat:—

<i>Pterostichus strenuus.</i>	<i>Choleva Watsoni.</i>
<i>Homalota longicornis.</i>	<i>Athous haemorrhoidalis.</i>
<i>Philonthus fimetarius.</i>	<i>Agriotes lineatus.</i>
<i>Xantholinus linearis.</i>	

We have much pleasure in recording the following additions to the list of Irish Beetles:—

<i>Homalota mortuorum</i> <i>Thoms.</i>
<i>Tachinus proximus</i> <i>Kr.</i>
<i>Myllaena gracilis</i> <i>Matthw.</i>
<i>Malthodes mysticus</i> <i>Kies.</i>

Further reference will be made to these in the detailed notes.

The following 56 species have not been previously recorded from the province of Connaught:—

<i>Dyschirius salinus.</i>	<i>P. albipes.</i>	<i>C. scanicus</i> <i>var. patruelis.</i>
<i>Stenolophus vespertinus.</i>	<i>P. umbratilis.</i>	<i>Ephistemus gyrinoides.</i>
<i>Pterostichus minor.</i>	<i>P. longicornis.</i>	<i>Helodes marginata.</i>
<i>Amara lucida.</i>	<i>Baptolinus alternans.</i>	<i>Cyphon coarctatus.</i>
<i>Pristonychus terricola.</i>	<i>Othius laeviusculus.</i>	<i>C. pallidulus.</i>
<i>Anchomenus atratus.</i>	<i>Lathrobium multipunctum</i>	<i>Telephorus paludosus.</i>
<i>Aëpus Robinii.</i>	<i>Stenus canaliculatus.</i>	<i>Malthodes mysticus.</i>
<i>Alianta incana.</i>	<i>S. nitens.</i>	<i>M. flavoguttatus.</i>
<i>Homalota currax.</i>	<i>S. crassus.</i>	<i>M. pellucidus.</i>
<i>H. cambrica.</i>	<i>S. geniculatus.</i>	<i>M. atomus.</i>
<i>H. elongatula.</i>	<i>S. cicindeloides.</i>	<i>Donacia limbata.</i>
<i>H. oblongiuscula.</i>	<i>Micralymma brevipenne.</i>	<i>D. vulgaris.</i>
<i>H. monticola.</i>	<i>Agathidium laevigatum.</i>	<i>Lochmaea capreae.</i>
<i>H. gemina.</i>	<i>Micropeplus porcatus.</i>	<i>Longitarsus gracilis.</i>
<i>H. mortuorum.</i>	<i>Epuraea florea.</i>	<i>Haltica palustris.</i>
<i>Myllaena gracilis.</i>	<i>Lathridius lardarius.</i>	<i>Cassida nobilis.</i>
<i>Conosoma lividum.</i>	<i>Corticaria denticulata.</i>	<i>Salpingus ater.</i>
<i>Tachinus proximus.</i>	<i>C. elongata.</i>	<i>Phytobius iv-tuberculatus.</i>
<i>Philonthus addendus.</i>	<i>Cryptophagus saginatus.</i>	



As Croaghpatrick (2510 ft.) is the highest point in the district examined, it will be of interest to record the species found on the summit, which are as follows:—

Cychrus rostratus.	A. viduus.	P. politus.
Carabus catenulatus.	Trechus minutus var.	P. varius.
C. nemoralis.	obtusus.	Othius fulvipennis.
Notiophilus biguttatus.	Patrobus assimilis.	Lathrobium fulvipenne.
N. aquaticus.	Cymindis vaporariorum.	Stenus geniculatus.
N. palustris.	Aleochara brevipennis.	Stilicicus affinis.
Leistus montanus.	Alianta incana.	Byrrhus pilula.
Nebria Gyllenhali.	Homalota vicina.	B. fasciatus.
Loricera pilicornis.	H. analis.	Athous haemorrhoidalis.
Harpalus latus.	H. aterrima.	Corymbites cupreus var.
Pterostichus vitreus.	H. muscorum.	aeruginosus.
Amara spinipes.	Tachyporus chrysomelinus.	Malthodes flavoguttatus.
Taphria nivalis.	Quedius mesomelinus.	Salpingus ater.
Anchomenus parumpunctatus.	Q. boops.	Otiorrhynchus maurus.
	Philonthus proximus.	Ceuthorrhynchus quadridens.

Some of these are natural denizens of the mountain-top, such as *Leistus montanus* and *Otiorrhynchus maurus*; others are casual visitors which have flown up or been carried up by a current of air, such are *Alianta incana*, *Malthodes flavoguttatus*, *Salpingus ater*, and *Ceuthorrhynchus quadridens*, which were found flying around the freshly painted door of the little oratory on the summit on a hot July day. It will be noticed that some of the common Irish mountain species are absent from this list, but that must not be taken as proof that they are absent from the locality. The visits of collectors of Coleoptera to the summit of Croaghpatrick have been few and far between, so that these species are most likely merely awaiting a discoverer.

We are much indebted to Dr. David Sharp, F.R.S., and Mr. G. C. Champion, F.Z.S., for kind assistance in the identification of critical species.

In the following list the names of localities are indicated as follows:—

A = Achill Island.	L = Louisburgh.
B = Inishbofin.	M = Mulranny.
Bc = Belclare.	P = Croaghpatrick.
Bm = Belmullet.	R = Mweelrea.
C = Clare Island.	S = Inishshark.
Cb = Castlebar.	T = Inishturk.
Cu = Curraun Achill.	W = Westport.
D = Doo Lough and Delphi.	

Curraun Achill includes the whole of the eastern side of Achill Sound. We have placed Clare Island first in each case, so that the species occurring in the island can be at once picked out.

In the complete list of species from the district, which now follows, we have adopted the arrangement and nomenclature of Fowler and Sharp's "Catalogue of British Coleoptera" (1893).

Some critical notes on new British species of *Gabrius* and *Parnus* have recently appeared in the "Entomologists' Monthly Magazine." The available material from the Clare Island district is not sufficient to permit a satisfactory treatment of these genera in the present paper.

In the more extended notes on certain species of special interest which follow, we have made use of the following initial to indicate the captors of the specimens:—

R. E. D. . . Hon. R. E. Dillon.	C. M. . . Claude Morley.
N. H. F. . . Nevin H. Foster.	R. Ll. P. . . R. Lloyd Praeger.
J. N. H. . . J. N. Halbert.	W. E. S. . . W. E. Sharp.
W. F. J. . . W. F. Johnson.	J. J. W. . . J. J. Walker.
E. S. J. . . Mrs. Johnson.	L. B. W. . . L. H. Bonaparte Wyse.
H. W. K. . . H. Wallis Kew.	R. W. . . R. Welch.

## LIST OF SPECIES.

<i>Cicindela campestris</i> L.—C, A, B, M.	<i>Elaphrus riparius</i> L.—M, W.
<i>Cychrus rostratus</i> L.—C, A, P, R.	<i>cupreus</i> Duft.—C, B, L, M, W.
<i>Carabus catenulatus</i> Scop.—C, A, L, P, R.	<i>Loricera pilicornis</i> F.—C, A, M, P, W.
<i>nemorialis</i> Müll.—A, P.	<i>Clivina fossor</i> L.—C, A, B.
<i>clathratus</i> L.—C, A, B, D, L, T, W.	<i>Dyschirius impunctipennis</i> Daws.—A, M.
<i>granulatus</i> L.—C, A, Cb, Cn.	<i>politus</i> Dej.—A.
<i>v. interstitialis</i> Duft.—C, A.	<i>salinus</i> Schaum.—M.
<i>Notiophilus biguttatus</i> F.—C, A, Cn, L. P.	<i>globosus</i> Herbst.—A, B, Bc, W.
<i>substriatus</i> Wat.—A.	<i>Brosicus cephalotes</i> L.—C, A, Bm, Cn.
<i>aquaticus</i> L.—C, A, B, P, W.	<i>Panagaeus crux-major</i> L.—Cb.
<i>palustris</i> Duft.—C, A, M, P.	<i>Badister bipustulatus</i> F.—A, Bc.
<i>Leistus montanus</i> Steph.—A, P.	<i>Stenolopus vespertinus</i> Panz.—B.
<i>fulvibarbis</i> Dej.—A, C.	<i>Bradycellus cognatus</i> Gyll.—A, L.
<i>Nebria brevicollis</i> F.—C, A, L, W.	<i>distinctus</i> Dej.—W.
<i>Gyllenhali</i> Sch.—A, P, R, W.	<i>Verbasci</i> Duft.—A, W.
<i>Blethisa multipunctata</i> L.—Cb.	<i>Harpalus puncticollis</i> Payk.—W.
	<i>ruficornis</i> F.—C, A, B, L, W.
	<i>aeneus</i> F.—C, A.

- Harpalus latus* L.—C, A, B, D, W.  
*Dichrotrichus pubescens* Payk.—A, M.  
*Stomis pumicatus* Panz.—W.  
*Pterostichus cupreus* L.—C, L.  
     *versicolor* Sturm.—C, A, B.  
     *madidus* F.—A, L, M, W.  
     *vitreus* Dej.—P.  
     *niger* Schall.—C, B.  
     *vulgaris* L.—C, A, L, R.  
     *nigrita* F.—C, A, Cb, L, W.  
     *gracilis* Dej.—B.  
     *minor* Gyll.—A, Bc.  
     *strenuus* Panz.—C, A, L, W.  
     *diligens* Sturm.—L.  
     *vernalis* Gyll.—L, M, W.  
     *striola* F.—C, A, Cn, R.  
*Amara fulva* Dej.—A, M.  
     *apricaria* Sturm.—W.  
     *spinipes auct.*—C, A, P.  
     *bifrons* Gyll.—Cn.  
     *ovata* F.—A, M.  
     *familiaris* Duft.—A.  
     *lucida* Duft.—A.  
     *trivialis* Gyll.—A, Bc, Cn.  
     *communis* Panz.—C, A, L, W.  
     *plebeia* Gyll.—C, L.  
*Calathus cisteloides* Panz.—C, A, Bm, L.  
     *mollis* Marsh.—C, A, Cn, L, M.  
     *melanocephalus* L.—C, A, L, W.  
         *v. nubigena* Hal.—C, A, B.  
*Taphria nivalis* Panz.—C, L, P, W.  
*Pristonychus terricola* Herbst.—W.  
*Laemostenus complanatus* Dej.—W.  
*Anchomenus angusticollis* F.—W.  
     *dorsalis* Müll.—C, A, Cb.  
     *albipes* F.—C, A, B.  
     *marginatus* L.—C, A, B, L, W.  
     *parumpunctatus* F.—C, A, L, W.  
     *atratus* Duft.—C.  
     *viduus* Panz.—Cb, P,  
     *Anchomenus viduus v. moestus* Duft.—Cb, W.  
         *gracilis* Gyll.—B, L, W.  
         *piceus* L.—A, W.  
*Olisthopus rotundatus* Payk.—C, A, L, M, W.  
*Bembidium rufescens* Guér.—Cn, W.  
     *Mannerheimi* Sahl.—A, Bc.  
     *aeneum* Germ.—Cn.  
     *doris* Panz.—W.  
     *normannum* Dej.—W.  
     *lampros* Herbst.—C, A, M.  
     *decorum* Panz.—Bc.  
     *bruxellense* Wesm.—C, Bc.  
     *saxatile* Gyll.—C, A, B.  
     *littorale* Ol.—C, A, B, M, W.  
     *pallidipenne* Ill.—C, A, M.  
     *bipunctatum* L.—C, A, B.  
     *punctulatum* Drap.—A.  
*Aëpus Robinii* Lab.—C, B'sod.  
*Trechus minutus* F.—C, A.  
     *v. obtusus* Er.—C, P.  
*Patrobus assimilis* Chaud.—C, P.  
*Cymindis vaporariorum* L.—A, P.  
*Cyclonotum orbiculare* F.—A, W.  
*Sphaeridium scarabaeoides* F.—C, A, Cn, W.  
     *bipustulatum* F.—L.  
*Cereyon littoralis* Gyll.—C, A, M, W.  
     *depressus* Steph.—C, Cn, M.  
     *haemorrhoidalis* Herbst.—C, A, Cn, L.  
     *obsoletus* Gyll.—Cn.  
     *flavipes* F.—C, A, L, W.  
     *melanocephalus* L.—C, Bc, L,  
     *unipunctatus* L.—C.  
     *quisquilius* L.—C.  
     *anal* Payk.—C, W.  
*Megasternum boletophagum* Marsh.—C.  
*Cryptopleurum atomarium* F.—B, W.  
*Aleochara fuscipes* F.—D.

- Aleochara brevipennis* Grav.—C, S, L, D.  
*bipunctata* Ol.—Cb.  
*lanuginosa* Grav.—C, A, L, W.  
*moesta* Grav.—A.  
*succicola* Thoms.—C, A, W.  
*nitida* Grav.—A.  
*morion* Grav.—W.  
*grisea* Kr.—A, Cn.  
*algarum* Faur.—Cn.  
*obscura* Er.—A.  
*Oxyopoda opaca* Grav.—M.  
*longiusecula* Er.—W.  
*Astilbus canaliculatus* F.—C, A.  
*Aliantia incana* Er.—P, W.  
*Homalota currax* Kr.—Be.  
*cambrica* Woll.—Be.  
*gregaria* Er.—A.  
*elongatula* Grav.—L.  
*volans* Scrib.—A, L, W.  
*vestita* Grav.—A, Cn.  
*oblongiusecula* Sharp.—C.  
*vicina* Steph.—P.  
*halobrectha* Sharp.—A, W.  
*puncticeps* Thoms.—A.  
*monticola* Thoms.—W.  
*circellaris* Grav.—C, A, Cn.  
*gemina* Er.—Cb, W.  
*analis* Grav.—C, A, P, W.  
*aquatica* Thoms.—Cb, D.  
*mortuorum* Thoms.—P.  
*nigra* Kr.—W.  
*atramentaria* Gyll.—C, A, L, M.  
*longicornis* Grav.—B, M.  
*aterrima*, Grav.—C, P.  
*laticollis* Steph.—Cb.  
*fungi* Grav.—A, Cb, W.  
*v. clientula* Er.—A, W.  
*Xenusa sulcata* Kies.—A.  
*Falagria obscura* Grav.—A.  
*Autalia rivularis* Grav.—Cb, W.  
*Encephalus complicans* Westw.—W.  
*Myllaena gracilis* Matth.—W.  
*Conosoma lividum* Er.—C.  
*Tachyporus obtusus* L.—L.  
*v. nitidicollis* Steph.—C, A, Cn, W.  
*solutus* Er.—W.  
*chrysomelinus* L.—A, Be.  
*humerosus* Er.—C.  
*tersus* Er.—A, W.  
*hypnorum* F.—C, A, Cn, L.  
*v. meridionalis* Fairm.—C.  
*pusillus* Grav.—C.  
*Tachinus proximus* Kr.—C.  
*rufipes* L.—C, A, M, W.  
*marginellus* F.—L, W.  
*laticollis* Grav.—W.  
*Megaconus cingulatus* Mann.—A.  
*Mycetoporus lepidus* Grav.—L.  
*Quedius mesomelinus* Marsh.—C, P, W.  
*fulgidus* F.—W.  
*puncticollis* Thoms.—W.  
*cinctus* Payk.—C, A, M.  
*fuliginosus* Grav.—C, A.  
*tristis* Grav.—C, A.  
*molochinus* Grav.—C, B.  
*picipes* Mann.—C.  
*rufipes* Grav.—C, A, L.  
*attenuatus* Gyll.—C, L.  
*semiaeneus* Steph.—C, A, L, M.  
*boops* Grav.—C, A, P.  
*Creophilus maxillosus* L.—C, A, B, L, M, S.  
*Leistotrophus nebulosus* F.—A.  
*murinus* L.—C, A, Bm.  
*Staphylinus pubescens* De G.—C, A.  
*erythropterus* L.—C, A, L, W.  
*caesareus* Ceder.—C, A.  
*Ocypus olens* Müll.—C, A, Cn, L.  
*cupreus* Rossi.—C, A, B, L.  
*ater* Grav.—C, Bm, L, W.  
*morio* Grav.—C.

- Philonthus splendens* F.—C, M.  
*intermedius* Boisd.—C, A, M, W.  
*laminatus* Creutz.—C, A, L, M.  
*aeneus* Rossi.—M.  
*proximus* Kr.—C, A, B, M, W.  
*addendus* Sharp.—M.  
*politus* F.—C, A, L, P, W.  
*varius* Gyll.—C, A, M, W.  
*marginatus* F.—C, A, D, L.  
*albipes* Grav.—C, L.  
*fimetarius* Grav.—C, A, D, W.  
*sordidus* Grav.—A, Cb.  
*ebenus* Grav.—C, A, Cb.  
*umbratilis* Grav.—C, L.  
*longicornis* Steph.—D.  
*varians* Payk.—C, Cb, D, M.  
*quisquiliarius* Gyll.—C.  
*nigrita* Nord.—L.  
*micans* Grav.—L.  
*nigritulus* Grav.—A.  
*trossulus* Nord.—A.  
*puella* Nord.—D.  
*Cafius xantholoma* Grav.—A, M.  
*fucicola* Curt.—A.  
*Xantholinus glabratus* Grav.—C, A,  
 Cn, W.  
*punctulatus* Payk.—C, A, Cn.  
*ochraceus* Gyll.—C, A, Bc, Cb.  
*tricolor* F.—W.  
*linearis* Ol.—C, A, B, L.  
*longiventris* Heer.—Cn, L.  
*Baptolinus alternans* Grav.—W.  
*Othius fulvipennis* F.—A, P.  
*laeviusculus* Steph.—C, A, M.  
*melanocephalus* Grav.—A.  
*myrmecophilus* Kies.—C, A, W.  
*Lathrobium boreale* Hoch.—C, A, W.  
*fulvipenne* Grav.—C, A, P.  
*brunnipes* F.—C, A, Cb.  
*quadratum* Payk.—Cb, W.  
*terminatum* Grav.  
*v. immaculatum* Fowler.—D.  
*Lathrobium multipunctum* Grav.—C.  
*Stilicium affinis* Er.—A, P.  
*Evaesthetus laeviusculus* Mann.—D.  
*Stenus Juno* F.—A, Cb, L.  
*ater* Mann.—Cb.  
*speculator* Er.—A.  
*lustrator* Er.—A.  
*buphthalmus* Grav.—A, L.  
*canaliculatus* Gyll.—W.  
*nitens* Steph.—W.  
*declaratus* Er.—A, W.  
*crassus* Steph.—Bc, W.  
*v. littoralis* Thoms.—Bc, W.  
*brunnipes* Steph.—C, A, Cb.  
*ossium* Steph.—A.  
*geniculatus* Grav.—P.  
*impressus* Germ.—C, A, Bc.  
*pubescens* Steph.—Cb.  
*pallitarsis* Steph.—C, Cb, L, W.  
*nitidiusculus* Steph.—L, W.  
*picipes* Steph.—W.  
*cicindeloides* Grav.—A.  
*similis* Herbst.—C, Bc, Cb, W.  
*tarsalis* Ljun.—C, L, W.  
*Bledius spectabilis* Kr.—M.  
*arenarius* Payk.—C, A, M.  
*pallipes* Grav.—A.  
*longulus* Er.—A, L.  
*Platystethus arenarius* Fourc.—C, A,  
 W.  
*Oxytelus rugosus* Grav.—A, Cn, Cb.  
*laqueatus* Marsh.—C.  
*sculpturatus* Grav.—W.  
*maritimus* Thoms.—C, A.  
*complanatus* Er.—W.  
*tetracarinus* Block.—A.  
*Trogophloeus corticeus* Grav.—Cb.  
*Lesteva pubescens* Mann.—L.  
*sicula* Er.—A.  
*punctata* Er.—C, D.  
*Olophrum piceum* Gyll.—A.  
*Arpedium brachypterum* Grav.—A.

- Micralymma brevipenne* Gyll.—C, A, Cn.  
*Omalius rivulare* Payk.—C, A, Bc, W.  
     *laeviusculum* Gyll.—A, W.  
     *riparium* Thoms.—C, A.  
     *excavatatum* Steph.—W.  
*Megarthus depressus* Lac.—C, A.  
*Pselaphus Heisei* Herbst.—C.  
*Seydmaenus collaris* Müll.—C.  
*Agathidium nigripenne* Kug.—W.  
     *laevigatum* Fr.—C.  
*Anisotoma ovalis* Schmidt.—A.  
     *calcarata* Er.—A.  
*Necrophorus humator* F.—A, Cn.  
     *mortuorum* F.—A.  
*Necrodes littoralis* L.—D.  
*Silpha opaca* L.—A.  
     *rugosa* L.—D.  
     *subrotundata* Steph.—C, A, B, L, W.  
*Cholera Watsoni* Spence.—Bills.  
*Hister neglectus* Germ.—W.  
     *carbonarius* Ill.—W.  
*Saprinus aeneus* F.—Cn.  
*Coccinella x-punctata* L.—C, A, M, W.  
     *xi-punctata* L.—C, A, B, L.  
*Halyzia xvi-guttata* L.—W.  
     *xiv-guttata* L.—C, M, W.  
*Coccidula rufa* Herbst.—C, Bc, L, W.  
*Micropeplus porcatus* Payk.—C.  
*Brachypterus pubescens* Er.—C, A, W.  
     *urticae* F.—C, A, W.  
*Cercus pedicularius* L.—C, W.  
*Epuraea aestiva* L.—L, M.  
     *deleta* Er.—W.  
*Meligethes aeneus* F.—W.  
*Rhizophagus cribratus* Gyll.—A, W.  
*Lathridius lardarius* De Geer.—A, Ch.  
*Coninomus nodifer* Westw.—W.  
*Enicmus transversus* Ol.—W.  
     *denticulata* Gyll.—W.  
*Corticaria elongata* Humm.—W.  
*Melanophthalma gibbosa* Herbst.—C, W.  
*Telmatophilus Caricis* Ol.—Bc, W.  
     *Typhae* Fall.—Cb, W.  
*Antherophagus pallens* Gyll.—C.  
*Cryptophagus saginatus* Sturm.  
     *scanicus* L.—C.  
     *v. patruelis* Sturm.—A, M, W.  
     *dentatus* Herbst.—W, M.  
     *affinis* Sturm.—W.  
*Micrambe vini* Panz.—C, W.  
*Atomaria fuscata* Schön.—W.  
     *atricapilla* Steph.—C, W.  
     *basalis* Er.—Cb.  
     *mesomelas* Herbst.—W.  
     *analis* Er.—B.  
*Ephistemus globosus* Waltl.—C.  
     *gyrinoides* Marsh.—C, W.  
*Byturus tomentosus* F.—B.  
*Byrrhus pilula* L.—C, A, B, P, W.  
     *fasciatus* F.—P.  
*Cytillus varius* F.—C, A, B, L, W.  
*Simplocaria semistriata* F.—A.  
*Elmis parallelipedus* Mull.—C.  
*Parnus prolifericornis* F.  
*Aphodius fossor* L.—C, L, W.  
     *foetens* F.—Cb.  
     *finetarius* L.—C, A, Cn, M.  
     *scybalarius* F.—C, Cn, M.  
     *ater*—C, A, Cn, L.  
     *nitidulus* F.—C.  
     *sordidus* F.—A, M.  
     *rufescens* F.—A, M, L, W.  
     *lapponum* Gyll.—C, Cn, M.  
     *putridus* Sturm.—C, A, Cn.  
     *punctato-sulcatus* Stm.—C, A, L.  
     *prodromus* Brahm.—C, M.  
     *contaminatus* Herbst.—C.  
     *rufipes* L.—C, Cn, L.  
     *depressus* Kug.—C, A, M, L, R.

- Aegialia arenaria* F.—C, A, Cn.  
*Geotrupes spiniger* Marsh.—C.  
     *stercorarius* L.—C, A.  
     *sylvaticus* Panz.—C, A, W.  
*Serica brunnea* L.—C, A, B, L, W.  
*Melolontha vulgaris* F.—Bc, Cb.  
*Phyllopertha horticola* L.—Cn, Bm,  
     B, W.  
*Cryptohypnus riparius* F.—C, A, M,  
     B.  
*Athous niger* L.—C, A, B, W.  
     *haemorrhoidalis* F.—C, A, B, Cn.  
*Adrastus limbatus* F.—A.  
*Agriotes obscurus* L.—C, A, L, W.  
     *lineatus* L.—C, B, L.  
*Dolopius marginatus* L.—A, Bc.  
*Corymbites cupreus* F.—C, A, P.  
     *v. aeruginosus* F.—A, B, P.  
     *tessellatus* F.—C, A, L, W.  
     *quercus* Gyll.—C, A.  
     *v. ochropterus* Steph.—C, A,  
     W.  
*Dascillus cervinus* L.—C, Bc.  
*Helodes minuta* L.—A, B, Bc, W.  
     *marginata* F.—C, A.  
*Microcara livida* F.—Bc, W.  
*Cyphon coarctatus* Payk.—C, A, Cn,  
     W.  
     *nitidulus* Thoms.—C, Bc, W.  
     *variabilis* Thunb.—A, Bn, W.  
     *pallidulus* Boh.—C, A, L.  
     *Padi* L.—W.  
*Hydrocyphon deflexicollis* Müll.—Bc.  
*Scirtes hemisphaericus* L.—L.  
*Telephorus nigricans* v. *discoideus*  
     Steph.—Bc.  
     *litratus* F.—C, A.  
     *bicolor* F.—C, A, B, W.  
     *paludosus* Fall.—Cn.  
     *flavilabris* Fall.—C, A, L, W.  
*Rhagonycha fulva* Scop.—Bc, W.  
     *limbata* Thoms.—C.  
*Rhagonycha pallida* F.—C, A, Bc.  
*Malthinus punctatus* Fourc.—Bc.  
*Malthodes marginatus* Latr.—W.  
     *mysticus* Kies.—Bc.  
     *flavoguttatus* Kies.—P.  
     *pellucidus* Kies.—Bc.  
     *atomus* Thoms.—W.  
*Niptus crenatus* F.—C.  
*Priobium castaneum* F.—Bc.  
*Cis nitidus* Herbst.—W.  
*Octotemnus glabriculus* Gyll.—A.  
*Grammoptera ruficornis* F.—A.  
*Donacia crassipes* F.—L.  
     *versicolore* Brahm.—Cb, L.  
     *dentipes* F.—W.  
     *limbata* Panz.—Bc.  
     *thalassina* Germ.—C, L.  
     *impressa* Payk.—Bc, Cb, L, W.  
     *simplex* F.—C, Bc, W.  
     *vulgaris* Zsch.—A, L, W.  
     *clavipes* F.—B, Bc, L.  
     *sericea* L.—C, A, Cb, W.  
     *discolor* Panz.—C, A, L, W.  
*Lema lichenis* Voet.—Cb, L, W.  
*Cryptocephalus aureolus* Suffr.—B, T.  
*Chrysomela Banksi* F.—A.  
     *staphylea* L.—R.  
     *polita* L.—C, W.  
*Gastroidea viridula* De G.—C, Cn, M,  
     W.  
*Phaedon armoraciae* L.—A, W.  
*Phyllodecta vulgatissima* L.—W.  
     *marginella* L.—C, B, M, W.  
*Prasocuris Phellandrii* L.—C, W.  
*Lochmaea Capreae* L.—L.  
     *suturalis* Thoms.—C, A, M.  
*Galerucella Sagittariae* Gyll.—A, L,  
     W.  
     *lineola* F.—C, A, W.  
     *calmariensis* L.—C, A, M, L.  
     *tenella* L.—Cb, L, W.  
*Longitarsus holsaticus* L.—C, L.

- Longitarsus luridus* Scop.—C, A.  
     *melanocephalus* All.—A.  
     *pusillus* Gyll.—C.  
     *gracilis* Kuts.—C.  
     *laevis* Duft.—C.  
*Haltica palustris* Weise.—W.  
*Phyllotreta undulata* Kuts.—A, Cb,  
     L, W.  
*Aphthona lutescens* Gyll.—C, Bc, W.  
     *nonstriata* Goeze.—C, Bb, W.  
         *v. aenescens* Weise.—Bc, W.  
     *atrata* All.—Cb, W.  
*Sphaeroderma testaceum* F.—C.  
     *Cardui* Gyll.—C, A, L, W.  
*Crepidodera transversa* Marsh.—C, A,  
     L.  
     *ferruginea*, Scop.—C, A, L, W.  
     *fulvicornis* Fab.—C, B, L.  
*Plectroscelis concinna* Marsh.—A, W.  
*Psylliodes chrysocephala* L.—A, Cn.  
     *cuprea* Koch.—A.  
     *affinis* Payk.—C, L.  
*Cassida nobilis* L.—W.  
     *flaveola* Thunb.—C, A, W.  
     *equestris* F.—W.  
     *viridis* F.—A.  
*Helops striatus* Fourc.—B.  
*Salpingus ater* Payk.—P.  
*Rhinosimus ruficollis* L.—W.  
     *planirostris* F.—W.  
*Apion cruentatum* Walt.—C, Bc, W.  
     *haematodes* Kirby.—C.  
     *viciae* Payk.—C, Bc, W.  
     *apricans* Herbst.—C, A, L, W.  
     *dichroum* Bedel.—C, A, L, W.  
     *Carduorum* Kirby.—C, W.  
     *virens* Herbst.—W.  
     *aethiops* Herbst.—C, A.  
     *Ervi* Kirby.—B, Bc.  
     *scutellare* Kirby.—W.  
     *Loti* Kirby.—W.  
     *violaceum* Kirby.—A, Bc, L, W.  
*Apion Hydrolapathi* Kirby.—C, Bc, W.  
     *humile* Germ.—C, Bc, Cb, W.  
*Otiorrhynchus atroapterus* De G.—C,  
     A, B, M.  
     *blandus* Gyll.—C, A, B, L, R, W,  
         Bills.  
     *maurus* Gyll.—A, P.  
     *ligneus* Ol.—A, Bc.  
     *picipes* F.—C, A, M, W.  
     *sulcatus* F.—A, L.  
     *rugifrons* Gyll.—C, A, L, W.  
*Strophosomus Coryli* F.—Bc, Cb, W.  
*Sciaphilus muricatus* F.—Bc, W.  
*Liophiloeus nubilus* F.—Cn.  
*Polydrusus tereticollis* De G.—Bc.  
     *pterygomalis* Boh.—Bc.  
     *cervinus* L.—Bc, Cb.  
*Phyllobius oblongus* L.—W.  
     *Pyri* L.—Cb.  
     *viridiaeris* Laich.—Cb.  
*Philopedon geminatus* F.—C, A, M,  
     L, T.  
*Barynotus Schönherrii* Zett.—C, A, Cn.  
*Alophus triguttatus* F.—C.  
*Sitones griseus* F.—Cn.  
     *regensteinensis* Herbst.—C.  
     *lineellus* Gyll.—A, Cn.  
     *tibialis* Herbst.—B.  
     *flavescens* Marsh.—C, A, M, W.  
     *puncticollis* Steph.—A, W.  
     *lineatus* L.—A, Bc.  
     *sulcifrons* Thunb.—C, Bc.  
*Hypera Rumicis* L.—C, A, Cb, W.  
     *Polygoni* L.—A.  
     *Plantaginis* De G.—C, Cn.  
     *trilineata* Marsh.—L.  
     *nigrirostris* F.—A, Cb, L, W.  
         *v. ononidis* Stev.—L.  
*Liosoma ovatum* Clairr.—A.  
     *oblongulum* Boh.—W.  
*Orchestes Rusci* Herbst.—Bc.  
     *Salicis* L.—C, L, W.



- Rhamphus flavicornis *Clairv.*—C, W.  
 Grypidius Equiseti *F.*—L.  
 Erirrhinus acridulus *L.*—C, A, Bc, W.  
 Dorytomus maculatus *Marsh.*—B, Bc.  
 Bagous Alismatis *Marsh.*—Cb, W.  
 Gymnetron Beccabungae *L.*—L.  
 Mecinus pyraister.—Bc.  
 Anthonomus Rubi *Herbst.*—L.  
     Comari *Crotch.*—W.  
     Lythri *F.*—C, W.  
 Coeliodes quadrimaculatus *L.*—C, Cb,  
     W.  
 Poophagus Sisymbrii *F.*—Cb.  
 Ceuthorrhynchus assimilis *Payk.*—L.  
     Ericae *Gyll.*—B.  
     quadridens *Panz.*—P.  
 Ceuthorrhynchus pollinarius *Forst.*—  
     C, W.  
     pleurostigma *Marsh.*—A.  
     litura *F.*—L. W.  
 Ceuthorrhynchidius troglodytes *F.*—  
     C, A.  
     Dawsoni *Bris.*—C.  
 Rhinoncus pericarpus *L.*—C, A, Cn.  
 Eubrychius velatus *Beck.*—Cb, W.  
 Phytobius quadrituberculatus *F.*—Cn,  
     W.  
     canaliculatus *Fahr.*—W.  
 Limnobaris pilistriata *Steph.*—W.  
 Balaninus salicivorus *Payk.*—A, W.  
 Rhopalomesites Tardy *Curt.*—Cb, W.  
 Trypodendron domesticum *L.*—W.

## NOTES ON THE LIST.

**Carabus clathratus** *L.*—Clare Island: Croaghmore and roadside at Toormore, June (J. N. H.); under stones on turf wall near lighthouse (C. M.); under stones in boggy ground west of lighthouse road and in Toormore, June and September (W. F. J.). Achill: heathery banks of Sraheens Lough; under stones on low walls in N.E. Achill, and on sandhills (J. N. H.); Glendarary, and bogs in Curraun Achill, on wet sphagnum, June (W. F. J.); Dugort (L. B. W.). Louisburgh: on bridle path at Laghtaeigher, July (J. N. H.). Doo Lough, August (L. B. W.). Inishturk (R. Ll. P.). Inishbofin (G. P. F.). Westport (J. J. W.).

This handsome ground-beetle is one of the most interesting insects of the district, and the foregoing notes give a good idea of the variety of environment in which it occurs. In Ireland generally it is found in the north, west, and south, with one locality (Sugarloaf) in Co. Wicklow.

**C. granulatus** *L.* var. **interstitialis** *Duft.*—Clare Island and Curraun (J. N. H. and W. F. J.). Achill (L. B. W.).

Some specimens from the above localities are referable to this variety, which has the raised elytral ridges greatly reduced, and the granules not so strong as in the type, giving it an appearance somewhat resembling *C. arvensis*. One example from Croaghmore is identical with continental types of the variety from the Tyrol. It is of a dull black colour, and the central ridge of each group of elytral ridges is only very slightly stronger than the others. Bronze-coloured forms of the variety also occur. This

form has also been found at Newtownhamilton (W. F. J.), Waterville, Parknasilla, Glengariff, and Caragh Lake in Ireland, and at Stornoway and Loch Maree in Scotland (G. C. Champion *in litt.*). Mr. Donisthorpe also notes it from South Kerry (Irish Naturalist, xii). So far as we are aware this variety has not been previously recorded from the British Islands. The type form is common throughout the district.

**Leistus montanus** Steph.—Slievemore (J. N. H.). Croaghpatrick (Dawson, Geod. Brit.).

This local alpine species was taken in April on the summit of Slievemore, where it was very difficult to catch among the heather. It is found in North Britain and the mountains of western Europe (Pyrenees, Switzerland, Tyrol).

**Nebria Gyllenhali** Sch.—Achill Island and Slievemore (J. N. H.). Croaghpatrick and Mweelrea (L. B. W.).

Also an alpine insect, though often met with at low altitudes in Ireland, where it is widely distributed. Occurs throughout the northern Palaearctic region, and on the mountains of central Europe.

**Blethisa multipunctata** L.—Castlebar Lough (J. N. H.).

A few specimens of this uncommon beetle were obtained under stones on the muddy margin of the lake in June; a northern species, being found in northern and central Europe, Siberia, and North America.

**Notiophilus palustris** Duft.—Achill Island.

A form was taken with dark tibiae, which may be referable to *N. hypovrita* Spaeth (*vide* Ent. Mo. Mag., 1908, p. 103).

**Dyschirius impunctipennis** Daws.—Keel and Mulranny (W. F. J.). A somewhat local species in Ireland, the other records for it being from Donegal, Antrim, Sligo, and Kerry. It was taken in company with *Bledius arenarius*. These specimens are referable to a variety in which the striae of the elytra are quite distinctly punctured.

**D. politus** Dej.—Keel (W. F. J.), taken in company with the preceding. It has been found in Ireland on both the east and west coasts.

**D. salinus** Schaum.—Mulranny (W. F. J.). Though pretty widely distributed in Ireland, there is no previous record of this species from the west coast.

**Panagaeus cruz-major** L.—Castlebar (W. E. S., *vide* Irish Naturalist, xix, p. 245). Taken on the lough shore by Mr. W. E. Sharp.

This is one of the most local of Irish insects, and the present is the second record of its occurrence in Ireland, the previous one being Mr. F. Neale's capture of it on the shore of Fin Lough, Co. Clare. In England it is found in the east and south.

- Stenolophus vespertinus** Panz.—Inishbofin (R. E. D.). This species has a limited range in Ireland, occurring only in the south and west.
- Pterostichus vitreus** Dej.—Croaghpatrick (W. E. S.). Taken on the summit by Mr. W. E. Sharp. It is widely distributed in Ireland on high ground. A northern species ranging through northern Europe, Siberia, and North America.
- P. minor** Gyll.—Achill Island at Sraheens Lough (W. F. J.). Belclare (N. H. F.). Though by no means common, it is widely distributed in Ireland.
- Amara lucida** Duft.—Achill Island at Dugort (W. F. J.). Taken in June in flood refuse which had been carried down by a little stream to the sandy beach. Rare; the other Irish records are from Donegal, Down, Armagh, and Dublin.
- Calathus melanocephalus** L. var. **nubigena** Hal.—Clare Island on Knocknaveen, Achill Island at Keel and Dugort (W. F. J.). Slievemore (J. N. H.). Inishbofin (R. E. D.). This alpine variety is found throughout Ireland both on mountain and plain; the specimens from lower ground being not so markedly dark as those from a greater altitude.
- Pristonychus terricola** Herbst.—Westport (J. N. H.). Taken under a large hencoop in a garden. Its first recorded occurrence in the west of Ireland.
- Laemostenus complanatus** Dej.—Westport. Four examples found under a stone at the Quay by Mr. Bonaparte Wyse. Probably introduced through commerce.
- Anchomenus parumpunctatus** F. ab. **tibialis** Heer.—Clare Island (W. F. J.). An aberration of a dull pitch-black colour. It has also been taken in Donegal at Rathmullan (J. J. W.).
- A. atratus** Duft.—Clare Island (W. F. J.). Taken under stones beside the road to the lighthouse. Rare in Ireland, the other records being from Donegal, Derry, Louth, Wexford, Cork, and Kerry.
- Bembidium lampros** Herbst. var.—Mulranny (W. F. J.). Taken on the beach among stones. This beautiful variety is of a steel-blue colour, and the striae of the elytra are less strongly punctured than in the type. Johnson has taken it at Ardara, Co. Donegal, among turf. Mr. G. Champion informs us he has a somewhat similar variety from Chobham in Surrey.
- B. pallidipenne** Ill.—Clare Island, Keel, and Mulranny (W. F. J.). Taken on sands in company with *Bledius arenarius*.
- Aëpus Robinii** Lab.—Clare Island (H. W. K.). Taken in crevices of rocks between tide-marks in June, 1910. Mr. Stanley Kemp took this species at Blacksod in September. It is very local, the only other Irish records

- being from Cork and Kerry. It is possible, however, that its small size and habitat cause it to be passed over. *Aëpus marinus* Ström., and *Cillenus lateralis* Sam. have been taken at Ballynakill just outside the district.
- Patrobis assimilis** Chaud.—Clare Island, on summit of Croaghmore (W. F. J.). Croaghpatrick (J. N. H.). Mweelrea (L. B. W.). It is abundant on the summit of Croaghpatrick. A mountain species with a northern range in Europe.
- Cymindis vaporariorum** L.—Achill Island on Minnaun cliffs (J. N. H.). Croaghpatrick (W. E. S.). The only other Irish record is from the Donegal mountains. It is remarkable that this species should in Ireland have occurred only on the west coast. In Great Britain it is found in suitable localities from Staffordshire to the Highlands. It is a mountain insect. Those met with in Achill were very difficult to capture among the long heather. It is distributed throughout the northern Palaearctic region and the mountainous districts of central Europe.
- Cercyon obsoletus** Gyll.—Curraun Achill (E. S. J.), taken on the sandhills at southern entrance of Achill Sound *in stereore bovino*. Though it has a wide range in Ireland, being recorded from Donegal, Antrim, Armagh, Galway, Dublin and Waterford, yet it is by no means common.
- Aleochara brevipennis** Grav.—Clare Island (W. F. J.). Summit of Croaghpatrick and Louisburgh (J. N. H.). This species is much more common in the south and west than in the rest of Ireland. In Great Britain it is not common, though widely distributed, and in France it is moderately common, being found there in forests among moss in which it hibernates.
- A. moesta** Grav.—Achill Island (J. N. H.). Taken under decaying seaweed just above tide-mark on the coast near Sruhill Lough near the northern entrance of Achill Sound. This is the only Irish record for this species. In Great Britain it is somewhat rare, while elsewhere it occurs not only in Europe, but extends its range to Siberia and North America.
- Alianta incana** Er.—Westport and Croaghpatrick (J. N. H.). This is a rare species in Ireland, for there are but two other Irish records, from Armagh and Fermanagh.
- Homalota cambrica** Woll.—Belclare (J. N. H.). Taken among sandy gravel at the Owenwee River. Decidedly local in Ireland, having only been taken in Donegal and Wicklow.
- H. oblongiuscula** Sharp.—Clare Island, June (J. N. H.). Very rare, the only other Irish locality being the summit of Slieve Donard, in Co. Down,

where it was taken first by Mr. G. C. Champion, and subsequently by Halbert.

- Homalota halobrectha** Sharp.—Achill and Westport (J. N. H.). Dr. D. Sharp thinks that one of the Westport specimens is “var. *minor* immature.” The only other Irish records are Magilligan sands and Kenmare, though it also occurs at Baldoyle on the Dublin coast. It is found on the sea-coast over the greater part of Europe.
- H. monticola** Thoms.—Westport (J. N. H.). A large form of this beetle was taken in the demesne in July. It had been taken previously at Dublin and Waterford.
- H. gemina** Er.—Westport and Castlebar (J. N. H.). Taken by sweeping in marshy places on the margin of lakes. There is only one other record for it in Ireland, viz., Portmore Lough, Co. Antrim, where it was taken by Halbert in 1910.
- H. mortuorum** Thoms.—Croaghpatrick (J. N. H.). A few specimens were taken on the summit in July. The only other known Irish locality is Slieve Donard, where it was taken in August, 1902, by Halbert, but not hitherto recorded.
- Xenusa sulcata** Kies.—Achill (J. N. H.). The other Irish records for this uncommon Irish species are Shane’s Castle, Co. Antrim, the Dublin coast, and Kenmare. It is found abroad on the sea-coast of northern Europe.
- Myllaena gracilis** Matth.—Westport (J. N. H.). Two examples were taken in moss. This species has not been previously recorded from Ireland, and in England it appears to be confined to the midlands.
- Tachyporus tersus** Er.—Achill and Westport (J. N. H.). The range of this species in Ireland, though widespread, is little known. Hitherto it has only been recorded from Co. Sligo.
- Tachinus proximus** Kr.—Clare Island (W. F. J.). Taken on the summit of Croaghmore in September, 1910. This is an addition to the known Irish beetle-fauna. It is found in high and northern districts, and according to Ganglbauer is not rare in the alpine regions of Europe.
- Megacronus cingulatus** Mann. (W. F. J.). A single specimen (which has the elytra suffused with black) was taken in June, 1910, on the sandy shore near Glendarary.

The range of this species in Ireland is west and south, from Donegal round to Waterford.

- Leistotrophus nebulosus** F.—Achill (W. F. J.). Taken at Sraheens Lough.

This species has a rather restricted range in Ireland, not being recorded from the south or south-west. Previous records are from Antrim, Down,

Armagh, Fermanagh, Meath, and Roscommon, so that the present is its most westerly record.

**Philonthus addendus** Sharp.—Mulranny (W. F. J.). Taken on the beach in June, 1910. This is its first recorded occurrence in the west of Ireland, though otherwise it is widely distributed through the country.

**P. longicornis** Steph.—Clare Island (W. F. J.). Doo Lough (L. B. W.) Westport (J. N. H.).

Like the preceding, this species has not been previously recorded from the west of Ireland, nor does it seem to have been met with to the south of Dublin.

**P. nigrita** Nord.—Castlebar Lough (J. N. H.). A remarkable form of this species was met with on the shores of this lake. It is smaller than the type, and has the elytra and abdomen more finely punctured. Dr. D. Sharp, to whom we have submitted specimens, supposes that it must be referable to the present species; but he has seen no other like it. Similar forms were taken in the Belfast district by Mr. Buckle.

**Cafus fucicola** Curt.—Achill (W. F. J.). Taken on the sandy beach at Dugort among seaweed. This species is found locally round the Irish coast, being rarer than the allied *C. xantholoma*. Abroad it ranges along the south and west coasts of England, Wales, and Scotland, occurring also in the Isle of Man. Apparently it has been recorded only from the British and French coasts (*vide* Reitter, 1906).

**Xantholinus tricolor** F.—Westport (J. N. H.) Taken in the demesne among decaying seaweed, which seems to be its common habitat.

**Baptolinus alternans** Grav.—Westport (J. N. H.). A single specimen was taken under the bark of a decayed fir-tree in the demesne. It has not been previously recorded from the west of Ireland, nor is there any record of it between Fermanagh and Cork.

**Evaesthetus laeviusculus** Mann.—Delphi (J. N. H.). Taken in moss. This is quite a western species in Ireland, for the only other record is from Leenane, which is practically in the same district, where it was found in flood-refuse from the Erriff river in April.

**Stenus Juno** F.—Mr. W. E. Sharp in the "Irish Naturalist" (vol. xix, p. 247, 1910) recorded *Stenus ater* Mann., from Castlebar Lough. He now informs us that the specimens are referable to the present species.

**S. lustrator** Er.—Achill (J. H. N.). Taken on the summit of Slievemore in April. Scarce in Ireland; there is but one other record, which is from Fermanagh.

- Stenus nitens** Steph.—Westport (J. N. H.). Taken on the banks of the river in July. Rare in Ireland; the other records are from Antrim, Armagh, and Fermanagh.
- S. geniculatus** Grav.—Croaghpatrick (J. N. H.). A single specimen was taken on the wing on the summit of the mountain on a hot July day. It is said to be attached to heathy localities. The only other Irish record is from Newcastle, Co. Down, where it was found by Mr. G. C. Champion. It ranges through northern and central Europe.
- Bledius spectabilis** Kr.—Mulranny (W. F. J.). Taken on the sandy beach in company with *B. arenarius*. The only other western locality is Enniscrone, Co. Sligo. The other records are from Donegal, Down, Dublin, Wicklow, and Kerry.
- Oxytelus maritimus** Thoms.—Clare Island (W. F. J.). Achill, Sruhill Lough (J. N. H.). A maritime species found in sea-weed. It is not common in Ireland, the other records being from Donegal, Galway, Meath, and Dublin. It is distributed widely over the coasts of western Europe.
- Lesteva pubescens** Mann.—Croaghpatrick and Westport (J. N. H.), Louisburgh (C. M.). Found amongst wet moss in a tiny runnel half way up Croaghpatrick in July. Mr. E. A. Newbery has recently pointed out (*Ent. Mo. Mag.* (2) xxi, p. 109) how this species may be separated from *L. fontinalis* Kies, a species which has not yet been recorded from Ireland. An examination of the specimens standing under this species in Irish collections shows that *L. fontinalis* occurs in the Foyle, Lough Neagh, Armagh, and Belfast districts.
- L. sicula** Er.—There is some doubt as to the correct name to use for the species standing under "sicula" in British collections (*vide Entom. Mo. Mag.* (2) xxi, p. 231, 1910).
- L. punctata** Er.—Clare Island and Delphi (J. N. H.). Taken on Croaghmore at a height of 1300 feet in July.
- Micralymma brevipenne** Gyll.—Clare Island (H. W. K.). Achill Island at Keel, and Curraun Achill (W. F. J.). Found among seaweed and between tide-marks in company with *Aëpus Robinii*.
- It has not been previously recorded from the west of Ireland. Occurs on the sea-coasts of Great Britain, northern France, Denmark, and Scandinavia.
- Agathidium laevigatum** Er.—Clare Island (J. N. H.). Found on Croaghmore cliffs in July at 1300 feet. This is the first record of its occurrence in the west of Ireland.

- Anisotoma ovalis** Schmidt.—Dugort (W. F. J.). Found on the sandy beach among flood-rubbish carried down by a small stream.
- Silpha subrotundata** Steph.—Both the black and brown forms of this interesting species occur commonly throughout the district. Curiously enough, some of the specimens from Clare Island and Achill Island approach the English *S. atrata* more closely in structure than the average Irish mainland form.
- Choleva Watsoni** Spence.—The Bills (R. L. P.). A single specimen in birds' nest refuse. Has occurred in a similar habitat in the Scilly Isles (Ent. Mo. Mag. (2) xx, p. 54, 1909).
- Antherophagus pallens** Gyll.—Clare Island (W. F. J.). Taken by sweeping herbage in June. Widely distributed but not common in Ireland. It is often found associated with Humble-bees (*Bombus*).
- Telmatophilus Typhae** Fall.—Westport and Castlebar (J. N. H.). Found in company with *T. varicis*, though more local in Ireland; the only other records being from Antrim and Clare.
- Byrrhus fasciatus** F.—Croaghpatrick (J. J. W.). The other Irish records are from Derry, Down, and Wicklow.
- Elmis paralellopedus** Müll.—Clare Island (J. N. H.). Common amongst moss in rapid stream flowing from Croaghmore.
- Aphodius foetens** F.—Castlebar (J. N. H.). A single specimen was found sunning itself on a stone at Castlebar Lough. Though widely distributed in Ireland, ranging from Derry to Kerry, and from Galway to Dublin, it is not at all common, and generally only single specimens occur. The late Dr. Bailey met with it, also singly, in three localities in the Isle of Man.
- A. fimetarius**, L. ab. **castaneus** Bouskell.—Clare Island, and Achill Island at Darby's Point (E. S. J.). Taken in both localities *in stercore bovino*. The elytra in this form, instead of being bright red, are of a deep chestnut brown. Bouskell records it from Leicester in numbers. (Bouskell, F.; The Variation and Distribution of the genus *Aphodius* (Illiger). Trans. Leicester Literary and Philosophical Society, January, 1901).
- A. ater** De G. ab. **terrenus** Steph.—Clare Island (E. S. J.). Curraun Achill on Polranny Mountain (W. F. J.). Found plentifully on Knocknaveen and on the headlands at Ooghbeg *in stercore ovino*.  
In this aberration the elytra are red-brown, almost red, and more shining; specimens generally small; punctures stronger. It is recorded from Queenstown and Buncrana (J. J. W.).



- Aphodius sordidus** F.—Achill Island at Dugort (L. B. W.). Mulranny (E. S. J.). Very local in Ireland, being recorded only from Derry, Antrim, Dublin, and Kerry.
- A. rufescens** F., ab. **melanotus** Muls.—Mulranny (E. S. J.). Taken on the sand-hills *in stercore bovino*. In this aberration the elytra are chestnut brown, with the margins lighter. It does not appear to have been recorded from Ireland before.
- A. lapponum** Gyll.—Clare Island and Mulranny (E. S. J.). Curraun Achill, on Polranny Mt. (W. F. J.). Found in great numbers on Knocknaveen *in stercore ovino*. An aberration occurred on Polranny with the elytra suffused with black. It is widely spread in the mountainous districts in Ireland.
- A. putridus** Sturm.—Clare Island (E. S. J.), found on Knocknaveen and headlands at Ooghbeg *in stercore ovino*.  
Local in Ireland according to present records, which are from Donegal, Antrim, Down, Sligo, and Kerry.
- Cyphon pallidulus** Boh.—Clare Island (C. M.). Curraun Achill (W. F. J.). Louisburgh (C. M.). Scarce in Ireland. The only other record is from Glencar, Co. Kerry, where Mr. Donisthorpe took it by "sweeping in a damp spot." (Irish Nat., xii, p. 59.)
- Hydrocyphon deflexicollis** Müll.—Belclare (J. N. H.) Taken by sweeping herbage on the banks of the Owenwee River, July.
- Malthodes flavoguttatus** Kies.—Croaghpatrick (J. N. H.). A single specimen found flying on the summit of the mountain in July. Rather local; has been recorded from Antrim, Waterford, and Kerry.
- M. pellucidus** Kies.—Belclare (J. N. H.). Though not previously recorded from Connaught, this species is undoubtedly more widespread than the present records indicate.
- M. mysticus** Kies.—Belclare (J. N. H.). Specimens of a *Malthodes* taken in this locality are in all probability to be referred to the present species, though the record should perhaps be given with reserve. The species has been recorded as Irish from Dublin specimens, which proved to be the common *M. marginatus*.
- Telephorus lituratus** F.—Clare Island, and on Achill Island at Sraheens Lough (W. F. J.). Taken by sweeping among heather. Occurs in scattered localities throughout Ireland; rather commoner in the south.
- T. paludosus** Fall.—Curraun Achill, on Polranny Mountain (W. F. J.). Taken by sweeping among dwarf sallows on the northern side of the hill, where it rises from the road between Achill Sound and Mulranny. There is no

previous record for it from the west of Ireland. It is usually found in northern and mountainous districts.

**Telephorus flavilabris** Fall.—Dark forms with the thorax and base of the femora pitchy black are common in the district.

**Niptus crenatus** F.—Clare Island (R. W.). A single specimen found in a hay-loft. Probably introduced.

**Donacia crassipes** F.—Louisburgh (J. N. H.). Met with once on water-lilies at Lough Cahasy in July. Widely distributed in Ireland, but very local. The only other recorded western locality is Lough Gill, Co. Sligo, where it is common.

**D. versicolorea** Brahm.—Louisburgh and Castlebar (J. N. H.). Local, but generally distributed throughout Ireland.

**D. dentipes** F.—Westport (J. N. H.). This beautiful species is common on the banks of the Westport River close to the town. It is abundant also at Moycullen, in Co. Galway.

**D. limbata** Panz.—Belclare (J. N. H.). Taken once at Prospect Lough in July. It has not been previously recorded from the west of Ireland.

**D. impressa** Payk.—Belclare, Louisburgh, Westport, and Castlebar (J. N. H.). Not uncommon by sweeping water-plants. There is no record of its occurrence in Ireland east of a line drawn from Londonderry to Carlow. Recorded by Fowler from a few localities in the south of England.

**D. vulgaris** Zsch. (*D. typhae* Ahr.)—Achill, Louisburgh, and Westport (J. N. H.). Local and not previously recorded from the west of Ireland. The other Irish records from Antrim, Down, Armagh, Westmeath, and Dublin.

**D. clavipes** F.—Inishbofin (R. E. D.). Belclare and Louisburgh (J. N. H.). Rare in Ireland. The other records are from Antrim, Armagh, Roscommon, and Clare; and Johnson has an unrecorded specimen from Donegal. Also at Moycullen in Co. Galway (J. N. H.).

**D. discolor** Panz.—Clare Island, Achill, Belclare, Louisburgh, Westport. Common throughout the district.

**Cryptocephalus aureolus** Suffr.—Inishbofin and Inishark (R. E. D.). There are specimens of this handsome species from the above localities in the National Museum. Haliday indicates in his ms. list of Irish Coleoptera that this species was taken in the west of Connaught, but does not give any precise locality.

**Lochmaea Capreae** L.—Louisburgh (C. M.). Belclare (J. N. H.). A single specimen was beaten off willows at the latter locality in July.

**Aphthona atratula** All.—Westport and Castlebar (J. N. H.). Very local in Ireland, though spread over all four provinces.

**Crepidodera** (*Chalcoides*) **fulvicornis** Fab. (*C. smaragdina* Foudr.).—Clare Island, Achill Island (Glendarary), and Mulranny (W. F. J.). Belclare (J. N. H.). Taken by beating willows in June and September. Mr. James Edwards, in a paper<sup>1</sup> on this genus, gives fresh characters for separating the present species from *C. helixines*, or *aurea* Geoffr., as he calls it. In the present insect the thorax at the base is clearly narrower than the base of the elytra, and its puncturation is very coarse, and nearly or quite as deep as that in the elytral striae; but in *aurea* (*helixines*) the thorax at the base is as wide as the base of the elytra, its puncturation feeble or evanescent, very much less deep than that of the elytral striae. It seems probable that all our Irish records of *C. helixines* will have to be referred to *C. fulvicornis*.

**Haltica palustris** Weise.—Westport (J. N. H.). A few specimens taken by sweeping herbage in the demesne. We are indebted to Mr. J. Edwards for verifying the identification of this and the preceding species.

**Cassida nobilis** L.—Westport (J. N. H.). Specimens of this pretty "Tortoise Beetle" were bred from pupae found at Westport in July attached to the underside of stones on a grassy part of the sea-shore. The other Irish records are from Down, Louth, and Clare, so that it is very local.

**Salpingus ater** Payk.—Croaghpatrick (J. N. H.). Taken on the summit of the mountain on a hot July day. A very rare beetle. There is but one other record for Ireland, and that is Dublin (Dr. Power), while Fowler (Brit. Coleoptera, vol. iv., p. 52) says:—"Of all the specimens I have seen, one only appears to be related to the type *S. ater*, and this was taken by Mr. Champion at Aviemore, Inverness-shire"; nor can we find any record of its occurrence since.

**Otiorrhynchus blandus** Gyll.—Clare Island and Achill (J. N. H.). Inishbofin (R. E. D.). Louisburgh, Mweelrea, and Westport. The Bills (R. Ll. P. and R. W.). This boreal weevil is spread all round the north, west, and south coasts of Ireland, being common in suitable localities, and extending to the sea-level. It is found in Scotland, where it is common, but the only other recorded locality is Lapland.

**Ceuthorrhynchus quadridens** Panz.—Croaghpatrick (J. N. H.). Taken on the wing on the summit in July. Very widely distributed in Ireland, and displays a *penchant* for gorse.

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<sup>1</sup> Vide "On the British species of *Chalcoides* Foudras," Ent. Monthly Mag., (2) xx, p. 127, 1909.

**Eubrychius velatus** Beck.—Westport and Castlebar (J. N. H.). Common among *Myriophyllum* in Coolbareen Lake at Barley Hill and other lakes in the district.

**Limnobaris pilistriata** Steph.—Westport (J. N. H.). All the records from Ireland of *Limnobaris T-album* are to be referred to this species (*vide* Ent. Mo. Mag. (2), xvi, p. 224, and Irish Nat., xix, p. 33).

**Rhopalomesites Tardyi** Curt.—Westport and Castlebar (J. N. H.).

Although no living examples were found during the Survey, this interesting weevil is no doubt locally common, judging by the occurrence of its dead remains and the traces of its boring operations in old ash-trees in the Westport district. The headquarters of the Holly Weevil are undoubtedly in Ireland and the south-west of England; yet it is more widely distributed in Britain than was formerly supposed to be the case, as evidenced by recent records (Entom. Mo. Mag. (2), xvi, xxi) from the Isle of Man, Lancashire, and elsewhere in the Britannic area.

AQUATIC COLEOPTERA.

By FRANK BALFOUR BROWNE, M.A. (OXON.), F.R.S.E., F.Z.S.

Read DECEMBER 11, 1911. Published JANUARY 23, 1912.

FOR the vice-county of West Mayo the published records of water-beetles include a total of four species so that, so far as this group is concerned, the Clare Island Survey has had practically virgin soil to work upon. The total number of species in the accompanying lists is ninety, a number which compares not unfavourably with that for other Irish counties which have been worked.

In studying this group I have only twice been able to visit the district but I have been assisted by several friends, Messrs. A. W. Stelfox, R. J. Welch, J. N. Halbert and the Rev. W. F. Johnson having collected water-beetles for me while carrying on their own work. I am especially indebted to Mr. Stelfox who not only collected on several occasions a large number of specimens but also managed to find three species which, but for him, would not have appeared in the lists. His discovery of *Deronectes griseo-striatus* on Achill Island is specially noteworthy and, it may be mentioned, it was he who first found the species in Ireland, bringing me a specimen from the Parkmore district, Co. Antrim, in June, 1910. Mr. Halbert has also taken three species which I failed to find, the most interesting of which is *Octhebius viridis* which previously has only occurred in the east and south-east of Ireland. The four gentlemen mentioned, between them, collected fifty-one species, a highly creditable total, considering that water-beetles were entirely off their lines of work.

In the lists of species I have not included *Helochares lividus*, Forst. Without having gone very carefully into the matter, I had come to regard *H. lividus* and *H. punctatus* as having been separated on insufficient grounds. After mentioning this to Dr. Sharp he wrote to me that he had re-investigated the matter and that they are distinct species. In West Mayo I found both light and dark specimens of *Helochares* but I seem to have brought home only dark ones and I have since wondered whether those that were pale-coloured

may not have been *lividus*. Dr. Sharp tells me that in the New Forest district this species only occurs in the salterns, so perhaps it is much more local than the records indicate. It has been recorded for at least thirty-eight out of the seventy English vice-counties but there is no record for either Scotland or Ireland. Is it possible that *H. punctatus* has light- and dark-coloured forms and that those of us who have come to the conclusion that it is merely a variety of *lividus* have never examined the latter species? The absence of records of the latter from Scotland could be accounted for on the ground that in more northern latitudes perhaps only the dark form of *punctatus* occurs!

With regard to the area dealt with in this paper I have included all the records for West Mayo. These are, however, almost all for the district covered by the Survey that is, Clare Island and the surrounding mainland. Mr. Halbert visited the district in 1897 and worked Achill Island and also apparently the district about Killary Harbour.<sup>1</sup> He however only recorded four species of water-beetles, one of these being the first Irish record for *Paracymus nigroaeneus*, discovered in flood-refuse by the Erriff River, erroneously described in the "List of the Beetles of Ireland"<sup>2</sup> as being in Galway. Mr. Stelfox collected in various places besides around Clew Bay. He brought me specimens from Belmullet, Bangor and Castlebar and also from Caher and Inishturk, islands which are within the vice-county of West Mayo. I myself have collected in both Clare and Achill Islands, in the Curraun and Achill Sound district and also round about Louisburgh and to some extent in the neighbourhoods of Murrisk, Westport and Newport. My first visit to the district was in July 1909 when I had a day or two about Achill Sound and on Achill Island, spent a few days on Clare Island and a few days at Louisburgh. My second visit was in March and April 1910 when I again visited Louisburgh and Achill, being about ten days in the district altogether. Two projected visits had, at the last moment, to be cancelled so that various places which, from a study of the map, seemed to promise good results have not been touched at all. I greatly regret not having had an opportunity of properly working the mountain loughs and peat-holes. Mr. Stelfox brought me a few specimens from highland loughs but, excepting *D. griseo-striatus* from Lough Aigher on Achill, there was nothing characteristic of these habitats. One visit I made to high ground in the Mweelrea mountains produced a single specimen of *Agabus congener*, the only one so far found in Ireland, but March is not the time of year for that kind of work and otherwise my climb produced nothing interesting.

<sup>1</sup> Irish Nat., vii., 1898, pp. 135 and 212.

<sup>2</sup> Johnson and Halbert, Proc. Roy. Irish Acad., 1901,

Mr. Halbert has suggested (*loc. cit.*) that *Dytiscus lapponicus* might be expected to occur in some mountain tarn in this district and I think, especially after the discovery of *D. griseo striatus*, which occurs with it in the western islands of Scotland, it most probably occurs either in Achill or in some of the loughs on the Curraun high ground where, I understand, alpine plants are found. Several other highland species almost certainly occur in the pools on the high ground as, for instance, *Hydroporus morio* and *H. melanarius* and *Agabus arcticus*. The first species is found in Leitrim, Derry, Antrim, Armagh and Wicklow, always in mountain districts, while the second I have met with in Leitrim and Down, and it has been recorded from North Kerry. *A. arcticus* has so far occurred only in Antrim and Wicklow but I have no doubt that it will be found in many other localities, especially in the north and west.

With regard to Clare Island which, owing to the limited extent, I worked more exhaustively than other parts of the district, there are three or four what might be called main classes of habitat. First, the peat-moss pool habitat covering most of Knocknaveen, Croaghmore and the western end of the island; secondly the lake habitat which is very limited in extent, and thirdly a fresh-water marsh habitat, also very limited, found chiefly in the south and east of the island on the farm-land area, soil which has presumably been converted by man from acid into mild humus. A fourth kind of habitat might be added and that is the streams which are very few and small and which, unfortunately, I entirely neglected. By far the greater part of the island is composed of peaty ground so that the oxylophile fauna naturally predominates.

The only species characteristic of the lake habitat were found in Creggan Lough and in a smaller lough or large pond (Loughanaphuca) at the western end of the island. *Haliplus fulvus* and *Laccophilus obscurus* occurred in both these while *Deronectes assimilis* occurred only in Creggan Lough.

The cultivated area had a fauna of thirty-four species out of the total of forty-seven taken on the island. Nine collections were made in this area, and probably every pond and marsh was worked. Of the fauna eleven species occurred here and nowhere else on the island. These were:—

*Hydroporus planus*.  
*Agabus paludosus*.  
*Ilybius fuliginosus*.  
*Dytiscus punctulatus*.  
*Hydrobius fuscipes*.  
*Philhydrus coarctatus*.

*Laccobius alutaceus*.  
*L. minutus*.  
*Limnebius truncatellus*.  
*Octhebius pygmaeus*.  
*Cyclonotum orbiculare*.

The following species occurred chiefly in this area :—

<i>Haliphus ruficollis</i> <sup>1</sup>	8 out of 12 occurrences in the island.
<i>H. lineatocollis.</i>	4 out of 6       "       "       "
<i>Hydroporus palustris.</i>	4 out of 6       "       "       "
<i>Helophorus brevipalpis.</i>	8 out of 13       "       "       "

When plants occur only on a cultivated area on an island, any question as to their origin is swept aside by the assumption that they have been brought in by man, but in the case of water-beetles such an assumption is untenable. None of the above-mentioned species are entirely absent from peaty ground but every species is predominantly helophile as opposed to oxylophile. We therefore have here the same problem as presented itself in the case of the island of Eigg.<sup>2</sup> Is the helophile fauna a remnant from a pre-peat age or is it a new fauna which has drifted into the island in recent times ?

It is to be noted that of the four species which occurred in Eigg, three are among the Clare Island helophiles also, viz. : *H. fuscipes*, *H. brevipalpis* and *C. orbiculare* while the fourth Eigg species is normally found in moving water and not in stagnant pools, as is also *A. paludosus* in the above list; it occurred in some marshy ground with drainage water running through it.

There is however nothing distinctive about this helophile fauna; a few of the species are southern, e.g. *H. lineatocollis*, *H. planus*, *D. punctulatus*, and *L. alutaceus*, while the rest have a wide continental distribution, some of them throughout most of the palaeartic region, e.g. *H. brevipalpis* and *O. pygmaeus*, and some even reaching North America, e.g. *I. fuliginosus* and *H. fuscipes*. There seems to be nothing therefore to assist in determining the age of the group so that it merely becomes a question as to the time of arrival of the general fauna, which will be referred to later on.

Forty-five collections were made on Clare Island and forty-seven species were found and in the following list I have given, after each species, the number of collections in which it occurred.

<sup>1</sup> [All the specimens which I kept—only a few—and all those which were sent me are *H. ruficollis*, De G. Possibly however some of the related species occurred. Vide Edwards, J. : "A Revision of the British species of *Haliphus*, Latr." EMM., xxii, Jan., 1911.]

<sup>2</sup> F. BALFOUR BROWNE: "Aquatic Coleoptera of the North Ebbes." Ann. Scott. Nat. History, July and October, 1911.



## CLARE ISLAND LIST.

<i>Haliphus confinis</i> , <i>Steph.</i>	. 1	<i>Rhantus bistratus</i> , <i>Bergstr.</i>	. 2
<i>fulvus</i> , <i>F.</i>	. 2	<i>Dytiscus punctulatus</i> , <i>F.</i>	. 1
<i>ruficollis</i> , <sup>1</sup> <i>Brit. auct.</i>	. 12	<i>marginalis</i> , <i>L.</i>	. 1
<i>lineatocollis</i> , <i>Marsh.</i>	. 6	<i>Gyrinus minutus</i> , <i>F.</i>	. 3
<i>Laccophilus obscurus</i> , <i>Panz.</i>	. 6	<i>natator</i> , <i>Scop.</i>	. 5
<i>Caelambus inaequalis</i> , <i>F.</i>	. 11	<i>Hydrobius fuscipes</i> , <i>L.</i>	. 1
<i>Deronectes assimilis</i> , <i>Payk.</i>	. 1	<i>var. picicrus</i> , <i>Thoms.</i>	. 1
<i>Hydroporus lepidus</i> , <i>Ol.</i>	. 3	<i>Philhydrus melanocephalus</i> , <i>Ol.</i>	23
<i>tristis</i> , <i>Payk.</i>	. 16	<i>minutus</i> , <i>F.</i>	. 3
<i>gyllenhalii</i> , <i>Schiöd.</i>	. 20	<i>coarctatus</i> , <i>Gredl.</i>	. 1
<i>palustris</i> , <i>L.</i>	. 6	<i>Paracymus nigroaeneus</i> , <i>Sahlb.</i>	9
<i>incognitus</i> , <i>Sharp</i>	. 6	<i>Anacaena globulus</i> , <i>Payk.</i>	. 12
<i>erythrocephalus</i> , <i>L.</i>	. 2	<i>limbata</i> , <i>F.</i>	. 2
<i>celatus</i> , <i>Clark</i>	. 1	<i>Helochares punctatus</i> , <i>Sharp</i>	. 6
<i>memnonius</i> , <i>Nic.</i>	. 2	<i>Laccobius alutaceus</i> , <i>Thoms.</i>	. 2
<i>obscurus</i> , <i>Sturm</i>	. 20	<i>minutus</i> , <i>L.</i>	. 1
<i>nigrita</i> , <i>F.</i>	. 10	<i>Limnebius truncatellus</i> , <i>Thunb.</i>	2
<i>pubescens</i> , <i>Gyll.</i>	. 36	<i>Helophorus aquaticus</i> , <i>L.</i>	. 5
<i>planus</i> , <i>F.</i>	. 1	<i>viridicollis</i> , <i>Steph.</i>	. 36
<i>lituratus</i> , <i>F.</i>	. 2	<i>brevipalpis</i> , <i>Bedel.</i>	. 13
<i>Agabus paludosus</i> , <i>F.</i>	. 1	<i>Octhebius pygmaeus</i> , <i>E.</i>	. 1
<i>sturmii</i> , <i>Gyll.</i>	. 3	<i>lejolisii</i> , <i>Rey &amp; Muls.</i>	. 2
<i>bipustulatus</i> , <i>L.</i>	. 30	<i>Cyclonotum orbiculare</i> , <i>F.</i>	. 1
<i>Ilybius fuliginosus</i> , <i>F.</i>	. 2		

By far the majority of the collections were made in peaty pools where Sphagnum and Eriophorum formed the dominant vegetation and if we therefore take out of the above list those species which occurred in most collections we have an association of peat-pool species as follows:—

<i>Hydroporus pubescens</i> ,	} . 36	<i>Hydroporus gyllenhalii</i> ,	} . 20
<i>Helophorus viridicollis</i> ,		<i>obscurus</i> ,	
<i>Agabus bipustulatus</i> ,	. 30	<i>tristis</i> ,	. 16
<i>Philhydrus melanocephalus</i> ,	. 26	<i>Anacaena globulus</i> ,	. 12

These same eight species head the lists of the Skye and Eigg (*loc. cit.*) and Coll<sup>2</sup> water-beetles, although not in precisely the same order. Thus the

<sup>1</sup> May include several species. Unfortunately no specimens were kept.

<sup>2</sup> F. BALFOUR BROWNE: "The Aquatic Coleoptera of the Mid-Ebudes." *Ann. Scott. Nat. Hist.*, April, 1910.

typical peat-pool fauna of Clare Island is identical with that of these other three islands.

Only three species in the Clare Island list call for any remark. *H. celatus* occurred at 700 feet on Croaghmore in a small pool in a trickling stream, the typical habitat of the species. The Irish records for this species are few. It was first taken by Mr. J. N. Milne at Downhill (Derry) and recorded by the late C. W. Buckle.<sup>1</sup> A single specimen was taken by Rev. W. F. Johnson in 1907 in Co. Armagh, and I have since that taken the species in Mid Cork (1) August 1907; in Down, 1908; in Leitrim and Clare Island, 1909 and in Co. Antrim, August 1911. It is a mountain species by choice, and therefore in Ireland its distribution is marginal but it is, I think, much less rare than the records indicate.

*P. nigroaeneus* was common in a few peat-holes at various parts of the island up to about 700 feet above sea-level. It occurred also on Achill and on the mainland but did not seem to be so common as in the pools on Clare Island.

*O. lejolisii* I found on both sides of Clare Island, east and west, and it was common. On the east side I found it at once quite near the hotel and just above high-water mark. At the west end I searched for a considerable time before I discovered it; here it was in pools rather more than 100 feet above the sea, which gives some idea of the delicacy of the balance between this insect and its environment. It always occurs along a narrow belt sufficiently close to the sea to be certain of an intermittent but fairly frequent supply of sea-water in the form of spray and yet far enough above the high-tide mark to ensure occasional flushings of the pools with fresh water. The height above sea-level at which it occurs on the western side of the island as compared with the eastern side indicates the comparative wave-motion on the two sides.

Achill Island produced much the same kinds of habitat as Clare Island but I worked the former much less thoroughly than the latter and found only thirty-eight species. Only nine collections were made during each visit and on the second occasion I did not work any of the same places as on the first so that a comparison of the results is not quite reliable, although perhaps it indicates the relative abundance of species in July and March. In the former month the average number of species per collection was eleven or twelve while in the latter it was only five or six.

Apart from *D. griseo-striatus* already referred to, the only species worthy

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<sup>1</sup> "Beetles collected in Lough Foyle District, Counties Donegal and Derry." *Irish Nat.*, January, 1900, pp. 2-11.

of notice from Achill is *Laccobius regularis* of which I found one male specimen. It is quite readily recognised from the other *Laccobii* which come near it by the aedeagus. This species was first recorded as British by Dr. Sharp<sup>1</sup> from Brockenhurst and he mentions having seen specimens from Surrey. It has since been recorded from Berks and South Devon,<sup>2</sup> and these are at present the only known British localities. It was first introduced under Motschulsky's name but, owing to the vagueness of that author's description, Rey's name has since been adopted.

The Achill Island list, including all records, amounts to forty-four species and is as follows:—

## ACHILL ISLAND LIST.

Haliplus fulvus, <i>F.</i> (W. F. Johnson, 1911).	Ilybius fuliginosus, <i>F.</i>
ruficollis, <sup>3</sup> <i>Brit. auct.</i>	aenescens, <i>Thoms.</i>
lineatocollis, <i>Marsh.</i>	Rhantus bistriatus, <i>Bergstr.</i>
Laccophilus obscurus, <i>Panz.</i>	Dytiscus punctulatus, <i>F.</i>
Caelambus inaequalis, <i>F.</i>	Gyrinus minutus, <i>F.</i>
Deronectes assimilis, <i>Payk.</i>	natator, <i>Scop.</i>
xii-pustulatus, <i>Ol.</i> (A. W. Stelfox, 1911).	opacus, <i>Sahlb.</i>
griseo-striatus, <i>De G.</i> (A.W.S., 1911).	Hydrobius fuscipes, <i>var. picicrus,</i> <i>Thoms.</i>
Hydroporus lepidus, <i>Ol.</i>	Philhydrus melanocephalus, <i>Ol.</i>
umbrosus, <i>Gyll.</i>	minutus, <i>F.</i>
gyllenhalii, <i>Schiöd.</i>	Paracymus nigroaeneus, <i>Sahlb.</i>
palustris, <i>L.</i> (A. W. S., 1911).	Anacaena globulus, <i>Payk.</i>
incognitus, <i>Sharp.</i>	limbata, <i>F.</i>
erythrocephalus, <i>L.</i>	<i>var. ovata, Reiche.</i>
memnonius, <i>Nic.</i>	Helochares punctatus, <i>Sharp.</i>
obscurus, <i>Sturm.</i>	Laccobius regularis, <i>Rey.</i>
nigrita, <i>F.</i>	alutaceus, <i>Thoms.</i>
pubescens, <i>Gyll.</i>	minutus, <i>L.</i> (A. W. S., 1910).
litoratus, <i>F.</i>	Limnebius truncatellus, <i>Thunb.</i>
Agabus sturmi, <i>Gyll.</i>	Helophorus aquaticus, <i>L.</i>
chalconotus, <i>Panz.</i>	viridicollis, <i>Steph.</i>
bipustulatus, <i>L.</i>	brevipalpis, <i>Bedel.</i>
	Oethebius bicolon, <i>Germ.</i> (J. N. Halbert, 1898).

<sup>1</sup> "*Laccobius scutellaris*, Motsch., in England." EMM., ser. 2, xx, 1909, p. 217.

<sup>2</sup> J. R. LE B. TOMLIN: "New Localities for *L. scutellaris*, Motsch." EMM., ser. 2, xxi, 1910, p. 15.

<sup>3</sup> *Vide* foot-note, p. 5.

The only species worth mentioning from the Curraun district is *Oethebius punctatus*. I succeeded, after much labour, in finding at Mulranny two or three specimens of this, one of the only two salt-marsh species in the West Mayo list. I spent a very short time in this locality, and took only twenty-three species. The Westport district, where I took forty-two species, may be passed over without comment.

The Louisburgh district produced sixty-nine species and was therefore the richest part of the whole area. This was largely due to variety of habitat, for instance, the numerous pools in the Boulder-clay along the road to Doo Lough, in which many helophile species occurred, and the sandy loughs along the coast where, besides helophiles, one or two lake species find a home. The halophile fauna was remarkable for its absence, although several places seemed to be specially suitable for it.

The occurrence of *Agabus congener* in this district has already been referred to and otherwise only three species need be mentioned. *Helophorus granularis* was found in hundreds in the flooded grassy ground by the Bunowen River in the spring. A single specimen had occurred in a shallow grassy ditch in the neighbourhood in the previous July, perhaps a survivor of the army of the previous spring.

*Hydraena testacea*, previously only taken once in Ireland, at Thomastown (Kilkenny),<sup>1</sup> occurred very sparingly in one grassy ditch near Louisburgh. This species is easily passed over and is, I fancy, chiefly a spring insect. It occurs mostly in the southern counties of England but has once been recorded from Scotland (Kirkcudbright) and I took it in the Isle of Man.

From this district A. W. Stelfox brought me a single specimen of *Agabus unguicularis*, a species I was unable to find. An interesting point about its distribution in Ireland is its apparent absence from the south-eastern counties. It occurs in the north and west as far south as North Kerry but there is no record for Leinster or for the eastern part of Munster.

The following list includes all the species taken on the mainland of West Mayo. After each species I have indicated the districts in which it has occurred and, unless I have taken the species myself, I have given the initials of the collector. In a case where I have received a species or one has been recorded from a district in which I myself have taken it I have only given my own record, as in the case of the Clare and Achill Island lists.

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<sup>1</sup> Johnson and Halbert's "List."

## MAINLAND LIST.

- Halplus obliquus**, *F.*—Westport (J. N. H.)  
*confinis*, *Steph.*—Louisburgh.  
*fulvus*, *F.*—Belmullet (A. W. S.); Louisburgh; Westport and Castlebar (J. N. H.).  
*ruficollis*,<sup>1</sup> *Brit. auct.*—Belmullet (A. W. S.); Curraun; Louisburgh; Westport.  
*ruficollis*, *De G.*—Rosturk and Newport (A. W. S.).  
*wehnckeii*, *Gerh.*—Louisburgh (J. N. H.).  
*lineatocollis*, *Marsh.*—Curraun; Louisburgh; Westport.
- Noterus sparsus**, *Marsh.*—Louisburgh; Westport.
- Laccophilus obscurus**, *Panz.*—Curraun; Louisburgh; Westport.
- Hyphydrus ovatus**, *L.*—Westport; Castlebar.
- Caelambus v-lineatus**, *Zett.*—Louisburgh; Westport.  
*inaequalis*, *F.*—Curraun; Louisburgh; Westport.  
*ix-lineatus*, *Steph.*—Louisburgh.  
*impressopunctatus*, *Schall.*—Louisburgh.
- Deronectes assimilis**, *Payk.*—Louisburgh.  
*elegans*, *Panz.* [*depressus*, *Brit. auct.*].—Louisburgh; Killala; (W. E. Sharp).  
*xii-pustulatus*, *Ol.*—Louisburgh; Killala (W. E. Sharp).
- Hydroporus pictus**, *F.*—Louisburgh; Westport.  
*lepidus*, *Ol.*—Curraun; Louisburgh.  
*rivalis*, *Gyll.*—Louisburgh.  
*septentrionalis*, *Gyll.*—Louisburgh.  
*lineatus*, *F.*—Westport.  
*tristis*, *Payk.*—Louisburgh.  
*umbrosus*, *Gyll.*—Louisburgh; Westport.  
*angustatus*, *Sturm.*—Westport (A. W. S.).  
*gyllenhalii*, *Schödtte.*—Curraun; Louisburgh; Westport.  
*vittula*, *Er.*—Louisburgh.  
*palustris*, *L.*—Curraun; Louisburgh; Westport.  
*incognitus*, *Sharp.*—Louisburgh.  
*erythrocephalus*, *L.*—Curraun (A. W. S.); Louisburgh; Westport.  
*memnonius*, *Nic.*—Louisburgh; Westport.  
*obscurus*, *Sturm.*—Curraun; Louisburgh.  
*nigrita*, *F.*—Belmullet (A. W. S.); Curraun; Louisburgh; Westport.

<sup>1</sup> *Vide* foot-note, p. 5.

- Hydroporus pubescens**, *Gyll.*—Curraun ; Louisburgh ; Westport.  
*planus*, *F.*—Curraun ; Louisburgh.  
*litturatus*, *F.*—Curraun ; Louisburgh.
- Agabus paludosus**, *F.*—Belmullet (A. W. S.).  
*affinis*, *Payk.*—Louisburgh.  
*unguicularis*, *Thoms.*—Louisburgh (A. W. S.).  
*congener*, *Payk.*—Louisburgh.  
*nebulosus*, *Forst.*—Westport (Murrisk).  
*sturmii*, *Gyll.*—Louisburgh.  
*chalconotus*, *Panz.*—Louisburgh ; Westport.  
*bipustulatus*, *L.*—Curraun ; Louisburgh ; Westport
- Ilybius fuliginosus**, *F.*—Louisburgh.  
*obscurus*, *Marsh.*—Louisburgh.  
*aenescens*, *Thoms.*—Curraun ; Louisburgh.
- Rhantus bistriatus**, *Bergstr.*—Louisburgh.
- Colymbetes fuscus**, *L.*—Castlebar (A. W. S.) ; Louisburgh.
- Dystiscus punctulatus**, *F.*—Louisburgh.  
*marginalis*, *L.*—Curraun ; Louisburgh.
- Aeilus sulcatus**, *L.*—Louisburgh.
- Gyrinus minutus**, *F.*—Louisburgh.  
*elongatus*, *Aubé.*—Belmullet (A. W. S.) ; Westport.  
*natator*, *Scop.*—Curraun ; Louisburgh ; Westport.  
*marinus*, *Gyll.*—Westport.
- Orectochilus villosus**, *Müll.*—Louisburgh ; Castlebar.
- Hydrobius fuscipes**, *L.*—Louisburgh ; Westport.  
*var. picicrus*, *Thoms.*—Curraun ; Louisburgh.
- Philhydrus melanocephalus**, *Ol.*—Curraun ; Louisburgh ; Westport.  
*nigricans*, *Zett.*—Killala (W. E. Sharp).  
*minutus*, *F.*—Louisburgh.  
*coarctatus*, *Gredl.*—Louisburgh ; Westport.
- Paracymus nigroaeneus**, *Sahlb.*—Louisburgh ; Westport.
- Anacaena globulus**, *Payk.*—Curraun ; Louisburgh.  
*limbata*, *F.*—Louisburgh.  
*var. ovata*, *Reiche.*—Louisburgh ; Westport.
- Helochares punctatus**, *Sharp.*—Louisburgh.
- Laccobius alutaceus**, *Thoms.*—Louisburgh.  
*minutus*, *L.*—Louisburgh ; Westport.  
*bipunctatus*, *F.*—Westport.
- Limnebius truncatellus**, *Thunb.*—Louisburgh ; Westport.
- Chaetarthria seminulum**, *Herbst.*—Louisburgh ; Westport.

- Helophorus aquaticus**, *L.*—Louisburgh; Westport.  
*viridicollis*, *Steph. (acneipennis, Thoms.)*.—Belmullet (A. W. S.); Curraun;  
 Louisburgh; Westport.  
*affinis var. griseus*, *Herbst.*—Louisburgh; Westport.  
*granularis*, *L.*—Belmullet (A. W. S.); Louisburgh; Westport.  
*brevipalpis*, *Bedel.*—Curraun; Louisburgh; Westport.  
**Oethebius viridis**, *Peyron.*—Westport (J. N. H.).  
*pygmaeus*, *F.*—Westport.  
*bicolon*, *Germ.*—Curraun; Louisburgh; Westport.  
*punctatus*, *Steph.*—Curraun.  
*lejolisi*, *Rey and Muls.*—Louisburgh.  
**Hydraena testacea**, *Curt.*—Louisburgh.  
*riparia*, *Kug.*—Louisburgh; Westport.  
*gracilis*, *Germ.*—Louisburgh.  
**Cyclonotum orbiculare**, *F.*—Louisburgh; Westport; Castlebar.

The only other parts of West Mayo for which I have any records are Caher Island and Inishturk from which Mr. Stelfox brought me a few specimens after his visit last July. From the former I have two species:—*C. inaequalis* and *A. sturmi* and from Inishturk I have three:—*H. lituratus*, *G. natator* and *O. lejolisi*.

From the inequality in the time spent in the different districts it would not be possible to make any comparison of the separate faunas, but what I said with regard to the habitats on Clare Island will explain any differences in the mainland districts. For instance, a number of species occurred on the Curraun peninsula and about Louisburgh which were not found at Westport merely because no peat moss was worked in the latter district. So far as I know, geological conditions have little or no direct effect upon the water-beetle fauna. Where the conditions are such as to produce acid humus, the oxylophile fauna occurs, while in areas of good drainage the helophile fauna dominates. But peat-mosses occur even in limestone areas and are not peculiar to any particular geological conditions, although some rocks may be better suited to their formation than others.

With regard to the relationship of the Clare Island fauna to that of the mainland, it possesses one species, *Hydroporus celatus*, which was not found anywhere else but which almost certainly occurs wherever a suitable habitat exists. It is by no means a rare species but the small trickling streams in which it normally lives are easily passed over and thus the species seems to be scarce. There is, therefore, nothing peculiar about the Clare Island water-beetle fauna as compared with that of the mainland. The total of forty-seven species compares favourably with that of other islands I have worked; on

Coll, which is larger but farther north, the same number of species occurred while on Eigg, still farther north, and with very poor accommodation for helophiles, there were only thirty-seven species. I doubt very much, however, whether there is much relationship between the size of an island and the number of species it possesses—which seems to me to depend entirely, or almost so, upon the variety of habitats. I have spoken in a general way of fresh-water-marsh, and peat-moss, but each of these names really covers a number of different habitats which grade into one another in such a way that only a very critical examination would reveal the differences. For instance, the heating capacity of a pond depends upon its depth and the nature of the water-supply and of the soil in which it lies. This will affect the vegetation and the fauna and assuming that heating capacity alone were what determined these—and I believe it is of some considerable importance—we might find two or three apparently different kinds of ponds possessing the same general fauna and flora. Then again Birge has shown in his “*Plankton Studies on Lake Mendota*” that of two species, one was abundant and the other scarce according as to which got the start at the beginning of the season and, from what is known of the oecological relations between species, the result of such a struggle might quite well affect the whole fauna and flora of the habitat, so that two ponds closely similar in all their physical characters might contain very different species and yet be classed as the same habitat. Further, the nature of the habitat is constantly and often rapidly changing owing to the growth and decay of the fauna and flora. A small, shallow pool with no surface vegetation heats up rapidly and cools rapidly while a pool filled with vegetation has a much more equable temperature; in a pool partly covered with vegetation the temperature differs in the bare and protected parts as much as 8 or 10 degrees at the hottest time of a summer day. Thus a pool which one year is a suitable habitat for species which endure extremes of heat and cold, may next year be suitable for those which only endure small variations.

There seems, however, to be much less variation in the “peat-moss” pool habitat than in the “fresh-water marsh” pool habitat and hence the similarity between the faunas of oxylophytic areas such as Clare Island, Coll, Eigg, and Skye. I would therefore account for the poverty of Clare Island fauna in comparison with that of the adjoining mainland merely through lack of variety of habitat. There seems to be geological evidence that the island has become separated from the mainland only in comparatively modern times, so that no question arises as to how the fauna may have reached it.

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<sup>1</sup> *Trans. Wisconsin Acad. Sci., &c., x. & xi.*



With regard to the water-beetles of West Mayo as a whole, they include species showing very different ranges of distribution in Ireland. Most of them show no particular localisation ; a smaller number are marginal in their distribution, being almost or entirely confined to the coastal counties while a very few are remarkable chiefly in that they are absent from the centre and east of Ireland. Some of these latter are found in the north and west, others in the south and west, none apparently being common to north, west and south.

This “ western ” group consists of only eight species but if we include a few which, although not so far found in West Mayo, occur in one of the neighbouring western counties, it consists of thirteen species which are as follows :—

*West and North Species.*

- N. Caelambus ix-lineatus, *Steph.*
- N. Deronectes griseo-striatus, *De G.*
- S. Hydroporus dorsalis, *F.*
- N. H. melanarius, *Sturm.*
- N. Agabus unguicularis, *Thoms.*
- N. A. congener, *Payk.*
- N. Dytiscus lapponicus, *Gyll.*

*West and South Species.*

- S. Copelatus agilis, *F.*
- S. and W. Paracymus nigro-aeneus, *Sahlb.*
- S. Helochares punctatus, *Sharp.*
- S. Laccobius ytenensis, *Sharp.*
- S. L. regularis, *Rey.*
- S. Hydraena testacea, *Curt.*

The accompanying “ symbol ”-maps illustrate the distribution of these two groups :—

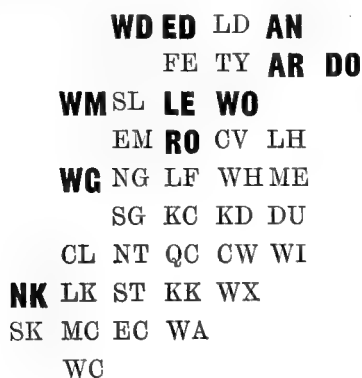


FIG. 1.—West and North Group.

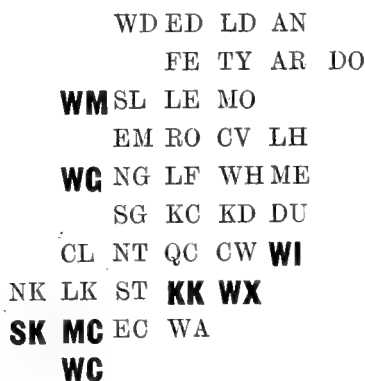


FIG. 2.—West and South Group.

With regard to their British distribution, six of these species may be described as belonging to the “ Scottish ” and “ Highland ” types—marked N. in above list—and six apparently belong to the “ English ” type—marked S.

in the list—while one species with a southern and western distribution might possibly be described as belonging to Watson's "Atlantic" type.

A reference to the Continental distribution of these thirteen species shows that seven of them have a range from Scandinavia to south Europe; *i.e.*, *D. griseo-striatus*, *A. congener*, *D. lapponicus*, *H. melanarius*, *H. dorsalis*, *C. agilis* and *P. nigro-aeneus*. The first three however owe their southern distribution to the fact that they there inhabit highland lakes while the fourth has, I think, two forms—a smaller highland and a larger lowland one—which may account for its very wide range. *H. dorsalis* is a distinctly northern species and like *D. griseo-striatus* and *D. lapponicus* has a holarctic range, while the other two species, *C. agilis* and *P. nigro-aeneus*, are much more common in the south than in the north. Two other species of the thirteen are northern, *i.e.*, *C. ic-lineatus* and *A. unguicularis*, and do not extend south of Belgium and North Germany, while the remaining four species are distinctly southern not being recorded from farther north than about the latitude of Denmark.

The Continental distribution of these species therefore corresponds with the Irish distribution while that in Britain differs from both only in the cases of *H. dorsalis* and *P. nigro-aeneus*. Apart from these two cases we have therefore in the western Irish group two clearly-marked elements and if we analyse the distribution of the other seventy-nine West Mayo species we find that in them also we have northern and southern elements, and in some cases anomalies with regard to British distribution. For instance, *Cuelambus v-lineatus* is a good example of a distinctly northern species abundant in pools in Lapland, according to Zetterstedt (*Insecta Lapponica*, 1840), and not found south of Denmark and north Germany. It is also a good example of anomalous British distribution since it has occurred sparingly in various parts of England, even as far south as the New Forest (Hants S.), while in Scotland it has so far been recorded from only four counties—Kirkcudbright, Fife, South Perth and Forfar. Of the markedly southern species, *H. lituratus*, *O. punctatus* and probably *O. lejolisii* may be mentioned, while a number of others are also southern, *e.g.* *H. lineatocollis*, *N. sparsus*, *L. obscurus*, *H. oratus*, *D. elegans* and *xii-pustulatus*, *H. lepidus*, *pubescens* and *planus*, *A. nebulosus*, &c., &c.

The western group is therefore chiefly peculiar on account of its "westernness" but it also contains the two most arctic of all our British water-beetles—*D. griseo-striatus* and *D. lapponicus*. The southern species are more southern than the majority of the similar group of the generally distributed fauna so that we may to some extent associate the western localisation with extreme northern or extreme southern Continental range. This is significant from the

fact that in other groups the same tendency is noticeable. It has been accounted for on the ground that these western species are a remnant of the pre-Glacial fauna and flora, the northern species having come southward with the Glacial period, the southern having come northward at an earlier date.

The statements in either direction are at present most unconvincing. Bulman<sup>1</sup> for instance points out that "Ice-sheets and glaciers terminate in temperate latitudes so that a temperate fauna would be in close proximity to ice, as in Switzerland, the Himalayas and America," and he suggests that the British fauna was not exterminated during the Glacial period, but only somewhat reduced. Scharff<sup>2</sup> produces evidence to show that the Ice Age was a much less severe period than is generally supposed and he also accommodates the bulk of the present fauna and flora in our islands during that period. This view undoubtedly has the advantage of being able to account for the comparative abundance of mammals, a group which, however easily the rest of the fauna and the flora might be transported can scarcely have reached our area after that became separated from the continent, and although there seems to be great differences of opinion with regard to when that separation took place, the majority of geologists seem to favour the view that it happened during or about the time of the Glacial period.

On the other hand, Clement Reid<sup>3</sup> regards any survival of our flowering plants, except in the case of a few arctic and alpine species, as quite impossible. He mentions the discovery in alluvial deposits of south Devonshire almost at sea-level, of leaves of the dwarf arctic birch and some arctic mosses as indications of the severity of the Glacial climate and also refers to evidence of floating ice in the English Channel. His views are supported also by the work of Lewis on the Scottish Peat-mosses<sup>4</sup> who finds evidence that the first flora on the Glacial deposits consisted of arctic species such as *Dryas octopetala*.

But even many of those who recognize the arctic nature of the fauna and flora of the Glacial period consider that the southern and western Irish group is pre-Glacial and apparently follow Edward Forbes<sup>5</sup> in regarding it as having reached our area during or before the Miocene period. Forbes, however,

<sup>1</sup> "The Effect of the Glacial Period on the Fauna and Flora of the British Islands." Nat. Sci., iii, 1893.

<sup>2</sup> "The History of the European Fauna," 1899, p. 65, et seq.

<sup>3</sup> "The Relation of the Present Plant Population of the British Isles to the Glacial Period." Brit. Assoc., Section K, Portsmouth Meeting, 1911.

<sup>4</sup> Trans. Roy. Soc. Edinb. :—xli, Part iii, 1905; xlv, Part ii, 1906; xlvi, Part i, 1907; xlvii, Part iv, 1911.

<sup>5</sup> "The Geological Relations of the Fauna and Flora of the British Isles," &c. Mem. Geol. Survey, vol. I. 1846.

included as part of his theory as to the origin of this group a land-connexion between the Spanish peninsula and the British Islands. It seems to me that even if this group survived the Glacial period in the west of Ireland there is no reason why it should have reached, and no evidence that it did reach, this country from that direction and in the alternative there is some reason for saying that no land-connexion would have been of any use to it.

Now climate has always been recognized as one of the chief factors in limiting the area of distribution of a species, in fact we rely upon it to such an extent that we deduce the character of the climate of a country in past ages from the nature of the species which inhabited it. We find that, in Eocene and Miocene times, the lion, hippopotamus and other animals which now live in tropical countries inhabited the British Isles and we conclude that our country at that time enjoyed a hot climate. We know also that during the same period the Arctic Regions were occupied by species now found in temperate latitudes and we conclude that the climate of the Polar Regions was then temperate.<sup>1</sup> Further, we can trace from the early Tertiary period to the early Pleistocene or post-Pliocene a gradual change in the faunas and floras of the northern hemisphere such that we conclude there was a gradual cooling of the climate over the whole area until the British Isles had slowly changed from hot to temperate and from temperate to cold, and until they endured the rigours of what we now call an "arctic" climate. Geological evidence as to the Glacial period supports the palaeontological record so that the relationship of climate to fauna and flora, at any rate for that epoch, is fully established.

On the basis of this relationship between fauna and climate, every species may be regarded as having a climatic area which it is capable of occupying. About some centre within that area the conditions of existence will approach the ideal for the species but towards the limits the conditions will become less and less suitable. Further, this climatic area will consist of large habitable areas dotted with uninhabitable "islands" and also, especially towards the limits, of isolated patches or "islands" in the midst of uninhabitable tracts. Fluctuations of climate will affect the area, isolating new patches and bridging old gaps; they will affect the rate of production of the species and of competitive species so that there will be constant changes in the oecological relations. The centre of production will however normally produce an excess of individuals and the surplus will distribute itself, replacing losses and spreading as far as climate and competition will allow.

With changes in climate such as those which led up to the Glacial period,

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<sup>1</sup> Nathorst, A. G.: "Fossil Floras of the Arctic Regions as evidence of Geological Climates." *Geol. Mag., N.S., Decade V, vol. viii, pp. 217-225. May, 1911.*

the centre of production of such a species would have moved southward, and with the retreat of the ice would again have returned northward and the palaeontological record is clearly explicable on this assumption. It is obvious therefore, that the present-day centre of production of any species only indicates the climatic type to which that species belongs and cannot in any way be regarded as the permanent home of the species. It must however be remembered that altitudinal movement is equivalent to latitudinal so that a species domiciled in the mountains of southern Europe during the tropical and warm temperate periods would occupy a temperate or even arctic "island" and could, by descending to the plains as the climate grew colder, maintain its centre of production in the same geographical area.

With regard to Forbes' Lusitanian species it is not contended that they were "tropical" in the Miocene period. They are not so now and from the fact that at least many of them occur in the mountains in the Spanish peninsula, they are not even warm temperate species. At the time when the British islands enjoyed a tropical climate these "Lusitanians"—if they were then in Spain and Portugal—must have been high up in the mountains and just as effectively isolated from Ireland as if an ocean rolled between these two areas as it does at the present day. Forbes' hypothesis of a land-bridge, to account for these species reaching Britain from the Spanish peninsula during Miocene times is therefore of no avail, unless we assume also the existence of a mountain-range and in western Europe mountain-chains tend to run east and west, not north and south.

When we remember also that from Miocene to Pleistocene the general movement of the fauna and flora was southward, it seems even less probable that our south-western Irish group came to us from south-western Europe—unless they have reached us since the climax of the Glacial period. At some time previous to the Glacial period our country enjoyed a temperate climate and, assuming that these species survived the cold period here, it seems more reasonable to believe that they came to us from the north and that they reached the Spanish peninsula from the same direction.

With regard to the western group being a relict fauna and flora, it is to be noted that the species are not in the west confined to the mountains. Many of them, both northern and southern, descend almost to sea-level and are found living side by side. It has been suggested that the damp atmosphere of the west is the dominating climatic factor, but this can scarcely affect the water-beetle fauna. It seems more likely that the small annual range of

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<sup>1</sup> I draw a distinction between his group and that of later writers who do not distinguish between his "Lusitanian" and "Gallican" types.

temperature may be of some importance in suiting these "westerns" better than it suits the bulk of the fauna and flora. The tendency of mountain species to descend on the coasts has long been known and the mountain climate for a large part of the fauna and for the flora resembles the coast climate in its limited annual range of temperature. The summer heat in mountain districts is not excessive and direct insolation is controlled by the prevalence of clouds, while in the winter the smaller animals and the plants are protected from excessive cold by a covering of snow and, in the case of water species, the temperature will, of course, not fall below freezing-point.

That our "arctics" can however withstand greater variations of temperature is seen from the fact that some of them still survive in other parts of our islands. For instance, *Caelambus v-lineatus* and *ix-lineatus* and *Agabus congener* are found in Hampshire, and the latter has also occurred in West Kent and Berkshire, in situations approaching sea-level. The first-mentioned species also occurs not only all over Ireland but is the commonest species in some of the hot mill-dams in the neighbourhood of Belfast, where the temperature runs as high as 25° C (77° F). In the case of plants many of them live well in our gardens in all parts of the country provided they are protected from excessive cold during the winter.

The localisation of these "arctics" seems therefore to be due chiefly to the fact that the conditions which they endure in mountain districts and on our western coasts are less inconvenient to them than to the bulk of the fauna and flora and their position is therefore due to competition. They are really species which have been squeezed out of the better places by stronger competitors and, in our latitudes, they are now penned into the only situations where they have an advantage over those species which happen to require a greater annual range of temperature for their existence.

The so-called "Lusitanians" may be a similar group to the arctics, but requiring rather more warmth than these. They may represent a few survivors of the pre-Glacial temperate group which had been driven out of the better places and owe their survival in Ireland to the fact that they had been penned in along the western coast.

On the other hand, if the squeezing-out process took place in pre-Glacial times it may equally well be taking place now, so that genuine pre-Glacials may, in the west, be mixed with post-Glacials. In another paper ("The Aquatic Coleoptera of the south-east of Ireland," *Irish Nat.*, January, 1912) I have suggested that those water-beetles which show a south-eastern Irish distribution are the latest arrivals in the country. The range of these species is almost entirely confined to the coastal counties, but several have spread westward as far as Kerry and one or two even as far as Clare. *Pelobius*

*tardus*, Herbst. has spread along the south coast only. *Helochares punctatus* which is common in West Mayo and has also occurred in West Galway extends along the south coast as far as Wexford, and *Octhebius viridis* extends from Armagh round the south and west coasts to West Mayo. It seems possible therefore that the southern section of these western water-beetles may be merely a squeezed-out portion of the main southern group of immigrants. On the other hand, it might be that in the west of Ireland they represent a relict of the pre-Glacial temperate fauna, while the English and southern Irish individuals have reappeared from the south in post-Glacial times. The British distribution of *P. nigro-*

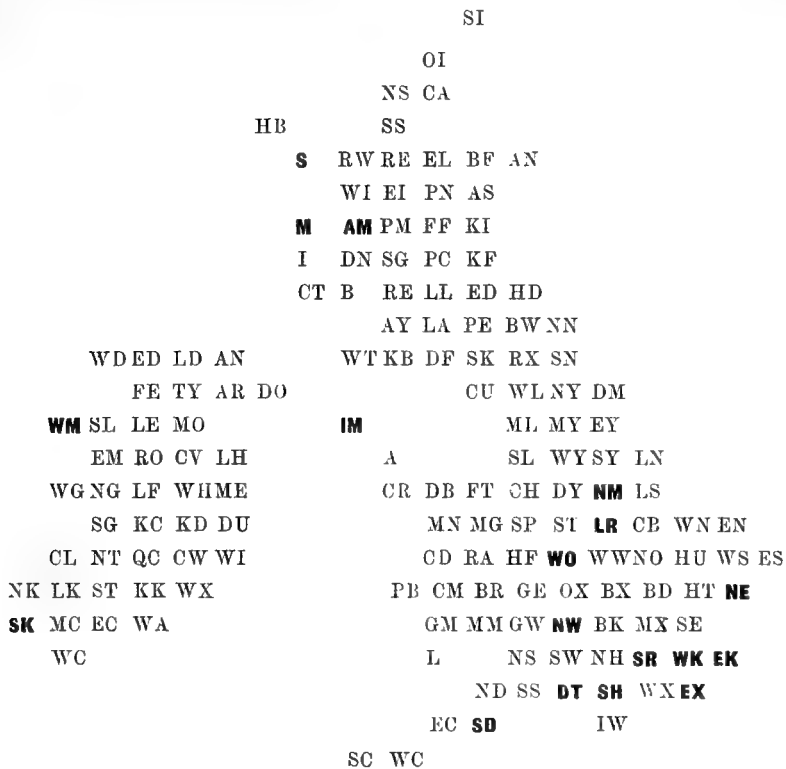


FIG. 3.—Distribution of *Paracymus nigro-aeneus*, Saub.

*aeneus* seems to favour this view. It occurs in the southern English counties from Kent in the east as far north as Nottingham and it reappears in western Scotland in Main Argyll, Coll and Mull (Mid-Ebudes), and Eigg (North Ebudes). Its occurrence in the Isle of Man, which was entirely glaciated, and where the whole fauna and flora are undoubtedly post-Glacial, is not so easily accounted for unless it is one of those "ectopic" cases

to which I referred in a previous paper ("The Aquatic Coleoptera of the Mid-Ebudes," *loc. cit.*). The entire absence of Forbes' "Lusitanians" from Britain might also perhaps be regarded as favouring the view of their pre-Glacial existence in Ireland.

The fact that the ice-sheet at the climax of the Glacial period did not completely cover the whole British area no doubt helps to make the question of survival of the fauna and flora more difficult. The north and south migration ceased perhaps before all the temperate species had been exterminated but it seems difficult to believe that much of our present fauna and flora could have endured the "tundra" conditions which appear to have existed even in the South of England.

If, as seems possible, at least the bulk of the southern species came from the south then, on the grounds already stated, they are post-Glacial immigrants. If, on the other hand, the climatic conditions were not so severe as many believe and the bulk of the fauna and flora survived in the country, then they arrived from the north and possibly only the warm temperate species localised in the south and east have arrived since the passing away of the Glacial period.

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1898. HALBERT, J. N.: "Impressions of Achill," *Irish Nat.*, vii, p. 135. (Mentions two species—*H. obscurus* and *O. bicolon.*)
1898. ————— Irish Field Club Union, Kenmare Conference. *Irish Nat.* vii, p. 212. (Mentions capture of *P. nigro-aeneus* in flood refuse, Erriff River in spring, 1897.)
1901. JOHNSON, W. F., and J. N. HALBERT: "A List of the Beetles of Ireland." *Proc. Roy. Irish Acad.*, Ser. iii, vol. vi. (Mentions seven species from Mayo, but only in the case of *H. tristis* and *H. obscurus* is any reference to locality given. These are both West Mayo records.)



HEMIPTERA.

BY J. N. HALBERT.

Read JUNE 24.      Published SEPTEMBER 7, 1912.

PREVIOUS to the organization of the present Survey, nothing was known of the hemipterous fauna of the Clare Island district, which includes a considerable part of Mr. Praeger's botanical division of West Mayo (division number 27).

The following records are the result of a few short visits to the district during the last three years, so that they cannot be regarded as supplying a complete list of this section of the fauna. Owing also to the pressure of other field-work, it was not possible to devote to these delicately organized insects the special attention which is necessary in order to secure a representative collection. This result could be attained only by very persistent work, as anyone who has attempted to collect such wary insects as Cicadina (the "frog-hoppers" of gardens) will understand. Still, I believe the following list conveys a fair idea of the prevalent forms of Hemiptera occurring in the Clare Island neighbourhood.

The actual area in which collecting was carried out ranges from Achill Island inland to Castlebar, and southwards to the Mayo shore of Killary Harbour. At least one interesting species (*Aëpophilus Bonnairi*) is recorded from Blacksod Bay, immediately north of Achill.

With regard to the natural features of the district, little need be said, as full accounts have already appeared in other reports of this series. For present purposes it is only necessary to point out that old-established woodlands are rare except in the neighbourhood of Westport, where, in the fine demesne of the Marquis of Sligo, most of the woodland species were collected. A great deal of the district is occupied by bare mountain (reaching in Croaghpatrick 2510 feet) and moorland, rather poor ground for hemipterous insects, though a few interesting species may be expected to occur in such places. There are sandhills at Curraun, Mulranny, and elsewhere; these do not seem quite as productive of insect life as are those of the east coast.

Three excursions were made to the Clare Island district in June and the first half of July, as opportunity occurred, and most of the species were collected on these occasions. The late summer and autumn species were not

specially sought for, which no doubt accounts for many absentees from the list, especially as I believe the Hemiptera to be decidedly later in reaching maturity in these exposed western localities than they are in the south of Ireland.

In the following list there are records of some 172 species of Hemiptera, belonging, with two exceptions, to the Heteroptera and Cicadina groups. The only species of the family Coccidae noted were *Chionaspis salicis* and *Orthesia cataphracta*; the latter is common in moss throughout the district. No attempt was made to collect the Aphidae, an important group which has not been studied to any extent in this country.

Naturally the great majority of the species recorded below are common and widely distributed in the British Isles. There is, however, a leavening of rare or local species, including the usual mixture of northern and southern forms, which we find in all orders of insects in the west of Ireland. As examples, the following may be referred to:—*Orthostira cervina*, *Aëpophilus Bonnairei*, *Gerris costae*, *Myrmedobia tenella*, *Teratocoris Saundersi*, *Dicyphus pallidicornis*, *Corixa Scotti*, *Corixa Germari*, *Cixius brachycranus*, *Liburnia distincta*, *Limotettix intermedia*, and *Orthesia cataphracta*.

The most interesting of these is undoubtedly *Aëpophilus Bonnairei*, a sub-maritime insect which was found in its usual habitat, between tide-marks, at Blacksod, as well as on the Galway coast. Since the discovery of this local species by Mr. A. R. Nichols on the shore at Dungarvan, it has been regarded as one of our most typical Lusitanian animals, as it is only found on the French and Spanish coasts, and in the south-west of England (see page 7). Bearing in mind the continental distribution of *Aëpophilus*, this extension of its known range into the west of Ireland is not surprising.

From a survey of the hemipterous fauna I should be inclined to believe that the southern element is not so well represented in West Mayo as it is in the more diversified county of Galway. For instance, in the family Pentatomidae, which includes the "shield-bugs," only three species were found in the Clare Island district, though a fourth, *Pentatoma baccharum*, almost certainly occurs.

In various parts of Galway I have found *Pentatoma prasina* (at Ross), *Pentatoma baccharum* (Roundstone), *Piezodorus lituratus*, *Picromerus bidens* (Moycullen), *Podisus luridus* (Clonbrock and Woodford), and the brightly coloured *Zicrona coerulea* (Woodford). These insects have a decidedly southern range in the Britannic area; and it is not unlikely that some of them may prove absent from West Mayo.

As Clare Island is the centre of interest in these researches, it should perhaps be mentioned that sixty-six species, including twenty-six Homoptera,

were collected there. Most of these were found in the east, where there is some stunted native wood. It will be noticed that a few of these were not found on the adjacent parts of the mainland, though there is no reason why they should not be found throughout the district. Amongst the less common Hemiptera occurring on the island are *Orthostira cervina*, *Gerris costae*, *Dicyphus pallidicornis*, *Notonecta furcata*, *Corixa Scotti*, and *Corixa Bonsdorffi*. Not a single representative of the family Pentatomidae was found on the island.

With regard to the way in which the hemipterous fauna found its way to Clare Island, there seems little doubt that it must have reached that area while it was yet joined to the mainland. No doubt the great majority of the species are winged, yet, with few exceptions, they cannot be regarded as strong fliers, and, compared with beetles, they are rarely seen on the wing. I would be inclined to believe that, short of the assistance of strong gales of wind, the three miles of open sea which separate the island from the nearest point of the mainland would be quite an effectual barrier to these insects. Some few Hemiptera, such as *Aëpophilus*, are devoid of wings.

Amongst the Heteroptera two species—*Dicyphus Epilobii* and *Corixa Scotti*—have not been previously recorded from Ireland; while of the Cicadina, a group which is very imperfectly known in this country, some thirty species are now recorded as Irish for the first time. I have notes, however, of the occurrence of the great majority of these in other Irish localities.

I am indebted to Mr. J. Edwards, F.E.S., for kindly verifying the identification of certain of the more critical species.

The initial letters following the species in the general list stand for the following localities:—

A = Achill.	Cb = Castlebar.
B = Inishbofin.	L = Louisburgh.
Bc = Belclare.	P = Croaghpatrick.
C = Clare Island.	W = Westport.

#### LIST OF SPECIES.

##### HETEROPTERA.

<i>Tropicoris rufipes</i> L.—W.	<i>S. arenarius</i> Hahn.—C.
<i>Acanthosoma haemorrhoidale</i> L.—A.	<i>Drymus sylvaticus</i> Fab.—C.
<i>A. dentatum</i> De G.—A.	<i>Scelopostethus decoratus</i> Hahn.—W.
<i>Cymus grandicolor</i> Hahn.—Bc, Cb, W.	<i>Piesma quadrata</i> Fieb.—W.
<i>Stygnus rusticus</i> Fall.—W.	<i>Orthostira brunnea</i> Germ.—W.
<i>S. pedestris</i> Fall.—W.	<i>O. cervina</i> Germ.—C.
	<i>O. parvula</i> Fall.—C, L.

- Derephysia foliacea* Fall.—W.  
*Monanthia cardui* L.—W.  
*Aërophilus Bonnairi* Sig.—B'sod.  
*Hydrometra stagnorum* L.—L.  
*Microvelia pygmaea* Duf.—L.  
*Velia currens* Fab.—C, A, W.  
*Gerris costae* H. S.—C, A, P.  
*G. thoracica* Schum.—C.  
*G. lacustris* L.—C, A, W.  
*G. odontogaster* Zett.—C.  
*Nabis flavomarginatus* Scholtz.—L, W.  
*N. limbatus* Dahlb.—W.  
*N. ferus* L.—C.  
*Salda saltatoria* L.—C, L, P, W.  
*S. pallipes* Fab.—A.  
*S. orthochila* Fieb.—C, B.  
*S. scotica* Curt.—Bc.  
*S. littoralis* L.—A, Cb, L, W.  
*S. cineta* H. S.—W.  
*Lycocoris campestris* Fall.—C, L.  
*Temnostethus pusillus* H. S.—W.  
*Anthocoris confusus* Reut.—C, W.  
*A. nemoralis* Fab.—W.  
*A. sylvestris* L.—C, W.  
*Myrmedobia tenella* Zett.—Cb.  
*Pithanus Maerkeli* H. S.—C, B, L, W.  
*Miris calcarata* Fall.—A, Bc, L, W.  
*M. laevigata* L.—Cb, W.  
*M. holsatus* Fab.—Cb, W.  
*Megaloceroea ruficornis* Fourc.—L, W.  
*Teratocoris Saundersi* D. & S.—Cb,  
L, W.  
*Leptopterna ferrugata* Fall.—C, L, W.  
*Monalocoris filicis* L.—C, Bc, L, W.  
*Phytocoris longipennis* Flor.—W.  
*Calocoris striatellus* Fab.—W.  
*C. sexguttatus* Fab.—W.  
*C. bipunctatus* Fab.—C, A, L, W.  
*C. roseomaculatus* De G.—L, W.  
*Oncognathus binotatus* Fab.—W.  
*Plesiocoris rugicollis* Fall.—C.  
*Lygus pratensis* Fab.—C, W.  
*var. campestris* Fab.—W.  
*L. contaminatus* Fall.—A, Bc, W.  
*L. viridis* Fall.—W.  
*L. lucorum* Mey.—C, L.  
*L. pabulinus* L.—C, P, L, W.  
*L. pastinacae* Fall.—L.  
*L. cervinus* H. S.—Bc, W.  
*Poeciloseytus unifasciatus* Fab.—Cb,  
W.  
*Liocoris tripustulatus* Fab.—W.  
*Rhopalotomus ater* L.—Bc, L, W.  
*Labops saltator* Hahn.—W.  
*Dicyphus epilobii* Reut.—W.  
*D. pallidicornis* Fieb.—C.  
*Campyloneura virgula* H. S.—W.  
*Cyllocoris histrionicus* L.—Bc, W.  
*Aetorhinus angulatus* Fab.—W.  
*Globiceps dispar* Boh.—W.  
*Mecomma ambulans* Fall.—Bc, W.  
*Cyrtorrhinus caricis* Fall.—Cb, W.  
*Orthotylus marginalis* Reut.—C, L.  
*Heterocordylus tibialis* Hahn.—A.  
*Phylus melanocephalus* L.—W.  
*Psallus betuleti* Fall.—Bc, W.  
*P. lepidus* Fieb.—Bc, W.  
*P. Fallenii* Reut.—Cb, W.  
*P. varians* H. S.—W.  
*P. sanguineus* Fab.—C, W.  
*Plagiognathus viridulus* Fall.—C, Bc,  
L, W.  
*P. arbustorum* Fab.—W.  
*Asciodema obsoletum* D. & S.—W.  
*Nepa cinerea* L.—C, A, T, W.  
*Notonecta glauca* L.—L, W.  
*var. furcata* Fab.—C, L, W.  
*Corixa Geoffroyi* Leach.—C, A.  
*C. Sahlbergi* Fieb.—C.  
*C. striata* Fieb.—C, L, W.  
*C. distincta* Fieb.—C, Cb, W.  
*C. Fallenii* Fieb.—A, L,

*Corixa moesta* Fieb.—C, A.  
*C. semistriata* Fieb.—C.  
*C. Fabricii* Fieb.—C.  
*C. fossarum* Leach.—C, Cb.  
*C. Scotti* Fieb.—C, A.  
*C. praeusta* Fieb.—C, A.  
*C. Germari* Fieb.—A.  
*C. Bonsdorffi* Sahlb.—C, A, W.

## CICADINA.

*Cixius pilosus* Ol.—Be, W.  
*C. cunicularis* L.—B, W.  
*C. nervosus* L.—C, A, Be, W.  
*C. stigmaticus* Germ.—P.  
*C. brachycranus* Fieb.—W.  
*Liburnia notula* Germ.—Cb, W.  
*L. vittipennis* J. Sahlb.—W.  
*L. distincta* Flor.—A, L.  
*L. lepida* Boh.—Cb.  
*L. pellucida* Fab.—W.  
*L. difficilis* Edw.—W.  
*L. discreta* Edw.—W.  
*L. forcipata* Boh.—Be, L, W.  
*L. Fairmairei* Perris.—C, Cb, W.  
*L. limbata* Fab.—C, W.  
*Aphrophora alni* Fall.—Cb, W.  
*Philoenus spumarius* L.—C, A, L, W.  
    *var. leucophthalma* L.  
    *var. leucocephala* L.  
    *var. lateralis* L.  
    *var. ustulata* Fall.  
    *var. lineata* Fab.  
    *var. populi* Fab.  
*P. lineatus* L.—C, Be, W.  
*Ulopa reticulata* Fab.—C, W.  
*Megophthalmus scanicus* Fall.—C.  
*Macropsis lanio* L.—W.  
*Bythoscopus rufusculus* Fieb.—A, Be.  
*B. flavicollis* L.—C, A, Be.  
*Pediopsis impurus* Boh.—C, L.  
*Idiocerus lituratus* Fall.—C, W.  
*I. confusus* Flor.—C.

*Agallia venosa* Fall.—W.  
*Evacanthus interruptus* L.—C, A, L, W.  
*Tettigonia viridis* L.—C, A, L, W.  
*Strongylocentrotus agrestis* Fall.—Cb, L, W.  
*Acrocephalus nervosus* Schr.—C, Cb, W.  
*A. albifrons* L.—C, P, W.  
*Athysanus sordidus* Zett.—A, W.  
*A. griseescens* Zett.—A, W.  
*A. communis* J. Sahlb.—Cb, W.  
*A. obscurellus* Kbm.—W.  
*A. obsoletus* Klm.—C, W.  
*Deltocephalus pascuellus* Fall.—W.  
*D. Flori* Fieb.—Cb, W.  
*D. socialis* Flor.—W.  
*D. sabulicola* Curt.—L.  
*D. striatus* J.—Be, L, W.  
*D. pulicarius* Fall.—C, L, W.  
*D. distinguendus* Flor.—C, L.  
*Thamnotettix prasina* Fall.—W.  
*T. subfuscula* Fall.—Be, W.  
*Limotettix striola* Fall.—C, Cb, W.  
*L. intermedia* Boh.—W.  
*L. quadrinotata* Fab.—W.  
*L. sulphurella* Zett.—W.  
*Cicadula septemnotata* Fall.—Cb, W.  
*C. fasciifrons* Stal.—Cb, L, W.  
*C. sexnotata* Fall.—L.  
*C. Fieberi* Edw.—C.  
*Dicraneura flavipennis* Zett.—C, W.  
*Kybos smaragdulus* Fall.—W.  
*Eupteryx vittatus* L.—W.  
*E. urticae* Fab.—W.  
*E. auratus* L.—W.  
*Typhlocyba ulmi* L.—W.  
*Livia juncorum* Latr.—C, Cb, W.  
*Rhinocola ericae* Curt.—P.  
*Aphalaria picta* Zett.—C, W.  
*Psyllopsis fraxini* L.—W.  
*Psylla pineti* Flor.—A, W.

*Psylla salicicola* Först.—C, L.*Psylla buxi* L.—W.*P. Hartigii* Flor.—Be.

## COCCIDAE.

*P. betulae* L.—C.*Chionaspis salicis* L.—W.*P. peregrina* Först.—W.*Orthesia cataphracta* Shaw.—C, A, L,*P. Forsteri* Flor.—W.

W.

*P.alni* L.—W.

## NOTES ON THE LIST.

*Acanthosoma haemorrhoidale* L.— } Found at Sraheens Lough on Achill  
*A. dentatum* De G.— } Island in June (W. F. Johnson). Both  
 are widely distributed insects in the southern parts of Great Britain.

*Piesma quadrata* Fieb.—Westport district, under stones, and by sweeping on the sea-shore, July.

*Orthostira brunnea* Germ.—Westport district; found frequently in moss while searching for Acari; also sent in moss from Leenane in April.

*O. cervina* Germ.—A few specimens found in moss sent from Clare Island in June. Has been recorded from Armagh and Waterford, and there is an example in the collection of the late C. W. Buckle taken at Portmore Lough in the Lough Neagh district.

*Microvelia pygmaea* Duf.—Lakes south of Louisburgh, and probably overlooked in other places. Widely spread in Ireland from Dublin and Armagh to Kerry and Donegal.

*Velia currens* Fab.—Clare Island, Achill, and Westport district, apterous form only. The rare winged form of this species may be met with in restricted spots year after year in company with the undeveloped form—as in the shallow bed of the River Dodder at the foot of the Dublin hills. Mr. Buckle found it at Shane's Castle, Lough Neagh, in the autumn months.

*Aëpophilus Bonnairei* Sig.—An adult specimen of this very local insect was found between tide-marks, at Elly Bay, Blacksod, during September, 1909, by Mr. S. W. Kemp, who has kindly presented it to the National Museum.

Nor is this the only western locality in which it has occurred. While studying the littoral fauna of County Galway some years ago, Mr. W. M. Tattersall found adult examples of *Aëpophilus* at Ballinakill<sup>1</sup> (March), and also at Tawin, a peninsula quite close to Ardfry (February, 1909). At both places it was found between tide-marks in the cavities

<sup>1</sup>Mr. Tattersall tells me that the exact locality is Green Rocks at the entrance to Fahy Bay, Ballinakill. These consist of a small group of isolated rocks which are covered by the sea at high tide.

of stones which had been bored by *Saxicava*. The only other recorded locality in this country is at Dungarvan on the Waterford coast, where the first Irish specimen was discovered by Mr. A. R. Nichols some years ago. (*Entom. Mo. Mag.*, (2), viii, 1897.)

The known range of *Aëpophilus* is distinctly south-west European, as the only continental records are from the French and Spanish (Galician) coasts. The species has long been known as a denizen of the Cornwall and Devon littoral, as at Polperro, Mousehold, Penzance, Lyme Regis, Plymouth, and between Barnstaple and Ilfracombe in North Devon. Mr. G. C. Champion has also met with the larva under deeply imbedded stones just below high-water mark on the beach at Totland Bay, Isle of Wight, in company with its usual associates *Aëpus* and *Micralymma*. (*Entom. Mo. Mag.*, xxx, 1894.)

***Gerris costae*** H. S.—Lakes on Clare and Achill Islands; Polranny (W. F. Johnson); in a pool near the summit of Croaghpatrick, June.

I have taken this highland form commonly in the Dublin and Wicklow Mountains (River Dodder, pools on Kippure, Lough Bray, and at Kelly's Lough on Lugnaquilla).

Mr. G. W. Kirkaldy has noted<sup>1</sup> the peculiar distribution of this water-bug. It is found over the greater part of central and southern Europe, but has not, apparently, been found in Scandinavia. In the Britannic area, on the other hand, it is decidedly a subalpine insect, occurring in North Wales and throughout the Scottish Highlands. An English locality (Burton) is recorded in Derbyshire.

***Nabis flavomarginatus*** Scholtz.—Louisburgh and Westport. The winged form occurred in the latter locality, and I have also met with it in the Dublin district and in South Clare. (Armagh, W. F. J.)

***Lytocoris campestris*** Fall.—Clare Island, and on Mweelrea. Occurred in a hay-loft in the first-mentioned locality, and was probably introduced there.

***Myrmedobia tenella*** Zett.—A female of this local insect was captured by sweeping herbage in a marshy place on the shore of Lough Lamough at Castlebar in July. I had previously found this species in County Dublin (Lucan demesne), Meath (Laytown sandhills), and in Galway (Clonbrock). Saunders records it from a few localities in Suffolk.

***Teratocoris Saundersi*** D. & S.—Found commonly at Castlebar, Louisburgh, and Westport by sweeping herbage in marshy places. This species is said to occur rather locally in England; it is widespread in Ireland, occurring in Dublin, Louth, Wicklow, Galway, and Kerry.

<sup>1</sup> A Guide to the Study of British Water-bugs (Aquatic Rhynechota). "Entomologist," xxxii, p. 298.

*Oncognathus binotatus* Fab.—  
*Plesiocoris rugicollis* Fall.—

{ Both of these insects are common in the west of Ireland; they are rarer, however, towards the east.

*Lygus lucorum* Mey.—Taken by Mr. Morley on Clare Island and at Louisburgh.

*Paeciloscytus unifasciatus* Fab.—Castlebar Lough and in the Westport demesne. Rather a local species, occurring chiefly in the west of Ireland. I have usually taken it by sweeping herbage on lake margins, as in Limerick (Lough Gur) and South Clare. The only locality known for it in the east is in the Belfast district (Lagan Canal), where it was taken by Mr. C. W. Buckle.

*Dicyphus epilobii* Reut.—In the Westport demesne. Although this insect has not been definitely recorded from Ireland, it is probably widespread, as I have taken it several times in the Dublin district (Tibradden, Tallaght, Donabate, and Santry).

*D. pallidicornis* Fieb.—Clare Island and Louisburgh; common everywhere on *Digitalis* (C. Morley). The range of this species in Ireland is not known, though probably it will be found to occur wherever its food-plant, the Common Foxglove, is abundant. Mr. Donisthorpe found it in north Kerry. Widespread in Great Britain.

*Globiceps dispar* Boh.—A few specimens taken by sweeping in meadows in Westport demesne. Not common in Ireland.

*Notonecta glauca* L. var. *furcata* Fab.—Common in Creggan Lough and other small lakes on Clare Island; also at Louisburgh and Westport. A melanic variety, which is probably common throughout the district. It has been found in various localities in Donegal (Foyle district, Bundoran, &c.), at Bangor (Co. Down), Kenmare, and it is the prevalent form in Ballyknockan bog in Co. Wicklow.

The allied *Plea* was not found; it occurs, however, in Cregduff Lough, near Roundstone, outside the limits of the Clare Island district.

*Corixa Germari* Fieb.—A single example of this local species occurred in a small lake in north-east Achill during June. As has been pointed out by Mr. Kirkaldy,<sup>1</sup> the *Corixa carinata* of the Saunders "Catalogue" comprises two species, which may be separated by the shape of the frontal fovea and of the strigil in the male. The insect here recorded is a male, and is undoubtedly to be referred to the species he calls *C. Germari* Fieb. Other localities for the species are Lough Gill, where it occurred in small pools on the lake-shore in July, Foyle district in March (C. W. Buckle), and at Ardara (W. F. Johnson). The insect recorded under the name of *C. carinata*, from Newcastle, Co. Down, in

<sup>1</sup> Kirkaldy, G. W. On the specific distinctness of *Corixa carinata* and *C. Germari*, &c. "Entomologist," xxxi, 1898, p. 249.



Saunders' "Monograph" is probably to be referred to the present species; it was taken by Mr. G. C. Champion.

The distribution of *Corixa Germari* in Great Britain is decidedly northern. It is recorded as occurring in various localities in Scotland as far north as the Shetlands.

**C. striata** Fieb.—Specimens of this common species taken in peaty lakes, such as Avullin and Creggan Loughs on Clare Island, are decidedly darker than the average, and the pale lines of the clavus are less dilated inwardly. Dark forms of *C. nigrolineata* Fieb. were also common in such places.

**C. Scotti** Fieb.—Found in various small peaty lakes on Clare and Achill Islands. This species has not been previously recorded from Ireland. It is evidently widespread in the north and west of Ireland, as I have taken it in the lakes at Fair Head (Antrim), Milford district (Donegal), and in Lough Crincaum near Killarney. There is a specimen in Mr. Buckle's collection taken at Roosky (Donegal) in the beginning of February. Evidently a northern species in the Britannic area. Saunders records the following localities—Shetlands, Morayshire, Argyllshire, Mull, and Strathglass.

**Corixa Bonsdorffi** Schlb.—Lakes on Clare and Achill Islands, and at Westport.

Widespread in Ireland, occurring in the counties Donegal, Sligo, Armagh, Galway, Dublin, Westmeath, and Kerry. In county Dublin it is abundant in the Royal Canal, along which it has evidently made its way from the Mullingar lakes, where it is quite common. The nymph of *C. Bonsdorffi* is rather a distinctively coloured insect. It is of a delicate greenish white, the apical margins of the body-segments and the connexivum are brown, and the lateral margins of the wing-pads are orange-yellow. Both the notum and wing-pads are clothed with long black hairs.

**Cixius stigmaticus** Fieb.—A specimen of *Cixius* taken by Mr. C. Morley on Croaghpatrick on heather, is referred by him to this species. Mr. Edwards<sup>1</sup> mentions only two British localities for this insect: "Deal, on *Hippophæ rhamnoides* (Douglas); Inverness-shire (Buchanan-White)."

**C. brachycranus** Fieb.—A single specimen taken by sweeping amongst "scrub" on the shores of Lough Lannough, at Castlebar, in July. It is recorded as being not uncommon in woods in England, ranging from Penzance to Newcastle at least. Though not previously found in Ireland, it is probably widespread there, as the species may be easily confused with the common *C. nervosus*. Identification verified by Mr. Edwards.

**Liburnia notula** Germ.— } Frequent in marshy places in the Westport and  
**L. vittipennis** J. Sahlb.— } Castlebar districts.

<sup>1</sup> The Hemiptera-Homoptera of the British Isles, p. 26.

- L. distincta** Flor.—A brachypterous male of this rare little hemipteron was captured in the woods at Sraheens Lough on Achill Island in June; and the female occurred by sweeping on the moor at Laghta near Louisburgh in the month of July. These are the first recorded specimens from Ireland, where it is apparently very local, as it seems unrepresented amongst some hundreds of Cicadina collected in all parts of Ireland. Equally rare also in Great Britain; only one locality, Bournemouth, is recorded. However, Mr. Edwards tells me he took both sexes of this insect at Roydon Fen near Diss, Norfolk, on the 21st September, 1908. Abroad it is recorded from Bohemia.<sup>1</sup>
- L. discreta** Edw.—Male taken at Mountbrowne Lough near Westport. I had previously collected this species in the east of Ireland on the Laytown and Portmarnock sandhills.
- L. sp.**—Some examples of a small yellowish brown Liburnia with the apical part of the elytra marked with black were taken in the Westport district and elsewhere in Ireland. It is impossible to identify these with certainty until the discovery of the male insect.
- Idiocerus confusus** Flor.—Taken by Rev. W. F. Johnson and Mr. Claude Morley on willows in the patch of "scrub" near Portlea on Clare Island. Elsewhere I have taken it at Portmore, Lough Neagh.
- Tettigonia viridis** L.—The variety *arundinis* Germ. occurs on Clare Island. At Castlebar a rather unusual variety was noticed in which the vertex of the head and the hinder two-thirds of the prothorax are black instead of the usual bright green. I have also an extreme melanic form from Ballycastle (Antrim) with the elytra and most of the thorax shining black.
- Deltocephalus Flori** Fieb.—At Coolbreen Lough in the Castlebar district. Not previously recognized in Ireland.
- D. distinguendus** Flor.—Mr. C. Morley notes the occurrence of this species on Clare Island and at Louisburgh.
- Limotettix intermedia** Boh.—Taken on the bank of the Westport River, and at Coolbreen Lough in the same district during July. A rare insect in Great Britain; the only recorded locality is Loch Greenin, where it was taken by Mr. Douglas as long ago as September, 1866.
- Orthesia cataphracta** Shaw.—Occurs commonly in moss throughout the district, especially on the mountains, as on Croaghmore and Croaghpatrick. The distribution of this curious insect is distinctly northern. Mr. Newstead in his work on British Coccids records it from Greenland, Scandinavia, and northern Europe. It is widespread in Ireland and Scotland, including the western Hebrides, and has also been found in Lancashire, Denbighshire, Carnarvonshire, and on the Cotswolds near Chetenham.

<sup>1</sup> Melichar, Cicadinen von Mittel-Europa, p. 78.

ORTHOPTERA.

By GEORGE H. CARPENTER, B.Sc.,

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Read JUNE 24. Published SEPTEMBER 7, 1912.

THE collection of Earwigs and Grasshoppers from Clare Island and the neighbouring mainland has served to do little more than make known the presence of a few common and widely spread species of an order which is not strongly represented in the British Islands as a whole. Excluding the obviously introduced Common Cockroach (*Blatta orientalis*), found in the outhouse on Clare Island which served the naturalists as a laboratory, the following list includes one species of Earwig, the House Cricket, and four Grasshoppers. All of these, with one exception (*Mecostethus grossus*), are found on Clare Island as well as on the mainland.

LIST OF SPECIES.

**GRYLLIDAE.**

***Gryllus domesticus***, Linn.

Clare Island, not uncommon (Praeger). Doubtless also on neighbouring mainland.

The House Cricket is probably widespread in rural districts of Ireland, though there are very few specimens of it in the National Museum. In towns it seems to be easily driven out by competition of the Cockroaches. It ranges widely over Europe, and North Africa, which is believed by Burr to have been its original home.

**ACRIDIIDAE.**

***Tettix bipunctatus*** (Linn.).

Clare Island (P. H. Grimshaw), July, 1910.

Louisburgh, May, 1909; Castlebar, June, 1909, and July, 1911 (Halbert).

A widespread species both in Ireland and Great Britain, and ranging over most of the Palaearctic Region (Europe, North Africa, North and West Asia).

***Stenobothrus (Omocestus) viridulus* (Linn.).**

Clare Island (Grimshaw), July, 1910.

Belclare, Westport, July, 1910; Westport Demesne, July, 1911. (Halbert).

Numerous examples of this common British and Irish grasshopper were taken both on the island and the mainland. It is a species of northern distribution, ranging all over Scotland (Evans), and inhabiting, on the Continent, northern and central Europe, and the mountains of northern Spain, Siberia, and Mongolia (Burr).

***Stenobothrus (Stauroderus) bicolor* (Charp.).**

Clare Island (Grimshaw), July, 1910.

Westport demesne and Mount Brown Lough (Halbert), July, 1911.

This species is evidently common in the district, though less abundant than *S. viridulus*. It is widespread in Great Britain and Ireland, and has an enormous range over the Palaearctic Region—eastward to Japan, and southward to North Africa and Burma.

***Mecostethus grossus* (Linn.).**

Doolough, Co. Mayo (H. Bonaparte Wyse).

This large and handsome Grasshopper has long been known as a feature of the fauna of Connemara (Carpenter), and it is of interest to record it from a station further to the north. It has been found also in Co. Kerry, but never in the midlands or east of Ireland. Its British and Continental distribution is very puzzling. In England its headquarters appear to be the Channel district (Dorset, Hants, Surrey) and the eastern fenland country (Huntingdonshire and Cambridgeshire). There seems to be only one old and doubtful record for Scotland. Abroad, on the other hand, the species seems distinctly northern, as it ranges all over northern and central Europe from Lapland to the Alps and Balkans, extending also into Siberia, northern Spain and Portugal, and northern Italy.

**FORFICULIDAE.**

***Forficula auricularia*, Linn.**

Clare Island and throughout the district. Common everywhere.

Miss E. K. Saunders, when on Clare Island in August, 1909, collected over 100 Earwigs, which have been forwarded to Mr. H. H. Brindley,

of Cambridge. Mr. Brindley is studying the variation of mainland and island Earwigs, in continuation of the observations which he published in 1892 in collaboration with Professor W. Bateson, on the forceps of male Earwigs collected on the Farne Islands off the coast of Northumberland. Of about 1000 Farne Island specimens, 583 were males, and these showed a marked dimorphism with regard to the length of the forceps, the majority of the specimens falling into two groups averaging respectively 3·5 mm. and 7 mm. in the forceps-length. It seems that on the mainland of Great Britain "high" males—as those with long forceps are called—are relatively scarce. Mr. Brindley in a recent letter has kindly informed me that 40 per cent. of the Earwigs collected on Clare Island were males, and that among these there were no strikingly "high" specimens, and only a "slight suggestion of dimorphism." The Earwigs of Clare Island, therefore, show far less "insularity" in character than those of the Farne Islands on the east coast of Great Britain. Among the specimens which I have examined, a male from Louisburgh has 7 mm. forceps, while two Clare Island males have forceps only 4·5 long.

The Common Earwig is one of the most abundant and widespread insects in the British Islands, and has an immense foreign range—Europe, North Africa, Madeira, western Asia, and North America.

#### DISTRIBUTIONAL NOTES.

With the exception of *Mecostethus grossus*, which was not found on Clare Island, and of the House Cricket, the species of Orthoptera listed above are among the commonest of Irish insects. The family of the Long-horned Grasshoppers (Phasgonuridae), which is but scantily represented in the Irish fauna, has no representative in the above list, no specimen of the group having been found in the district. The genus *Gomphocerus*, belonging, like *Stenobothrus* and *Mecostethus*, to the Acridiidae, which occurs in the south and south-west of Ireland, is also absent, so far as our present knowledge goes, from Clare Island and its neighbourhood.

So far as the Orthopterous fauna is concerned, we may conclude that Clare Island was peopled from the mainland, and the general distribution of five of the species found on the island does not suggest an immigration prior to the Glacial Period. None of the Grasshoppers nor the Earwig can be declared incapable of having reached the island, even since its separation from Co. Mayo; and *Gryllus domesticus*, a messmate of Man, may have been introduced artificially. The discontinuous range of *Mecostethus grossus*, on the other hand, suggests considerable antiquity, and despite its general northern

distribution on the Continent, its circumferential stations round the east, south, and west of Great Britain and Ireland, tend to show that it entered England from the south, and Ireland from the west. It may be very probably regarded as an inhabitant of the old western Continental land in pre-Glacial times.

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APTERYGOTA.

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PLATE I.

Read JUNE 23. Published AUGUST 2, 1913.

THE Apterygota collected on Clare Island comprise two species of Thysanura (Bristle-tails) and eighteen of Collembola (Springtails). My own field-work on Clare Island was restricted to a short week in July, 1911; but several of my colleagues, whose names are given below, detected and secured valuable specimens at other times; for this help I am sincerely grateful. The list might doubtless be extended by research during the colder months of the year; nearly all the specimens enumerated were found in the summer.

These lowly insects—primitively wingless, as they are believed to be by most entomologists—are of much interest to the morphologist, and also to the student of geographical distribution. Being without the power of flight, they cannot cross sea-channels unless they be accidentally carried by birds, &c., and a knowledge of their range seems therefore of special value in any endeavour to trace the paths of immigration by which various faunas have reached the districts which they now inhabit.

It is somewhat disappointing to find that the majority of the Clare Island Apterygota are common and widespread Irish species. The insects of this group inhabiting the island represent, on the whole, an attenuated remnant of forms dominant on the mainland. Yet one of the Springtails—*Folsomia iv-oculata* (Tullberg)—is one of the least-known members of the Britannic fauna, and has not hitherto been recognized in Ireland. Among the Thysanura, the careful scrutiny given to every Clare Island specimen has yielded the unexpected result that two shore-haunting species—closely similar in appearance, but definitely separable structurally—have been for many years past included under the name *Petrobius* (or *Machilis*) *maritimus* Leach. The Clare Island *Petrobius* is that commonly found around the Irish coasts. The characters by which it may be distinguished from its scarcer relation—so far found only in Co. Dublin—are discussed below.

An interesting and suggestive distributional fact is furnished by the discovery of the *Petrobius* and three species of *Collembola* on the Bills Rocks—a small group of outlying crags, with scanty vegetation, nine miles west-north-west of Clare Island.

### THYSANURA.

#### MACHILIDAE.

##### *Praemachilis hibernica* Carpenter.

*Machilis polyypoda*, Carpenter and Evans (Proc. Roy. Phys. Soc. Edinb., xiv, 1899), and most British lists.

Croaghmore cliffs, 1300 feet (A. W. Stelfox, July, 1911), one specimen.

This species—described (1907, pp. 55-6, pl. 16) from examples taken on Lambay, Co. Dublin—is now known to be generally distributed in Ireland and in Great Britain. The genus *Praemachilis*, to which it belongs, is included in a section of the family distinguished from *Machilis* by no abdominal segment having more than one pair of exsertile vesicles: see Silvestri's paper (1904, p. 5). *P. hibernica* is closely allied to, perhaps identical with, *P. italica* (Grassi), from southern Europe.

##### *Petrobius maritimus* Leach.

*Petrobius maritimus* Leach (Edinb. Encycl., ix., 1809, and Zool. Miscell., iii, 1817).

*Machilis maritima* Lubbock (Ray Society Monograph, 1873), and subsequent English writers (in part).

Not *M. maritima* Oudemans, Beiträge, 1886.

Nor *P. maritimus* Silvestri (*Redia*, 1904, and *Bull. Portici*, 1911).

On all parts of the Clare Island coast above high-water mark, also under stones of walls on the low cliff-tops, and along roads near the sea. In outhouse of hotel (June, 1909); on wall above harbour and at top of eastern cliffs (July, 1911); road between Glen and Kill on wayside wall (July, 1911). Eastern and north-eastern coast from harbour to lighthouse. (R. Welch, September, 1909.) The Bills, eastern rock, 50-100 feet above sea-level. (R. W., June, 1910). Wherever the species is seen, individuals are numerous; but their agility in running and leaping makes it hard to capture them.

On the mainland the species is common near the shore throughout the "Clare Island District." Blacksod Bay (R. Southern, Sept., 1909). Curraun Achill. (R. F. Scharff, June, 1909). Roonah (N. H. Foster, May, 1909). Louisburgh (N. H. F., May, 1909, and J. N. Halbert, Aug., 1910). Old Head (N. Colgan). Achill.



Beyond the district the species extends its range all around the Irish coast, both on the east and west. It is far commoner than the other shore-haunting *Petrobius* (which I hope shortly to describe as a new species); and I have no doubt that it is the form figured by Leach (1817, pl. 145) and Lubbock (1873, pls. liv, lxvi). Specimens from the eastern Scottish coast, in the Irish National Museum collection, are undoubtedly co-specific with the Clare Island and common Irish insect.

A species of *Petrobius* which occurs on the Dutch coast has been well described and figured by Oudemans (1886), who calls it *Machilis maritima* Latreille. It is certainly not the Irish and British species now under consideration, as the sub-coxa of the eighth abdominal segment in the male is prolonged into a rounded lobe, which is not the case in the true *maritimus* of Leach. This character has been emphasized in a recent paper by Silvestri (1911), who, apparently accepting Oudemans' species as certainly identical with Leach's, has unfortunately defined a sub-genus *Petrobius*, characterized by the feature just mentioned. As *Petrobius* was established by Leach for his *P. maritimus*, Silvestri's nomenclature will require modification; but as I am doubtful of the value of sub-genera in a group where our knowledge of specific distinctions is still very incomplete, I make no suggestion on the subject here. Until the Continental *Petrobii* have been critically examined, the range of *P. maritimus* outside the British Islands must remain doubtful.

The genus *Petrobius*, according to the recent diagnosis of Silvestri (1904), is distinguished from *Machilis* (with which it agrees in the presence of two pairs of exsertile vesicles on each abdominal segment from the second to the fifth inclusive) by the absence of genital processes (gonapophyses or paramera) on the eighth abdominal segment in the male. There can, I think, be no doubt that Verhoeff's genus *Halomachilis*, lately established (1910, pp. 428-9) for an Adriatic species, is identical with *Petrobius*. Verhoeff points out an easily observed character common to both sexes—the absence of scales on the feelers beyond the two basal segments. Further the apex of the mandible is without definite teeth.

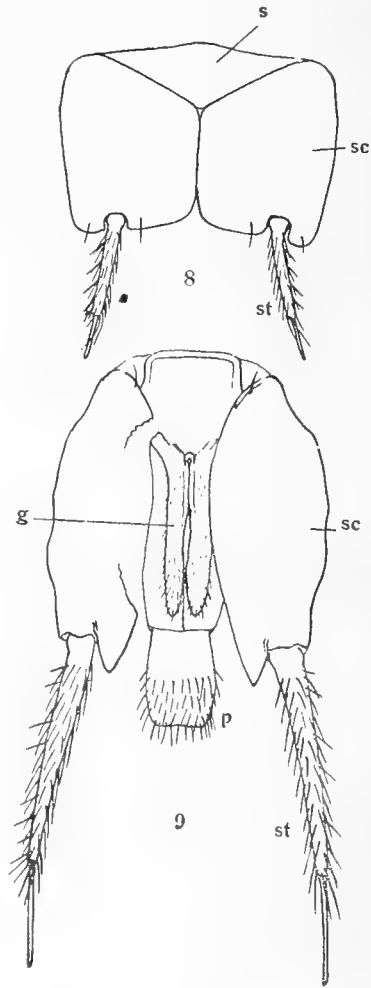
#### DIAGNOSIS OF *Petrobius maritimus* SENS STR.

Length, 25 mm. Feelers longer than body. Paired ocelli of the ordinary dumb-bell shape, a transverse diameter apart (Plate I, fig. 1, *o*). Median ocellus cordate, the apex directed upwards (fig. 1, *om*). Mandible with apex simple and slender, slightly sinuate on the inner edge (fig. 2); slight indications of teeth may be present in the male (fig. 3). Maxilla with tip of lacinia projecting beyond or as far as top of galea (figs. 4, 5); palp  $\frac{4}{3}$  length of feeler, six elongate segments of palp with the proportional lengths 6 : 6 : 6.5 : 9 : 8 : 6. The three terminal segments long and slender, only the antepen-

ultimate slightly swollen apically. *Eighth abdominal sternum* (fig. 8), with *sub-coxae* not produced into rounded lobes. *Ninth abdominal sternum* (fig. 9), with *sub-coxae* produced into pointed processes; *stylets* slender and elongate, terminating in a prominent spine nearly half the length of the appendage. Gonapophyses unannulated, not nearly reaching the apex of the sub-coxa, beyond which the tip of the penis projects but slightly. Ovipositor of female nearly as long as the cerci, which are half as long as the median terminal appendage of the abdomen.

The above characters will serve to differentiate this insect from our other Irish species. In the latter the paired ocelli are almost in contact, the median ocellus is sub-ovate, the apex of the mandible is rounded, the lacinia of the maxilla is markedly shorter than the galea, and the palp, less slender than in *P. maritimus*, has its six elongate segments proportionally as 6 : 6 : 8·5 : 8·5 : 6. With a little practice the two species can be distinguished as to this character by means of a hand-lens. More important, however, are the differences in the eighth and ninth abdominal segments and their appendages. In the other species, the stylet of the ninth segment in both sexes is relatively short, and its spine inconspicuous and stumpy. The sub-coxa of the ninth segment is drawn out into a very short acuminate process; but that of the eighth segment is produced into a prominent rounded lobe as in Oudemans' species. The gonapophyses reach beyond the tip of the sub-coxa, and the penis beyond the extremity of the stylets.

Silvestri has lately (1911) described several new species of *Petrobius* from North America, placing them in a sub-genus *Pedetontus*, which he distinguishes by the absence of the characteristic rounded lobe on the sub-



*PETROBIUS MARITIMUS.*

8. Eighth abdominal segment of male ventral aspect: *s.*, sternum; *s.c.*, sub-coxa; *st.*, stylet.  
 9. Ninth abdominal segment of male ventral aspect. *s.c.*, sub-coxa; *g.*, gonapophysis; *p.*, penis.  
 Magnification of figs. 8 and 9 = 36.

coxa of the eighth abdominal segment, by the annulation of the gonapophyses, and by the extreme shortness of the penis, which does not reach as far as the sub-coxae of the ninth segment. It is of great interest to find that our western *Petrobius* serves as a connecting link between the Continental and eastern Irish species on the one hand—with which it agrees in its unannulated gonapophyses—and the North American species (*Pedetontus*) on the other, which it resembles in its simple eighth abdominal sub-coxae; as regards the length of penis, it seems quite intermediate. The general aspect of this species is well enough delineated in Lubbock's coloured plate (1873, pl. liv). His details of structure (i.e., pl. lxvi) do not emphasize points of importance in differentiating between the two species now under discussion; but the lengths of the gonapophyses and penis, and the slender elongate stylets in his plate lxvi, fig. 7, seem clear evidence that he had the present species before him.

For further details reference may be made to the figures accompanying the present paper. It is only necessary to call attention to a few additional points in connexion with the jaws. Those of the female are generally larger and stronger than those of the male; but reference has been made above to the slight suggestion of apical teeth on the mandibles of the latter sex, which in some cases show also a few conical teeth near the molar area (fig. 3). The lacinia of the maxilla terminates in a somewhat blunt tooth (fig. 5), from the inner face of which project two delicate lamellae; between these, a hairy process, like an elongate brush, may be seen. The basal segment of the maxillary palp has two processes, a longish acute dorsal and a small rounded ventral lobe; these are far more prominent in the female (fig. 5) than in the male (fig. 4). The labial palps are remarkable—probably in all species of *Petrobius*—for the curious, broad, flattened spines, with minute processes on the terminal segment (figs. 6–7). These vary in shape among themselves, and show a number of fine longitudinal striations. The labrum (see fig. 1) is beset with long bristles and a number of short, stout spines at the tip. The maxillula has already been figured in the Proceedings of the Academy (vol. xxiv, p. 324). The comparative structure of the various species of *Machilidae* is worthy of careful study. Superficially alike, the allied forms may be readily distinguished by definite details of the jaws and abdominal appendages.

## COLLEMBOLA.

### PODURIDAE.

#### *Achorutes armatus* (Nicolet).

A few specimens in moss (J. N. Halbert, August, 1911).

The species, though not common, is widespread in both Great Britain

and Ireland, and has a well-nigh cosmopolitan range abroad, inhabiting, for example, Greenland, Siberia, South America, and Sumatra.

***A. longispinus* Tullberg.**

Portnakilly, a few on herbage near the beach (July, 1911).

This species, nearly allied to the last, is found both in the east and west of Ireland, as well as in Scotland and northern England. It seems to be a characteristically Arctic insect, inhabiting Novaya Zemlya, Spitsbergen, Franz Josef Land, and Lapland, and appearing also, like other members of this order, in South America.

***A. viaticus* (Linn.) Tullberg.**

*A. murorum* Lubbock (Monograph, 1873).

In soil of hotel garden, numerous (R. Welch, June, 1910); Strake, in newly manured soil, many (July, 1911).

This is another very widespread insect, probably distributed throughout the British Islands, and ranging from Greenland and Spitsbergen to Tierra del Fuego at the far extremity of South America, and to Macquarie Island in the Antarctic Ocean south of New Zealand.

***Xenylla maritima* Tullberg.**

Kinnacorra, on beach, a few (July, 1911).

This species is known both in the east and west of Ireland, as well as in Scotland, England, and Jersey. Abroad it ranges in Europe from Norway and Finland to France, and is recorded also from North America. Neither in the British Islands nor on the Continent is it confined to the sea-margin, being found at inland localities under the bark of trees, as well as in moss and garden-soil.

***Anurida maritima* (Guerin).**

Common around the shore in rock-crevices between tide-marks (R. Southern and R. Welch, June, 1910); numerous on the surface of south-eastern rock-pools (July, 1911).

This well-known little insect is found on the southern, eastern, and western coasts of Ireland and Great Britain, and has been recorded from the shores of eastern North America, Scandinavia, Heligoland, and France.

**ENTOMOBRYIDAE.**

***Folsomia quadrioculata* (Tullberg).**

In moss, several (August, 1911, J. N. Halbert).

This is an interesting addition to the Irish fauna, and thus far it has not been recognized on our mainland. Lately introduced to the English lists by Bagnall (1910) and Collinge and Shoebottom (1910); it is widely spread

over northern and central Europe, inhabiting also North America and the Arctic regions.

***Isotoma sensibilis* (Tullberg).**

The Bills, in Puffins' nests (R. Welch, June, 1910). Also at Islandcara on bark, and Belclare, near Westport (J. N. Halbert, July, 1911).

The presence of this delicate insect on such remote outliers as the Bills Rocks is noteworthy. Probably it has a wide range in Ireland. I have seen specimens from Cos. Kerry, Sligo, Wicklow, and Louth; and it is known to occur both in Scotland and England. It ranges from Novaya Zemlya and northern Europe to France, Switzerland, and Austria, and occurs also in North America.

In recent years, some authors have identified this species with Linné's *I. arborea*. Linnaniemi states, however (1912, p. 144), that in the latter the two terminal abdominal segments are distinct, while in *I. sensibilis* they are fused together.

***Isotoma olivacea* Tullberg, var. *griseascens* Schäffer.**

Croaghmore cliffs, 1300 feet (A. W. Stelfox, July, 1911).

This form has already been recognized in Ireland (Co. Dublin), as well as in Scotland and the north of England; it has a wide range in northern and central Europe. The type-form of *I. olivacea*, from which *griseascens* differs in a few minor structural features as well as in colour (see Linnaniemi, 1912, pp. 150-151), is found also in Greenland and the Arctic Islands.

***Isotoma viridis* Bourlet.**

Apparently common all over the island. Croaghmore summit, dark purple form (July, 1911); the Bills Rocks, in Puffins' and Gulls' nests, dark olive-green form (R. Welch, June, 1910); wood near Capnagower, var. *riparia* Nicolet (R. Welch, June, 1910); Croaghmore cliffs, 1,300 feet, var. *pallida* Nicolet (A. W. Stelfox, July, 1911); under wayside stones near Maum, var. *pallida* Nicolet (July, 1911). On mainland between Roonah and Louisburgh, var. *riparia* Nicolet (N. H. Foster, May, 1909).

This is one of the commonest and most widespread of Irish and British insects; while abroad it ranges over northern and central Europe, Siberia, North America, and Arctic Islands.

***Isotomurus palustris* (Müller).**

Croaghmore cliffs, 1,300 feet, a few (A. W. Stelfox, July, 1911); by stream on north slope of Knocknaveen (July, 1911). Also on mainland at Belclare, Westport (J. N. Halbert, July, 1911), and near Lough Moher.

This, like *Isotoma viridis*, has a very wide distribution, and extends beyond

the northern regions to the Azores, the Argentine, and the Malayan Islands. In Great Britain and Ireland it is widespread, though perhaps not quite so abundant as *Isotoma viridis*.

**Tomocerus minor** (Lubbock).

*Macrotoma minor* Lubbock (Trans. Linn. Soc., 1862).

*Macrotoma tridentifera* Tullberg (Sveriges Podurider, 1872).

*Tomocerus plumbeus* Lubbock (Monograph, 1873).

Abundant through the island: Croaghmore cliffs, 1,300 feet (A. W. Stelfox, July, 1911; Kill, under stones (July, 1911); wood at Capnagower (R. Welch, June, 1910); northern and eastern cliffs (R. W., 9th September, 1909); Kinnacorra (July, 1911); slope of Knocknaveen, beneath stones (July, 1911). Also on mainland throughout the district; Westport, Belclare, and Knappagh (J. N. H., July and August, 1911); Achill (July, 1911, and H. W. Kew, June, 1910); Curraun (R. F. Scharff, June, 1909).

Another exceedingly common and widespread Irish and British springtail. Its foreign range is also extensive—Norway and Sweden; Russia and Finland; Germany, Heligoland, Bohemia, Switzerland, and the Azores; probably also in North and South America.

**Tomocerus longicornis** (Müller).

*Podura longicornis* Müller (Prodr. Zool. Dan., 1776).

*Tomocerus longicornis* Lubbock (Monograph, 1873).

*Tomocerus plumbeus* Carpenter and Evans (Proc. R. Phys. Soc. Edinb., 1899).

Like the preceding species, this is abundant throughout the island; Croaghmore cliffs, 1,300 feet (A. W. Stelfox, June, 1910, and July, 1911); wood at Capnagower (R. Welch, June, 1910, and July, 1911); north and east cliffs (R. W., September, 1909); Kill, under stones (July, 1911). Also on the mainland throughout the district: Westport, Belclare, and Knappagh (J. N. Halbert, July and August, 1911); Achill H. W. Kew, June, 1910).

Both in Ireland and Great Britain this species is common and widely distributed; abroad it has much the same distribution as *T. minor*, and is known to inhabit also Siberia, ranging to 70° N. lat.

**Entomobrya Nicoletii** (Lubbock).

*Degeria Nicoletii* Lubbock (Trans. Linn. Soc., 1867).

*D. muscorum* Lubbock (Monograph, 1873).

Clare Island (R. Welch, June, 1910).

This is a widespread insect in Ireland and Great Britain; it ranges southwards and eastwards to Italy and Siberia (70° N. lat.).

**Lepidocyrtus cyaneus** Tullberg.*Lepidocyrtus purpureus* Lubbock (Monograph, 1873).*L. violaceus* Lubbock (Monograph, 1873).

The Bills Rocks, in Puffin's nest, one specimen (R. Welch, June, 1910).

The presence of this tiny insect on this remote rock is somewhat surprising, especially as it was not found elsewhere during the Survey. It must, however, be generally distributed, as it ranges all over the British Islands, and abroad from Greenland and North America as far as Africa and Malaya.

**Orchesella cineta** (Linné).

Clare Island (June, 1910), a single specimen referable to the dark variety *vaga* Linné.

Strange to record, no other specimens were found on the Survey; so the species can hardly be as common in the district as it is elsewhere in Ireland and in Great Britain. Abroad it ranges throughout Europe to Siberia, and inhabits also Greenland and North America.

**Orchesella villosa** (Geoffroy).

Portnakilly, one under a stone (July, 1911).

No further specimens of this springtail were found in the district. It seems to be distinctly scarce in Ireland, and has hitherto been found only in Cos. Dublin, Wicklow, and Kerry. In Great Britain it has been found in southern Scotland as well as in England, while on the Continent it is known to inhabit Germany, France, and Switzerland.

**SMINTHURIDAE.****Sminthurides aquaticus** (Bourlet).*Sminthurus aquaticus* Lubbock (Monograph, 1873).

Kinnacorra, on surface of pool behind storm-beach, in enormous numbers (July, 1911).

This pretty little species is known from Ireland (Co. Dublin), Scotland, and England. Abroad it ranges from Norway and Finland to France, Switzerland, and Austria, and probably inhabits also North America.

**Dicyrtomina minuta** (O. Fabr.).*Papirius ornatus* Lubbock (Monograph, 1873).*P. nigromaculatus* Lubbock (*t. c.*).

Croaghmore cliffs, 1,300 feet (A. W. Stelfox, July, 1911); wood at Capnagower (July, 1911).

This insect is common in Ireland and in Great Britain; abroad its range extends over the greater part of Europe.

## SUPPLEMENTAL LIST.—MAINLAND.

Although only a few of the species from Clare Island, enumerated above were found on the adjacent mainland, there can be no reasonable doubt that they belong to the fauna of the district. Seven species of Collembola, however, not found on Clare Island, occurred on the mainland or Achill; and it seems convenient to enumerate these in a separate list.

**PODURIDAE.*****Lipura ambulans* (Linné).**

Belclare, Westport (J. N. H., July, 1911).

This species is common in soil and under stones throughout Ireland and Great Britain. Abroad it is found both in Europe and North America, but it does not extend into arctic or subarctic regions. Linnaniemi states (1912 p. 91), for example, that it is very scarce in Finland, and appears to be restricted to the southern districts of the country.

**ENTOMOBRYIDAE.*****Anurophorus laricis* Nicolet.**

Achill, on trees in wood near the Sound (July, 1911).

This is another widespread Irish and British species, inhabiting also North America, Europe, and Siberia.

***Entomobrya nivalis* (Linné).**

*Degeeria annulata* Lubbock (Monograph, 1873).

Belclare, Westport (J. N. H., July, 1911).

This is another widespread springtail with Britannic and foreign distribution like those of the last-named species.

***Entomobrya multifasciata* (Tullberg).**

*Degeeria nivalis* Lubbock (Monograph, 1873).

Croaghpatrick (J. N. H., June, 1909).

The occurrence of this species in our islands is interesting, as it may usually be found on the tops of mountains (I have taken it on the Macgillycuddy's Reeks and the Mourne), and also in gardens and greenhouses. As yet it does not seem to be certainly known outside northern and central Europe.

***Lepidocyrtus lanuginosus* (Gmelin).**

Belclare and Knappagh, Westport (J. N. H., July and August, 1911).

A widespread species in Ireland and Great Britain, extending throughout Europe into northern Siberia, Spitsbergen, and North America.



## SMINTHURIDAE.

*Sminthurus fuscus* (Linné).

Westport (J. N. H., July, 1911). Achill (H. W. Kew, June, 1910).

In Ireland as well as in Great Britain the species is widespread, but less common than others of the family. Abroad it is known from many European countries, from North Africa, the Azores, and North and South America.

*Sminthurus viridis* (Linné).

Westport (J. N. H., July, 1911).

This is a common and widespread insect in Ireland and Great Britain, while its range abroad extends from Novaya Zemlya to Japan, Tunis, and La Plata.

## DISTRIBUTIONAL NOTES.

The Apterygota of Clare Island are remarkable for the generally northern facies presented by the fauna. Of the eighteen species of Collembola, all but two—*Anurida maritima* and *Orchesella villosa*—are included in Linnaniemi's Finnish list (1912); and all but six—the two above-mentioned with *Xenylla maritima*, *Tomocerus minor*, *Sminthurides aquaticus*, and *Dicyrtomina minuta*—inhabit arctic or sub-arctic countries. In correspondence with the far western position of Clare Island, it is also noteworthy that of its eighteen recorded springtails, all but three—*Entomobrya Nicoletii*, *Orchesella villosa*, and *Dicyrtomina minuta*—are found in America, or at least in Greenland. Attention has already been called to the American affinities of the common Irish shore-haunting Thysanuran—*Petrobius*—though it is not known to be identical with any transatlantic species. The other Thysanuran—*Praemachilis hibernica*—and the Collembolan *Orchesella villosa* mentioned above, are, on the other hand, members of the southern or Mediterranean faunistic group.

Our knowledge of the distribution of these insects is as yet too scanty to warrant any dogmatic generalizations; yet the facts of the Clare Island Apterygotan fauna harmonize well with the theory of a western Continental land linking the present Irish area with south-western Europe, and with America by way of the Arctic Regions. At the same time the presence of the springtails recorded from Puffins' and Gulls' nests on the Bills Rocks, warns us that we must admit the possibility of the accidental transport of these small insects across sea-channels by the agency of birds.

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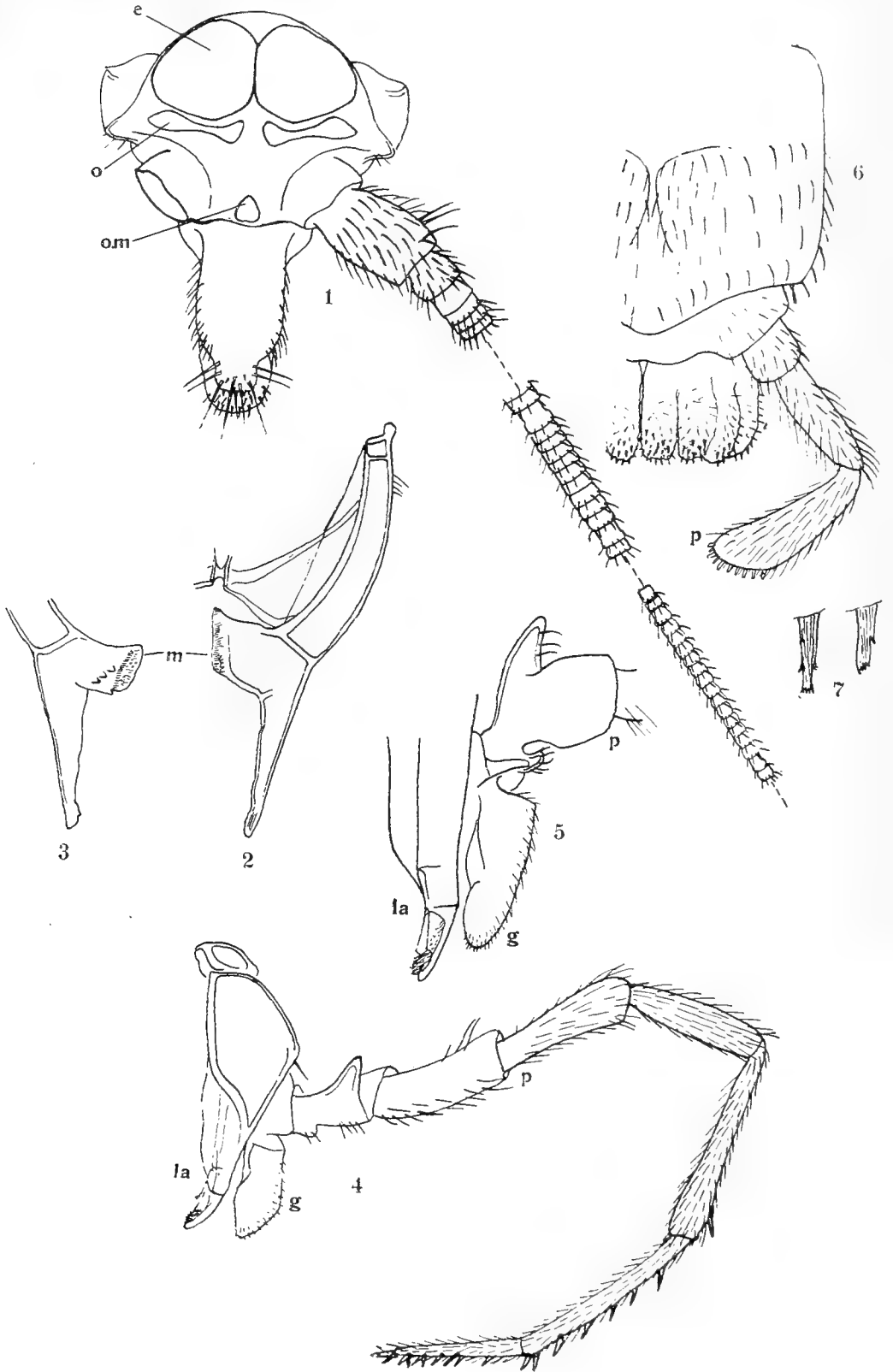
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EXPLANATION OF PLATE I.

Structural details of *Petrobius maritimus*.

FIG.

1. Head of male, front view, showing eyes (*c*), lateral ocelli (*o*), median ocellus (*o.m.*), and labrum; also basal, central, and terminal region of feeler.
  2. Right mandible of female, hinder aspect.
  3. Left mandible of male, front aspect.
  4. Right maxilla of male, hinder aspect; *g.*, galea, *la.*, lacinia, *p.*, palp.
  5. Portion of left maxilla of female, front aspect (galea, *g.*; lacinia, *la.*; and basal segment of palp, *p.*).
  6. Right half of labium of female. *p.*, palp.
- } *m*, molar area.
- Magnification of figs. 1-6 = 36.
7. Sensory spines from tip of labial palp.
- Magnification = 250.





## CHILOPODA AND DIPLOPODA.

By REV. W. F. JOHNSON, M.A., F.E.S.

Read NOVEMBER 11. Published DECEMBER 5, 1912.

OF the Myriapoda of Ireland very little is known, this group having been almost entirely neglected by Irish naturalists. The only Irish record that I can find previous to 1893 is a list published by the late Robert Templeton in 1836. Beginning with 1893 we have five papers published on the subject in the "Irish Naturalist" by Messrs. Pocock, Carpenter, Brölemann, and Selbie; and this constitutes the sum-total of our knowledge of the Irish Myriapoda to the present date. In these papers thirty-four species are enumerated, to which I am now able to add two more, bringing the total up to thirty-six species. As there are only some fifty species enumerated from Great Britain, this list is not so meagre as would appear at first sight; at the same time it must be remembered that Great Britain is not much better off in the matter of the investigation of these animals than Ireland is.

The Myriapoda are divided into five Orders, of which we are, in the Clare Island list, only concerned with two, viz., the Chilopoda or Centipedes, of which the most familiar example is the long narrow yellow centipede *Geophilus*, so often found in gardens; and the Diplopoda or Millipedes, the best-known of which is the shining black *Julus* Worm, also met with in gardens. In the Irish list there is a representative of a third Order, the Symphyla.

The work on the Myriapoda of the Clare Island district was carried out under considerable difficulties. None of those who collected had any special knowledge of the habits and habitats of these creatures, and all were engaged in other work. It is therefore matter for congratulation that the list is as good as it is. Of the thirteen species enumerated, eleven occurred on Clare Island; and, though we cannot hope to have a complete list of the species from the mainland, it is highly interesting to find so many on the island, for

these creatures could not make their way across the sea, and must therefore have taken up their abode while the island was still part of the mainland.

I have to thank Mr. C. M. Selbie, B.Sc., of the National Museum for kind assistance in the determination of these species, and the gentlemen mentioned below for collecting specimens.

I have used the following abbreviations of the names of those who collected in the Clare Island district :—

F.—N. H. Foster.	P.—R. Lloyd Praeger.
H.—J. N. Halbert.	S.—A. W. Stelfox.
J.—W. F. Johnson.	W.—R. Welch.
K.—H. Wallis Kew.	

Class MYRIAPODA Leach.

Order CHILOPODA Latreille.

Family **Lithobiidae** Newport.

- Lithobius forficatus** Linné. — Clare Island (J. & K.). Westport (H.).  
 Belclare (F.). Bills Rocks, 50–120 ft., in Puffin's nest (P. & W.).  
**L. variegatus** Leach.—Clare Island (J.). Inishbofin (P.).  
**L. melanops** Newport.—Clare Island (K.). Knappagh Wood, Westport (H.).  
**Lamyctes (Henicops) fulvicornis** Meinert.—Clare Island (J.). Inishturk (W.).

Family **Geophilidae** Leach.

- Geophilus carpophagus** Leach (*condylogaster* Latzel).—Clare Island (J.).  
 Belclare (F.).  
**Linotaenia maritima** Leach.—Clare Island (K.). Mweelaun (P.). Belclare (F.).  
**Schendyla submarina** Grube.—Clare Island (K.).  
**S. nemorensis** C. Koch.—Clare Island (K.).

Order DIPLOPODA Gervais.

Family **Glomeridae** Leach.

- Glomeris marginata** Villers.—Clare Island, on Croaghmore at 1000–1300 ft.  
 on north side (W.); wood at Portlea and near Lough Avullin (K.).

Family **Polydesmidae** Leach.

**Brachydesmus superus** Latzel.—Clare Island (K.). Inishturk (S.). Westport (H.).

Family **Iulidae** Leach.

**Iulus luscus** Meinert (*Britannicus* Verhoeff).—Clare Island (K. & J.). Inishbofin (P.). The Bills, in Puffin's nest (W.). Westport (H.).

**I. punctatus** Leach.—Westport (H.).

**I. teutonicus** Pocock (*Londinensis* Leach).—Delphi (H.).

Two of the above, *Lamyctes fulvicornis* and *Schendyla submarina*, have not been previously recorded from Ireland. The former seems to be attached to the banks of streams, and is said to have the power of remaining under water for some time. It has been found in Europe, north Africa, and North America. The latter is a denizen of the sea-shore, in this habit resembling *Linotaenia maritima*, along with which it was taken by Mr. Kew in rock-crannies between tide-marks. It has occurred in Great Britain and Italy.

I have thought it advantageous to subjoin a full list of the Irish Myriapoda to serve as a starting-point for future workers. To facilitate reference I am giving, under counties, all the localities recorded, with names of the authors of the papers in which the records occur, full reference to which will be found in the Bibliography appended.

I have used the following letters to indicate the authors' names:—

B.—H. W. Brölemann.

S.—C. M. Selbie.

C.—G. H. Carpenter.

T.—R. Templeton.

P.—R. I. Pocock.

## Class MYRIAPODA Linné.

## Order CHILOPODA Latreille.

Family **Lithobiidae** Newport.

**Lithobius forficatus** Linné.—Antrim (Cranmore,<sup>1</sup> T.). Dublin (Lambay, C.). Galway (B.). Wicklow (Poulaphouca), Cork (Glengariff and Bere Island), Kerry (Dingle) (P.).

**L. variegatus** Leach.—Antrim (Cranmore, T.). Galway (B. and C.). Dublin (Mountains), Wicklow (Kilruddery, Glen of the Downs, Enniskerry),

<sup>1</sup> Cranmore is now part of Belfast.

Galway (Kylemore), Cork (Glengariff and Berehaven), Kerry (Killarney) (P.).

**L. melanops** Newport.—Dublin (Lambay, C.). Wicklow (Poulaphouca), Kerry (Derrynane), Cork (Castletown Berehaven) (P.). Galway (B.). Clare (Ballyvaughan, C.).

**L. microps** Meinert.—Cork (Glengariff, P.).

Family **Scolopendridae**.

**Cryptops hortensis** Leach.—Antrim (Cranmore, T.). Dublin (P.). Galway (B.).

Family **Geophilidae**.

**Geophilus carpophagus** Leach (*conjugator* Latzel).—Wicklow (Great Sugarloaf, P.), Galway (B.).

**G. flavus** De Geer (*longicornis*, Leach).—Antrim (Cranmore, T.). Dublin (Lambay, C.). Galway (Kylemore), Kerry (Dingle), Cork (Glengariff), (P.). Galway (B.).

**G. truncorum** Meinert.—Antrim (Ballycastle, S.).

**G. gracilis** Meinert.—Galway (B.).

**G. proximus** C. Koch.—Galway (B.).

**G. electricus** Linné.—Antrim (Cranmore, T.).

**Linotaenia crassipes** C. Koch.—Cork (Kinsale, P.). Galway (B.).

**L. maritima** Leach.—Down (Bangor, T.). Dublin (Lambay, C.), (Portmarnock, P.). Galway (B.). Clare (Ballyvaughan, C.).

**Schendyla nemorensis** C. Koch.—Donegal (Glenveigh), Dublin (Lambay) (S.).

**Stigmatogaster subterraneus** Leach.—Antrim (Cranmore, T.). Dublin, Wicklow (The Dargle) (P.). Galway (B.).

Order **SYMPHYLA** Ryder.

Family **Scolopendrellidae** Newport.

**Scolopendrella immaculata** Newport.—Dublin (Lambay), Galway (Gentian Hill) (C.).

Order **DIPLOPODA** Gervais.

Family **Polyxenidae** Gray and Jones.

**Polyxenus lagurus** Linné.—Dublin (Lambay, C.; Phoenix Park, P.).

Family **Glomeridae** Leach.

**Glomeris marginata** Villers.—Antrim (Cranmore, T.; Ballinderry, P.). Down (Rostrevor), Donegal (Bundoran), Meath (Kells), Dublin



(Howth), Wicklow (Woodenbridge and Glen of the Downs), Kildare (Leixlip), Galway (Kylemore), Kerry (Killarney), Cork (Castletown Berehaven) (P.). Galway (B.).

Family **Polydesmidae** Leach.

**Brachydesmus superus** Latzel.—Dublin (Lambay, C.). Galway (B.). Cork (Glengariff, P.).

**Polydesmus complanatus** Linné.—Dublin (Lambay, C.). Galway (B.), (Kylemore, P.).

**P. gallicus** Latzel.—Armagh, Westmeath (Mullingar), Cork (Castletown Berehaven and Glengariff), Waterford (Lismore), (P.). Galway (B.).

Family **Chordeumidae** C. Koch.

**Atractosoma polydesmoides** Leach.—Armagh, Dublin (Leeson Park) P.

**Craspedosoma Rawlinsii** Leach.—Down (Downpatrick, S.).

Family **Iulidae** Leach.

**Blaniulus venustus** Meinert (*Iulus pulchellus* Leach).—Antrim (Cranmore, T.).

**B. fuscus** Am Stein.—Wicklow (Enniskerry), Galway (Kylemore), P.

**B. guttulatus** Bosc.—Galway (B.).

**Iulus pusillus** Leach.—Antrim (Cranmore, T.).

**I. luscus** Meinert (*Britannicus* Verhoeff).—Galway (B.), (Kylemore, P.), (M'Dara's Island, C.). Clare (Ballyvaughan, C.). Dublin (Lambay, C.). Wicklow (Enniskerry, P.). Kerry (Derrynane, P.).

**I. punctatus** Leach.—Antrim (Cranmore, T.). Dublin (on the mountains, P.), (Lambay, C.). Galway (Kylemore), Wicklow (Enniskerry), Kerry (Killarney), Cork (Glengariff), (P.).

**I. pilosus** Newport.—Louth (Drogheda), Galway (Kylemore), Wicklow (Enniskerry and Poulaphouca), Kerry (Killarney), (P.).

**I. ligulifer** Latzel.—Cavan (S.).

**I. sabulosus** Linné.—Antrim (Cranmore, T.). Dublin (Tibradden, P.). Wicklow (Belmont and Devil's Glen, P.). Galway (B.).

**I. niger** Leach.—Dublin (Tibradden, P.). Wicklow (Devil's Glen, P.).

**I. teutonicus** Pocock.—Mayo (Delphi, S.).

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PYCNOGONIDA.

BY GEORGE H. CARPENTER, B.Sc.,

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Read NOVEMBER 11. Published DECEMBER 5, 1912.

THE collection of "Sea-spiders" from the marine area included in the Clare Island Survey's field of work comprises only eight species, most of which are common and widespread around the Irish coasts. The specimens were mostly collected by officers of the Fisheries Branch of the Department of Agriculture, to whom I am indebted for the opportunity of publishing the results now given. The area extends from Blacksod Bay in the north to Ballynakill Harbour in the south. There can be little doubt that all the Pycnogons taken might be expected to inhabit any suitable localities throughout the district; but it may be of interest to enumerate the species that have, so far, been found in the various centres of observation.

BLACKSOD BAY.

<i>Nymphon gracile.</i>	<i>Ammonothea echinata.</i>
<i>Phoxichilidium femoratum.</i>	<i>Endeis laevis.</i>
<i>Anaphia pygmaea.</i>	<i>Pycnogonum littorale.</i>

CLEW BAY AND CLARE ISLAND.

<i>Nymphon gracile.</i>	<i>Anaphia pygmaea.</i>
<i>Anaphia petiolata.</i>	<i>Pycnogonum littorale.</i>

INISHBOFIN AND INISHTURK.

<i>Nymphon gracile.</i>	<i>Anaphia pygmaea.</i>
<i>Anaphia petiolata.</i>	<i>Endeis laevis.</i>

BALLYNAKILL HARBOUR.

<i>Nymphon gracile.</i>	<i>Anaphia pygmaea.</i>
<i>Pallene brevirostris.</i>	<i>Ammonothea echinata.</i>
<i>Anaphia petiolata.</i>	<i>Endeis laevis.</i>

The greater number of species in the first and fourth localities as compared with the second and third is probably due to the long-continued and systematic collecting carried on by the Fisheries officers at Blacksod and Ballynakill. I now proceed to give a systematic list of the species, with a few topographical and bionomic notes. The generic nomenclature of Norman (3) has been followed.

#### NYMPHONIDAE.

##### *Nymphon gracile* (Leach).

Blacksod (Feorinyeeo Bay, shore), Clew Bay (May, 1910), Inishbofin (Bofin Harbour), Ballynakill (Coastguard Bay and Deep, 1-8 fms.)—(see 1, 2).

Adults of this handsome species are most frequent in the spring months (March and April).

The synonymy of this species has been elucidated by Norman (3), who has shown the identity of Leach's types in the British Museum with *N. gallicum* of Hoek. It is a West Channel species, ranging northward along our west coast to Killala Bay. In the Irish Sea it is scarce, but I have examined specimens from Larne Lough and Malahide inlet.

#### PALLENIDAE.

##### *Pallene brevirostris*, Hodge.

Ballynakill (Coastguard Deep, 6-8 fms., see 2. Fahy Bay, one male at surface, 21st March, 1902).

This, though it occurs both on our east and west coasts, seems to be a distinctly rare species in Irish waters. It has a very wide range abroad, having been dredged off the south-west coast of Norway, in the North Sea, English Channel and Mediterranean, and off the coast of Connecticut, North America.

##### *Phoxichilidium femoratum* (Rathke).

Blacksod (Elly Bay, south shore, one female, 25th September, 1911).

This is also a scarce species, though occurring on both our east and west coasts. From the distribution as given by Norman (3) it seems to belong to the northern faunistic group.

##### *Anaphia petiolata* (Kroyer).

Clare Island ( $3\frac{1}{2}$  miles S.E. of lighthouse, 13-16 $\frac{1}{2}$  fms., 26th May, 1909, two females). Clew Bay (south of Mulranny Pier, 5-11 fms., 26th May and 23rd August, 1909, two females). Inishbofin (2). Ballynakill (2), many specimens.

This is one of the commonest and most widespread of Irish *Pycnogonida*, occurring probably all round our coasts. Abroad it has been recorded from southern Norway, the Mediterranean, and the North Pacific (coast of Alaska), though some of these records as collated by Norman (3) may refer to the next species (*A. pygmaea*).

Norman points out that the generic name *Anaphia* (Say, 1821) must replace *Anoplodactylus* (Wilson, 1878).

#### *Anaphia pygmaea* (Hodge).

Blacksod (Feorinyeeo Bay, north shore, 16th September, 1910, one female; Elly Bay, south shore, 25th September, 1911, one male). Clare Island (shore, 23rd May, 1909, one ovigerous male; 3.3 miles E.S.E. of Lighthouse, 26th May, 1909, 20 fms., one ovigerous male). Inishturk (2.3 miles S.E. of Tower, 13 fms., 25th May, 1909, one female). Ballynakill (Fahy Bay and Coast-guard Deep, 1-8 fms., see 2; north entrance, 6-8 fms., 14th March, 1904, one ovigerous male).

Norman (3) unites this species with the preceding (*A. petiolata*, Kr.), and the fact that the two forms have a similarly wide distribution, and often inhabit the same locality, might be held to support the opinion that they are identical. For some time past, however, the constant, if slight, distinctions observable between the adults have convinced me that the two are worthy of "specific" distinction, and that Hodge was justified in separating *pygmaea* from the foregoing species (which he called *attenuata*). I am gratified to learn that Dogiel, working at the development of *Pycnogonida* at the Millport Biological Station, Isle of Cumbrae, confirms the distinction: "The specific independence of *A. petiolata* from *A. pygmaea* was definitely proved. The difference between these two species, very slight in adults, is very prominent in the larval stages, the six-legged larvae of *A. pygmaea* being blind, whilst the larvae of *A. petiolata* possess a pair of eyes. Another difference is the genus of host inhabited by the parasitic stages of these species. The larvae of *A. pygmaea* infest the polyps of *Campanularia*; the larvae of *A. petiolata* form cysts in *Coryne*" (4, p. 31).

#### AMMOTHEIDAE.

##### *Ammothea echinata*, Hodge.

Blacksod (Feorinyeeo Bay, north shore, 15th March, 1911, two females). Ballynakill (Coastguard Bay and Deep, north entrance, 6-8 fms., see 2).

The *Pycnogon* has a very similar distribution to that of the two species of *Anaphia*, occurring on both our east and west coasts, and extending from

Norway to the Mediterranean. In Irish waters, however, it is not nearly so abundant as the *Anaphia* species.

#### ENDEIDAE.

##### *Endeis laevis* (Grube).

Blacksod (Feorinyeeo Bay, south shore, 14th September, 1909; Elly Bay, north shore, 12th March, 1910). Inishbofin (2). Ballynakill (2).

This is another widespread species, occurring probably all round the Irish coast, and ranging from Norway to the Mediterranean and the Azores.

Norman has shown (3) that *Endeis* (Philippi, 1843) must be used for this genus. The name *Phoxichilus*, which he, following Stebbing, would transfer to *Pseudopallene*, had better be dropped altogether; otherwise great confusion will result to future workers who are not specialists in the nomenclature of Pycnogonida.

#### PYCNOGONIDAE.

##### *Pycnogonum littorale* Stroem.

Blacksod (Elly Bay, south shore, 17th September, 1910). Off Achill Head ("Fingal," 144 fms., see 1). Clew Bay (15 fms., see 1).

Probably this species is to be found all round our coast. Its exceedingly wide geographical and bathymetric range (shore to over 700 fms. off our south-west peninsulas) has often been remarked.

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ARANEIDA.

By DENIS R. PACK BERESFORD, B.A.

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INTRODUCTION.

WHEN studying the geographical distribution of spiders, we must bear in mind that, although they have no wings, their means of dispersal are almost, if not quite, as great as if they had; for most species are aeronauts in their youth, while many of the smaller species are probably carried about by the wind at all times. The question then what species of spiders we are likely to find in any given area resolves itself very much into a question of suitable habitat, or what kinds are likely to survive and increase under the conditions in which they may find themselves. Thus on cliffs exposed to the Atlantic storms, only the hardiest of species, such as *Segestria senoculata* and *Textrix denticulata*, which live amongst stones and in crannies in the rocks, can survive. Both these species are present in enormous numbers on the cliffs in the far west of Clare Island. Then in sheltered nooks facing south or west we find species such as *Dysdera crocota* and *Heliophanus cupreus*, which usually inhabit warmer localities, while again on the mountain-tops we find species like *Tmeticus prudens*, which, in this country at all events, seems to be confined almost exclusively to such places.

Again, we are met with the difficulty that such a small amount of work has yet been done at spiders, that we know but little of the life-histories and general distribution of any but the commonest species. Thus, though some kinds are met with nearly everywhere in suitable habitats, many species are extraordinarily local, so that though quite numerous in a very limited area, they disappear entirely outside it, to reappear in another colony elsewhere. Others, especially in the male sex, are very short-lived, and are only found in the adult stage, in which alone it is possible to identify them with any certainty, for very short seasons of the year; consequently it is evident that in order to make anything like a complete survey of the species inhabiting any given area, it would be necessary to live and collect in that area, not only all the year round, but for many years in succession.

Work of this sort being manifestly impossible in a locality such as Clare Island, all one can hope to do is to give a list of the species which are to be

found fairly commonly there. My own work in the district included four days spent on the island in July, 1909, followed by a longer stay at Mulranny; while in September, 1911, with Leenane as headquarters, the district between Clew Bay and Killary Harbour was explored.

As may be seen from the list which follows, in which 108 species are recorded, the spiders of Clare Island do not differ materially from those of the adjoining mainland. There are a few species which have been found in the one district that have not so far occurred in the other; but so far as I know there is no particular reason why they should not do so.

The complete area under survey is the western half of Co. Mayo, known in Mr. R. Ll. Praeger's scheme by the initials WM. or the number 27.

In the list, I have put after the names of the species the letter C, which indicates that the species occurs on Clare Island, or M, which means that it has been found on the mainland of Co. Mayo, or both letters, if it is common to the whole area. I give also a few notes on some of the rarer species, three of which are new to the Irish list.

A small collection was also sent me by Mr. R. Ll. Praeger and Mr. R. Welch from the Bills rocks, which lie some nine miles to the west of Clare Island, and which deserves special note. It contained the four following species:—*Segestria senoculata* L., *Lepthyphantus tenuis* Bl., *Pedanostethus lividus* Bl., and *Lycosa ruricola* de Geer. Of these, there was a single specimen only of the second and third, while there were several of each of the other two. A wild and exposed spot such as the Bills rocks is the natural habitat of *Segestria senoculata*, a very hardy species, and one which lives in crannies of the rocks and would thus escape the fury of the Atlantic storms; but it is certainly remarkable to find that a delicate little spider like *Lepthyphantus tenuis* should be able to maintain itself on such a spot.

Professor Carpenter informs me that he received several years ago the following species from Inishbofin:—*Segestria senoculata*, *Xysticus cristatus*, *Tetragnatha extensa*, *Araneus cornutus*, *Lycosa ruricola*, *Pirata piraticus*, and *Pardosa nigriceps*.

I wish to offer my sincere thanks to Dr. A. Randell-Jackson for the great help he has given me in identifying the species that were unknown to me, and also in confirming the identification of many others among the less common kinds. I have also to thank Dr. R. F. Scharff, Professor G. H. Carpenter, Mr. R. Welch, Mr. Nevin Foster, Mr. H. Wallis Kew, Mr. P. H. Grimshaw, and Mr. R. Ll. Praeger for collections sent me from the island and various other parts of the district. I have also made use of Professor Carpenter's records, in his "List of the Spiders of Ireland,"<sup>1</sup> of captures on Achill Island.

<sup>1</sup> Proc. R.I. Acad., ser. 3, vol. v, pp. 128-210. 1898.

## LIST OF SPECIES.

- Dysdera crocota Koch.* M. C.  
*Harpactes Hombergii Scop.* C.  
*Segestria senoculata L.* M. C.  
*Drassus lapidosus Koch.* M. C.  
     *troglodytes C. L. K.* C.  
*Clubiona holosericea de G.* M. C.  
     *reclusa Camb.* M. C.  
     *neglecta Camb.* C.  
     *diversa Camb.* M.  
     *brevipes Bl.* M.  
*Micaria pulicaria Sund.* M. C.  
*Agroeca gracilipes Bl.* M.  
*Oxyptila trux Bl.* M. C.  
     *horticola Koch.* C.  
*Xysticus cristatus Cl.* M. C.  
*Cryphoea sylvicola Koch.* M.  
*Argyroneta aquatica Cl.* C.  
*Tegenaria Derhamii Scop.* M. C.  
*Textrix denticulata Oliv.* M. C.  
*Hahnia montana Bl.* M. C.  
     *elegans Bl.* M.  
*Amaurobius similis Bl.* M. C.  
*Nesticus cellulanus Cl.* M.  
*Theridion lineatum Cl.* M. C.  
     *sisyphium Cl.* M.  
*Enoplognatha thoracica Hahn.* C.  
*Pedanostethus lividus Bl.* M. C.  
     *arundinetis Camb.* M.  
*Peponocranium ludicrum Camb.* M.  
*Cnephalocotes curtus Sim.* M.  
*Ceratinella brevipes West.* C.  
*Araeoncus humilis Bl.* M. C.  
*Pocadicnemis pumilla Bl.* M. C.  
*Metopobactrus prominulus Camb.* M.  
*Tiso vagans Bl.* M. C.  
*Savignia frontata Bl.* M.  
*Diplocephalus castaneipes Sim.* M.  
     *fuscipes Bl.* M. C.
- Lophomma subaequale Camb.* C.  
*Dicymbium nigrum Bl.* M. C.  
*Walckenaera nudipalpis West.* C.  
*Wideria antica Bl.* C.  
*Gongylidiellum vivum Camb.* M. C.  
*Neriere rubens Bl.* M.  
*Dicyphus bituberculatus Wid.* M. C.  
*Dismodicus bifrons Bl.* M.  
*Gongylidium fuscum Bl.* M.  
     *retusum West.* M. C.  
     *agreste Bl.* M. C.  
*Erigone atra Bl.* M. C.  
     *dentipalpis Wid.* M. C.  
     *arctica White.* M. C.  
     *promiscua Camb.* C.  
     *longipalpis Sund.* M.  
*Maso Sundevallii West.* C.  
*Microneta saxatilis Camb.* C.  
     *subtilis Camb.* C.  
*Tmeticus abnormis Bl.* M. C.  
     *Huthwaitii Camb.* M. C.  
     *bicolor Bl.* M.  
     *prudens Camb.* M.  
*Hilaira uncata Camb.* M. C.  
     *reproba Camb.* M.  
     *excisa Camb.* C.  
*Porrhomma pygmaea Bl.* M.  
*Bathyphantes concolor Wid.* M. C.  
     *variegatus Bl.* M. C.  
     *gracilis Bl.* M.  
     *nigrinus West.* M.  
*Lepthyphantes tenuis Bl.* M. C.  
     *Blackwallii Kulcz.* M. C.  
     *Mengei Kulcz.* M.  
     *leprosus Ohl.* C.  
     *ericaeus Bl.* M. C.  
     *minutus Bl.* M.  
*Linyphia clathrata Sund.* M. C.

<i>Linyphia triangularis</i> Cl. M. C.	<i>Araneus quadratus</i> Cl. M.
<i>pusilla</i> Sund. M.	<i>cornutus</i> Cl. M.
<i>Stemonyphantes lineata</i> Lin. M.	<i>Dolomedes fimbriatus</i> Cl. M.
<i>Bolyphantes luteolus</i> Bl. M.	<i>Lycosa terricola</i> Th. M. C.
<i>Tapinopa longidens</i> Wid. M. C.	<i>ruricola</i> de Geer. M. C.
<i>Pachygnatha Degeerii</i> Sund. M. C.	<i>pulverulenta</i> Cl. M. C.
<i>Clerckii</i> Sund. M. C.	<i>perita</i> Latr. M.
<i>Tetragnatha extensa</i> Linn. M. C.	<i>Pirata piraticus</i> Cl. M. C.
<i>Meta segmentata</i> Cl. M. C.	<i>Pardosa amentata</i> Cl. M. C.
<i>Merianae</i> Scop. M. C.	<i>nigriceps</i> Th. M. C.
<i>Menardii</i> Latr. C.	<i>pullata</i> Cl. M. C.
<i>Singa pygmaea</i> Sund. M.	<i>palustris</i> Linn. M. C.
<i>Zilla x-notata</i> Cl. M. C.	<i>Neon reticulatus</i> Bl. M.
<i>atrica</i> C. K. M.	<i>Euophrys frontalis</i> Bl. M. C.
<i>Araneus diadematus</i> Cl. M. C.	<i>Heliophanus cupreus</i> Walck. C.

## NOTES ON SPECIES NEW TO IRELAND.

Of the above list three species have not previously been taken in Ireland; they are as follows:—

*Pedanostethus arundinetis* Camb.  
*Metopobactrus prominulus* Camb.  
*Diplocephalus castaneipes* Simon.

***Pedanostethus arundinetis* Camb.**

I took several females of this species, which is new to the Irish list, at Mulranny, Co. Mayo, and also at Recess, Co. Galway, in July, 1909. It has been recorded from only five localities in Great Britain, ranging from Dorset to Paisley in Scotland. On the continent of Europe it has been found in Sweden, Holland, Bavaria, and Hungary.

***Metopobactrus prominulus* Camb.**

I took a single female of this species, which has not previously been found in Ireland, at Mulranny, Co. Mayo, in July, 1909. Dr. Jackson was kind enough to identify it for me. In England it has been found to be widely distributed, ranging from Dorset to Northumberland, but it has not so far been taken in Scotland. On the Continent it is recorded from France, Bavaria, Nassau, and Silesia.

**Diplocephalus castaneipes** Simon.

A single female of this very rare species was sent me amongst a collection made by Mr. H. Wallis Kew on Clare Island in June, 1910, and kindly identified for me by Dr. A. R. Jackson. This is the first record of its capture in Ireland; but since I have been acquainted with it, I have come across five females, labelled as from Rathmullen, Co. Donegal, which are preserved in the National Museum in Dublin, and which undoubtedly belong to this species, and must have been taken some years previously. Unfortunately there is nothing to show when or by whom they were captured. The only known locality for it in Great Britain is on Snowdon, where it was discovered by Dr. Jackson; whilst on the continent of Europe it has occurred only in two mountainous places in Southern France.

NOTES ON THE RARER SPECIES.

**Drassus troglodytes** Koch.

A single female of this uncommon species was taken on Clare Island in April, 1909. It has been found in seven other localities in Ireland, and is widespread in Great Britain, but is nowhere common.

**Clubiona neglecta** Camb.

I took one male and four females of this rare spider on the cliffs of Clare Island, facing south and east. It had been taken in four localities in Ireland previously, all being near the sea. This is the first record of its capture in Connaught. In England it has been found only in Dorsetshire.

**Agroeca gracilipes** Bl.

I took a single mature male of this species, which is very rare in Ireland, at Delphi, Co. Mayo, in September, 1911. There are only three previous records of its capture in Ireland, viz. at Armagh; Roundstone, Co. Galway; and Newcastle, Co. Down.

**Oxyptila horticola** Koch.

A pair of this by no means common species were taken by Mr. R. Welch in September, 1909, on the north-eastern end of the island, and two more females were found on the western promontory in July. It is widely distributed in Ireland and Great Britain.

**Argyroneta aquatica** Cl.

Considering the small amount of water on Clare Island it was very interesting to find this spider in considerable numbers in the little Creggan Lough. Adult specimens were taken from April to July.

**Hahnia montana** Bl.

I took an immature male, probably of this species, on Clare Island in July, 1909, and a mature female on the slopes of Croaghpatrick in September, 1911. It has been found in only three other places in Ireland.

**Enoplognatha thoracica** Hahn.

Six females of this species were found in various parts of Clare Island in June and July. It has been taken in ten places in Ireland previously, all near the coast. In England it seems to be a rare spider, having been found in two or three places only.

**Peponocranium ludicrum** Camb.

I found a single mature female of this spider amongst heather near Delphi, Co. Mayo, in September, 1911. This, with another female taken on the Hill of Howth in September, 1908, are the only records of its occurrence in Ireland.

**Cnephalocotes curtus** Simon.

Professor Carpenter records this rare species from the north-eastern shore of Achill. The only other known locality in Ireland is Bangor, Co. Down.

**Ceratinella brevipes** West.

A single female of this spider was taken by Mr. H. Wallis Kew on Clare Island in June, 1910. The only other localities where it has been found in Ireland are Fenagh, Co. Carlow, and on the Ulster Canal near Monaghan. It was taken in the latter locality by Mr. R. Welch in October, 1909.

**Lophomma subaequale** West.

I found two males of this rare spider on Clare Island in July, 1909, on the southern slopes. A single male had been taken previously by Mr. J. N. Halbert at Terenure, Co. Dublin, and was recorded by Prof. Carpenter in his "List of the Spiders of Ireland" as *Tapinocyba subaequalis* West. I have since taken a female at Fenagh, Co. Carlow, while in England it has occurred in Hampshire only, and on the Continent in Sweden only.

**Walckenaera nudipalpis** West.

A single female of this rare spider was taken on the summit of Croaghmore on Clare Island, in May, 1909, by Mr. R. Ll. Praeger. Prof. Carpenter records it for four localities in Ireland, one being at a height of 3,000 feet on McGillicuddy's Reeks, and I have since received a single specimen from Belfast, taken by Mr. H. L. Orr.

**Walckenaera acuminata** Bl.

Females of this species were taken on Clare Island from April to July. It has not occurred before in the province of Connaught, though widely distributed in other parts of Ireland.

**Wideria antica** Bl.

A single female of this spider was taken at Knocknaveen, Clare Island, in July, 1909. This is its first occurrence in Connaught, but there are seven other known localities for it in Ulster and Leinster.

**Gongyliellum vivum** Camb.

I took a single female on Clare Island and three more at Mulranny of this tiny spider in July, 1909. It had previously been taken in Ireland only at Fenagh, Co. Carlow; Recess, Co. Galway; and Ardara, Co. Donegal.

**Erigone promiscua** Camb.

I took a single male of this rather rare spider on Clare Island in July, 1909, and also several females, probably of the same species, at the same time. It has occurred in all the four provinces of Ireland, but only in seven localities.

**Erigone arctica** White.

This species was fairly numerous on the sandy shore near the Harbour on Clare Island, and also on the sands at Mulranny and the rocks at Roonah Quay. It has not been found before in Connaught. I also took a single male at Dog's Bay, Roundstone, Co. Galway, in July, 1909. I think it will probably be found all round our coast.

**Microneta saxatilis** Camb.

A single female of this species was taken on Clare Island in 1909. Its only previous record in Ireland is from Fenagh, Co. Carlow.

**Microneta subtilis** Camb.

Mr. H. Wallis Kew sent me a male and three females of this spider taken on Clare Island in June, 1910. It has been found before in Ireland only at Fenagh, Co. Carlow, and on Carrantuohill, Co. Kerry.

**Tmeticus abnormis** Bl.

This rare spider seems to be rather commoner in the west than in other parts of Ireland. Prof. Carpenter records it from Achill; and Dr. R. F. Scharff sent me an adult pair he took on Achill in June, 1909. I also took it on Clare Island, on the side of Croaghpatrick, and at Mulranny.

**Tmeticus prudens** Camb.

Prof. Carpenter records this species from the summit of Slievemore on Achill Island, and I took an adult female near the summit of Croaghpatrick in September, 1911.

**Hilaira uncata** Camb.

I took a single female of this species on Knocknaveen, Clare Island, in July, 1909, and two females on a bog on the Erriff River, near Leenane, in September, 1911. Prof. Carpenter records it from Armagh, and Mr. R. Welch sent me three females from Monaghan in October, 1909. These are its only Irish records.

***Hilaira excisa* Camb.**

Prof. Carpenter sent me a female of this rare species which he took at a height of 1,300 feet on Croaghmore, Clare Island, in July, 1911. The only other places in Ireland where it occurred are Marble Arch, Enniskillen, and Ballycastle, Co. Antrim.

***Hilaira reproba* Camb.**

I found two females of this spider on the sands at Mulranny. At the time Prof. Carpenter published his list, only a single female had been taken in Ireland, on the North Bull, Co. Dublin. Since that time it has, however, been taken at several places round the coast—namely, Valencia Island, Lambay, and Kilroot Point, Co. Antrim; and I may add that it simply swarms on the southern shores of the Hill of Howth.

***Bathyphantes variegatus* Bl.**

Several females of this rather scarce spider were taken on Clare Island in June and July, and a single female at Louisburgh in September, 1911.

***Lepthyphantes obscurus* Ohl.**

A single male of this species was taken by Professor Carpenter at a height of 1,500 feet on Croaghmore, Clare Island, in July, 1911. It is not a very common spider, though in some places it occurs in considerable numbers.

***Bolyphantes luteolus* Bl.**

I took a single adult female of this spider on Croaghpatrick in September, 1911. It has occurred about six times only before in Ireland, and seems to frequent chiefly mountainous regions.

***Meta Menardii* Latr.**

No specimen of this spider was actually found on Clare Island, but under some boulders on the southern shore I found one of its remarkable egg-cocoons, which shows that it is undoubtedly present.

***Singa pygmaea* Sund.**

Mr. J. N. Halbert sent me three females of this rare little spider which he took on a moor at Lugaloughaun near Louisburgh in July, 1910. The only other Irish localities known for it are Tullamore, King's County, and Muckross, Co. Kerry, in both of which places it was also taken by Mr. Halbert.

***Dolomedes fimbriatus* Cl.**

I took two half-grown and a number of very small newly hatched specimens of this handsome spider on a moor near Delphi, in September, 1911. Though common in Connemara, it had not previously been recorded for Co. Mayo.

***Neon reticulatus* Bl.**

Professor Carpenter records this species from Keem Bay, Achill. Its only other known localities in Ireland are Leenane, Co. Galway; Kilcarrig Bridge, Co. Carlow; and Kenmare, Co. Kerry.



PHALANGIDA.

BY DENIS R. PACK BERESFORD, B.A.

Read NOVEMBER 13. Published DECEMBER 8, 1911.

OF the fourteen species of Harvestmen known to inhabit Ireland, ten have been taken in the area under survey, and seven on Clare Island.

**Liobunum rotundum** Latr.

Has not been taken on Clare Island, but occurs on the mainland at Louisburgh, and further inland. It is distributed over the whole of Ireland.

**Liobunum Blackwallii** Meade.

Another species that has not been found on Clare Island ; but one specimen was taken at Louisburgh, and another at Delphi. Previous records are confined almost entirely to the south and east coasts of Ireland.

**Phalangium opilio** Linn.

This species, which is common and widely distributed in Ireland, was taken on Clare Island, and on the mainland at Mulranny, Curraun, and Delphi.

**Phalangium parietinum** de Geer.

This rare species was taken at Blacksod Bay by Mr. R. Southern in 1909. The only other localities from which it is recorded in Ireland are in the counties of Dublin, Wicklow, and Carlow.

**Platybunus corniger** Herm.

This species was taken both on Clare Island and on the mainland. Though not very common, it is widely distributed in Ireland. *P. triangularis* Herbst., which was formerly considered to be a distinct species, is now recognized as being identical with *P. corniger*, but immature.

**Megabunus insignis** Meade.

This very distinct species, which is found all over Ireland, was taken in all parts of Co. Mayo, and by Professor Carpenter up to a height of 1300 feet on Croaghmore. It has also been found on Inishbofin.

**Mitopus morio** Fabr.

Probably the commonest species in Ireland. It was taken up to a height of 1500 feet on Croaghmore, Clare Island, by Professor Carpenter, and in several parts of Co. Mayo.

**Oligolophus agrestis** Meade.

This common and widely distributed species has been taken both on Clare Island, and in the Louisburgh district of Co. Mayo.

**Oligolophus ephippiatus** C. L. Koch.

This species has been taken both on Clare Island and at Westport in Co. Mayo. It is widely distributed but not very common in Ireland.

**Nemastoma lugubre** O. F. Müller.

This very common species has been taken nearly all over Ireland, including many parts of Co. Mayo; and on Clare Island was taken by Professor Carpenter up to a height of 1300 feet on Croaghmore.

ARCTISCOIDA.

BY JAMES MURRAY, F.R.S.E.

PLATES I-III.

Read APRIL 24. Published JUNE 15, 1911.

Order **ARCTISCOIDA** Schultze (27).\*

Family **Xenomorphidae** Perty (18).

(Water-bears : Tardigrada).

INTRODUCTION.

THE name **Arctiscoida** is here employed for the group of animals popularly known as Water-bears. Prof. Hay (7) showed that the long familiar name **Tardigrada** was preoccupied, and that the earliest known name applied to the family was **Xenomorphidae** Perty (18). As the group is of higher than family rank, I have recently suggested (17) the adoption of Schultze's name **Arctiscoida** (27) as an ordinal name (although it was given as a family name subsequent to Perty's), retaining Perty's **Xenomorphidae** for the only family at present in the group.

The word **Arctiscoida** is of suitable form for an ordinal name, and embodies the first generic name, **Arctiscon** Schrank (25), ever applied to a Water-bear.

*Historical sketch.*—Irish Water-bears appear to have no history. I can learn of no records previous to the commencement of the work of the Clare Island Survey.

Various naturalists employed on the Survey have assisted me by collecting material. In September, 1909, Dr. Penard brought to me some Sphagnum and other mosses, from which I obtained the first Irish Water-bears, *Macrobrotus echinogenitus* and *M. augusti*. The latter species has not been found in any subsequent collections.

In February, 1911, Mr. A. D. Cotton sent mosses from Belclare, among which there were found eight species of Water-bears.

In March, 1911, I spent about a week in the district, and collected thirty-

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\* Figures in thick type, enclosed in parentheses, refer to the Bibliography at the end.

one species. Mr. G. H. Wailes, who was working the district at the same time, called my attention to any Water-bears which occurred in the material he collected, and thus extended our knowledge of the local distribution. Subsequently Mr. Wailes sent moss from the island of Inishturk, and from a salt-marsh on Clare Island, both of which gave good results, the salt-marsh yielding the type of one of our new species (*Macrobotus richtersi*).

Lastly, the school-children of Westport collected quantities of moss, which were sent to me by Rev. J. O. Hannay, M.A. The Canadian species *Macrobotus occidentalis* occurred only in that collection.

#### NOTES ON THE SPECIES.

***Echiniscoides sigismundi*** (Schultze). (Plate II., figs. 8A-8B.)

*Habitat*.—Among the sediment washed from sea-weeds, under Achill Bridge; one example.

The Irish example shows some small differences from those figured by Schultze (28) and Richters (24). Length  $230\mu$ , exclusive of fourth legs. Body soft, not plated, with fine pellucid papillae on back and sides. Claws nine on first leg, eight on second and third, seven on fourth. Two pairs of palps near the mouth. Spine at base of head (corresponding to seta *a* of *Echiniscus*) large, about  $25\mu$  long, with a palp at its base. Spine on third leg with thick base. Fourth leg with a very large soft palp near its base. Web joining the claws for nearly half their length. Movements very sluggish.

***Echiniscus intermedius*** Murray. (Plate I, figs. 4A-4B.)

*Habitat*.—Castlebar, among *Cinclidotus* from the margin of a little lake near the railway station; several examples.

The Irish animal agrees with the Canadian form of the species in almost all details. The palps near the mouth, and also the papillae bearing the mouth-cirri, are very short and broad. The finding of the species alive permitted fuller study of the parts of the mouth and of the texture of the plates than had been previously possible. The teeth possess "bearers" (fig. 4A), as was first noticed by Herr Thulin, of Lund, Sweden, who recently found the species. It is the only *Echiniscus* known to have bearers.

The plates bear two kinds of dots,—one kind very small, uniform, and pellucid,—the other larger, irregular, and looking like pits (fig. 4B). The larger dots appear to be superficial; and it is necessary to focus deeper to see the others.

*Distribution*.—Australia, Hawaii, Canada, Sweden, Ireland

LIST OF SPECIES COLLECTED, WITH LOCAL DISTRIBUTION.

	ACHILL IS.				CLARE IS.								
	The Sea.	Moss.	Slievemore.	Tarn on Slievemore.	Moss.	Croaghmore.	Salt Marsh.	Inishturk.	Louisburgh.	Belclare.	Westport.	Castlebar, lake.	" inoss.
* <i>Echiniscoides sigismundi</i> ( <i>M. Sch.</i> ) (28),	×												
<i>Echiniscus suillus</i> <i>Ehr.</i> (4),			×	×				×		×			
* <i>E. intermedius</i> <i>Murray</i> (15),												×	×
<i>E. gladiator</i> <i>Murray</i> (11),			×										
<i>var. exarmatus</i> <i>Murray</i> (13),			×		×	×		×		×			
<i>E. granulatus</i> ( <i>Doy.</i> ) (1),													×
* <i>E. testudo</i> ( <i>Doy.</i> ) (1),												×	
* <i>E. crassus</i> <i>Richters</i> (22),												×	
* <i>E. militaris</i> <i>sp. n.</i> ,												×	
* <i>E. columinis</i> <i>sp. n.</i> ,			×										
<i>Milnesium tardigradum</i> <i>Doy.</i> (1),			×						×		×		×
<i>Macrobotus hufelandii</i> <i>C. Sch.</i> (26),		×	×		×	×		×	×	×	×	×	×
<i>M. echinogenitus</i> <i>Richters</i> (21),		×		×					×	×			
<i>M. crenulatus</i> <i>Richters</i> (21),			×	×		×							
<i>M. harmsworthi</i> <i>Murray</i> (14),		×	×					×			×		
* <i>M. occidentalis</i> <i>Murray</i> (15),											×		
<i>M. areolatus</i> <i>Murray</i> (15),				×									
* <i>M. richtersii</i> <i>sp. n.</i> ,							×						
variety with rounded processes,									×				
* <i>M. virgatus</i> <i>Murray</i> (15),		×		×									
<i>M. intermedius</i> <i>Plate</i> (19),		×			×			×		×			×
<i>M. arcticus</i> <i>Murray</i> (14),					×			×	×				
<i>M. hastatus</i> <i>Murray</i> (13),		×											
* <i>M. hibernicus</i> <i>sp. n.</i> ,				×									
<i>M. tuberculatus</i> <i>Plate</i> (19),										×			×
<i>M. papillifer</i> <i>Murray</i> (11),								×		×			
<i>M. ornatus</i> <i>Richters</i> (20),			×	×	×				×				
* <i>M. scabrosus</i> <i>sp. n.</i> ,					×								
<i>M. annulatus</i> <i>Murray</i> (11),					×							×	
<i>M. lacustris</i> <i>Duj.</i> (3),				×									
<i>M. augusti</i> <i>Murray</i> (18),									×				
<i>M. schaudinni</i> <i>Richters</i> (23),			×								×		
<i>Diphaseon chilense</i> <i>Plate</i> (19),						×							
<i>D. scoticum</i> <i>Murray</i> (10),			×		×					×			
<i>D. angustatum</i> <i>Murray</i> (11),			×							×			

\* Those marked with an asterisk are additions to the Britanic Fauna.

***Echiniscus gladiator* Murray.**

*Type*.—One example on Slievemore, Achill, between 1,000 and 2,000 feet.

Variety **exarmatus**.—Abundant on Slievemore, from 1,000 feet to the top, and at all elevations on Clare Island; Belclare. Larvae and skins with eggs frequent.

On mountains the variety is usually found on the higher levels and the type lower down. In Ireland the variety was abundant from sea-level to the highest hills, and the type was extremely scarce.

***Echiniscus testudo* (Doyère). (Plate II., figs. 7A-7B.)**

*Habitat*.—Among aquatic mosses (*Cinclidotus*) growing on stones at the margin of a small lake near Castlebar railway station.

The Irish example differs from that figured by Doyère in lacking seta *b*; but Doyère says that most of the specimens obtained in Paris were without this seta (which is now called *b*). The plates are more finely dotted than Doyère shows in his figure. The habitat is different, Doyère's animal living among the moss of roofs, etc., and therefore of the kind that dries frequently. But the water-bears do not strictly confine themselves to certain habitats, and an aquatic species may casually occur in moss, and *vice versa*.

***Echiniscus crassus* Richters. (Plate I., figs. 2A-2C.)**

*Habitat*.—Among *Cinclidotus* from the margin of a small lake at Castlebar, extremely abundant.

Adults about 400  $\mu$  in length, by 200  $\mu$  in width. Seta *a* 80  $\mu$ , *b* 155  $\mu$ , *c* 220  $\mu$ , *d* 150  $\mu$ ; spine over *c* 50  $\mu$ , over *d* 60  $\mu$ ; claws 30  $\mu$ ; skin of 250  $\mu$  long with three eggs of 60  $\mu$  by 50  $\mu$ . Larva 160  $\mu$  long, exclusive of legs; only lateral seta *a* and *d*, *a* 70  $\mu$ , *d* 110  $\mu$ ; over *c* and *d* curved spines of 25 to 30  $\mu$ ; claws 20  $\mu$ . Dots on plates large circles, each surrounded by a hexagon (fig. 2C), the largest in middle of plates about 6  $\mu$  centre to centre. Upper pair of cirri near the mouth, shaped like spear-heads (fig. 2B). Three median plates. Fringe of large triangular spines, separated at their bases. Small harbs near base of inner claws.

As Professor Richters gave no figure of his species, the larva and some details are here figured. This is, I believe, the first record of the species outside of Iceland.

*Distribution*.—Iceland, Scotland (not previously recorded), Ireland.

***Echiniscus militaris* sp. n. (Plate I., figs. 1A-1C.)**

*Specific characters*.—Small, red. Plates nine, two pairs, two median; dots

small discs, uniform, close together. Lateral processes five on each side—*a* and *b* setae of moderate length, *c* and *d* very long setae, *e* a short, thick spike. Dorsal processes three pairs—over *b* a slender seta, over *c* and *d* very large and thick spines. Fringe on fourth leg of large triangular teeth, separated at their bases. Claws large, with small inner barbs.

Length about 200  $\mu$ , exclusive of fourth legs. Seta *a* 50  $\mu$ , *b* 50  $\mu$ , *c* 100  $\mu$ , *d* 150  $\mu$ . Seta over *b* 30  $\mu$ , spine over *c* 50  $\mu$ , over *d* 50  $\mu$ . Seta *a* has the usual palp at its base. Lateral and dorsal setae at *b* very fine; setae *c* and *d* with thick bases and very fine points. Spines over *c* and *d* straight, or nearly so, very thick and stout, not flattened, but round. Spine *e* also thick and round, sometimes enlarged in middle. The dots are pellucid discs, almost touching at their bases, in regular rows. They did not seem to be either raised above the general surface, or depressed. None of the plates is crossed by plain bands. The lumbar plate is trifoliate, and obscurely faceted.

The claws measure about 25  $\mu$  in length. The larva has not been seen. A skin of 180  $\mu$  in length contained two eggs of 60  $\mu$  by 50  $\mu$ .

*Habitat*.—Castlebar, among *Cinclidotus* at margin of small lake near the railway station.

*E. militaris* is distinguished from all other species by having dorsal setae over *b*, by the extraordinary thickness of the spines over *c* and *d*, and by the stout spike at *e*. Only *E. africanus* has setae over *b*, and it has several pairs of them, and is otherwise very different. *E. bellermanni* and *E. creplini* might be supposed to have spines over *b*; but it is difficult to tell exactly what the figures are intended to show, and at any rate they differ widely from *E. militaris*.

#### *Echiniscus columinis* sp. n. (Plate I., figs. 3A–3B.)

*Specific characters*.—Size moderate, colour red. Plates nine, v and vi joined, two median, dots small, uniform, pellucid. Lateral processes five, all fairly long setae. Dorsal processes two—over *c* a long seta, springing nearer the middle line than the posterior angle of the plate; over *d* a short spine. Fringe on the fourth leg; inner claws barbed.

Length about 200  $\mu$ , exclusive of fourth legs; seta *a* about 75  $\mu$ ; *b*, *c*, and *d* 50 to 60  $\mu$  each; *e* 125  $\mu$ . Dorsal seta over *c* 80  $\mu$ . Fringe of small triangular spines. The setae taper gradually from the base. The dots appear to be flat granules, but they sometimes look like pits.

*Habitat*.—Summit of Slievemore, Achill Island.

There are only a few *Echinisci* described which have five lateral setae. *E. serofa* and *E. quadrispinosus* both possess some additional plates between

the ordinary plates, and the spine over *d* is longer. *E. creplini* has three pairs of dorsal spines. *E. oihonnae* usually has *b* and *d* as spines, but sometimes all five are setae. It has spicules at the bases of the setae, and the outer claws are usually barbed.

In distinguishing *E. columinis* from similar species the position of the dorsal seta over *c*, nearer the middle line than in most species, is an important character.

#### Echiniscus sp. ?

Three forms occurred which appear to be related to *E. columinis*. Two of them are figured.

*First*.—Lateral setae *a, c, d, e*; over *c* a moderate spine, over *d* a spicule. A spicule on first leg. This form is not figured, as it is exactly like *E. columinis* (Plate I., fig. 3A), but lacks seta *b*. The animal was mature, as an example was found with two eggs in the skin.

*Second*.—(Plate I, fig 5.) Lateral setae *a, c, d, e*; over *c* and *d* small spicules. This differs from the *first* form described above in having the dorsal process over *c* reduced to a spicule. The setae *c, d*, and *e* sometimes have bulbous bases. Examples with two and three eggs occurred.

*Third*.—(Plate I., fig. 6.) Lateral setae *a, c, d*; over *c* a moderate spine, over *d* a spicule. Differs from the type of *E. columinis* in lacking setae *b* and *e*, and the reduction of the dorsal process over *c* to a spine.

All these three forms agree with *E. columinis* in having the dorsal processes over *c* nearer the middle line than in most species. They differ from it mainly in the lack of one or two of the lateral setae, and in the varying proportions of the dorsal process over *c*.

#### Milnesium tardigradum Doy.

All the Irish specimens closely examined had three points on each of the lesser claws of all legs. It is important to note this, as there may be incipient local races distinguished by the number of points. Often the number of points varies from one to three in the same individual, the first leg having one point, the second and third legs two and three, and the fourth leg three.

#### Macrobotus crenulatus Richters.

This arctic species was abundant on the two mountains visited, Slievemore and Croaghmore, at elevations of over 1,000 feet.

*Distribution*.—Spitsbergen, Franz Josef Land, Orkney, Shetland, Ireland.



**Macrobotus occidentalis** Murray. (Plate III., fig. 14.)

*Habitat.*—Westport, several examples.

Irish examples did not show the rectangular plates, floating in clear fluid between two layers of skin, as in Canada. No eggs were found. The species is recognized from the dotted skin, and the characters of pharynx and claws.

It was ascertained that the dots are arranged in pairs, forming longitudinal, and probably also transverse, rows. The larger paired dots appear elliptical or almond-shaped.

Herr Thulin, of Lund, has just found the species and eggs in Sweden.

*Distribution.*—Australia, Hawaii, Canada, Sweden, Ireland.

**Macrobotus areolatus** Murray.

Apparently rare in Ireland, where it is replaced by *M. richtersii*. Only eggs were seen, in a tarn at about 1,000 feet on Slievemore, Achill.

**Macrobotus richtersii** sp. n. (Pl. III., figs. 13A–13H.)

*Specific characters.*—Large, strongly pigmented; no eyes. Teeth thick; gullet very wide; three narrow rods in pharynx, and a small “comma” distant from the last rod. Claws of *hufelandii*-type, joined for half the length of the longer one, which has two supplementary points. Processes of egg conical, truncate, and slightly expanded at apex; egg-surface between the processes areolate.

Length 750 to 1,000 $\mu$ . Gullet about 16 $\mu$  in width. Pharynx shortly oval, 80 $\mu$  in length; first and second rods about four times as long as broad, third five times as long. The pattern on the egg-surface is symmetrical, and consists of obscure polygons, which appear to have originated as regular hexagons, each divided by a partition into two equal pentagons. The processes are faintly papillose; the expansion of the apex varies in amount, and it is bordered by a circlet of papillae. The egg measures 120 $\mu$  over the processes, 75 $\mu$  without them.

*M. richtersii* is closely related to *M. areolatus*, which is distinguished by the pointed processes of the egg, the claws united at the base only, the absence of comma in the pharynx, and the possession of eyes.

*Habitat.*—Among *Hylocomium squarrosum* from the salt marsh at Kinnacorra, Clare Island, collected by G. H. Wailes, March, 1911.

Though it had not been described, the species was previously known, and had been found in many places—Loch Morar, Scotland (1904); Uganda (N. D. F. Pearce, 1906); Pretoria, Transvaal (Hewitt, 1910).

Prof. Richters has studied the egg, which he found in material from Samoa, and figured it in the "Moosfauna Australiens,"<sup>1</sup> plate 17, fig. 10. It is therefore appropriate that this species should be named in honour of the naturalist who has done so much to extend the knowledge of the Water-bears.

*Variety* (figs. 13G–13H).—Processes of the egg shorter, very obtuse, and rounded. Pattern on the shell sometimes exactly as described for the type, sometimes with the polygons further divided by partitions.

Embryo in the egg with the rods of the pharynx short and thick, the length not more than twice the thickness. Adult quite typical. In the embryo, and also in the adult, the middle rod of the pharynx often appears shorter than the other two. This suggested that the animal might be *M. virgatus* Murray, of which the egg is unknown. There are, however, several differences: *M. virgatus* possesses eyes, has no comma, and the claws are much thicker, with larger supplementary points.

*Habitat*.—Among *Tortula ruralis* growing on the sandy sea-shore at Louisburgh, March, 1911, plentiful.

I have not seen any intermediate forms of eggs between the type and the variety.

*M. richtersii* is an animal which tends to re-establish faith in the constancy of species of Water-bears. If the adult only were found, it might be identified as one of the forms of *hufelandii* or *harmsworthi*, or some other species; and it would be regarded as one of the puzzling intermediate forms which throw doubt on the validity of species. If the egg only were found, we would suspect close relationship with *M. areolatus*, and no connexion with *hufelandii* and its friends. Really the species is very distinct from both; but we must know both the adult and the egg before we perceive this.

#### **Macrobotus virgatus** Murray.

The occurrence of this recently discovered Canadian species in Ireland is interesting, in view of the fact that two other Canadian Water-bears and a Canadian Bdelloid Rotifer were also found in Ireland. The species is another link between Ireland and the Arctic, as it has been recorded for Franz Josef Land.

Although unfortunately the egg has not yet been discovered, the species has two good marks—the short middle rod in the pharynx, and the very thick claws, thicker than in most species of the *hufelandii*-group.

<sup>1</sup> Zool. Jahrb. Abt. f. Syst. xxvi, Taf. 17, fig. 10, 1908.

**Macrobiotus** sp.? (Plate II., figs. 9A-9B.)

Egg like that of *M. harmsworthi*, with closely set acuminate processes (fig. 9B). Pharynx of young in the egg with two short rods—first twice as long as broad, second quadrate—and no comma; teeth thick; gullet of moderate width; claws not seen.

This might be *M. echinogenitus* Richters *b*; but in that species the pharynx, when so well developed as in the figure, would usually show the comma distinctly.

**Macrobiotus hibernicus** sp. n. (Plate III., figs. 15A-15C.)

*Specific characters*.—Size moderate. Claws of Diphascon-type. Gullet slender; pharynx with three short rods. Eggs round or oval, thick-shelled, studded with nail-like rods embedded in a hyaline matrix, the rods arranged in a reticulate pattern.

Egg about  $60\ \mu$  by  $70\ \mu$ . The rods have somewhat bulbous bases, are contracted in the middle, and expanded at the end into a broad head like that of a nail. The size of the head varies. The reticulate pattern on the surface is fairly regular, the spaces enclosed nearly circular and about  $15\ \mu$  in diameter.

The young squeezed out of the egg was  $140\ \mu$  in length. The gullet is slightly expanded at the end in the pharynx. The rods are nearly equal, about twice as long as broad, and there is a comma. The claws were too small to allow details to be accurately seen. The Diphascon character does not appear to be very pronounced, the pairs being nearly equal, with the long claw of one pair somewhat produced. This shows an approach to the type of *hufelandii*; but it is not safe to take the characters of the claws from the young in the egg, as their development may be incomplete. The teeth and pharynx are fully developed earlier than the claws. Eyes were not seen.

The size of the adult cannot be given, as, although they may have been present in the material, the identity of any adult with the egg could not be proven.

Closely related to *M. arcticus* and *M. hastatus*. Although the observations are incomplete and the adult is unknown, the reticulate pattern on the egg and the three rods in the pharynx sufficiently distinguish *M. hibernicus* from these species. Both of them have only two rods in the pharynx, and the rods on the egg are more numerous and closer together, not forming a reticulation.

Judging by what is known of the related species, it may be expected that

the adult will have the rods in the pharynx relatively longer, and the claws more decidedly of the Diphascion type.

*Habitat.*—Among moss from the margin of a tarn on Slievemore, Achill Island, at an elevation of about 1,000 feet; only a few examples.

**Macrobotus papillifer** Murray. (Plate II., figs. 10A–10C.)

*Variety.*—Papillae in number and position as in the type, but arising from large hemispherical or conical bases. There are six papillae in a transverse row on each segment and pseudo-segment; and they cover the whole surface of the segments, touching at their bases. The last three apparent segments have only four papillae on each. There is a large papilla at the base of each fourth leg. Pharynx with three short rods, and no comma. Claws unequal, united near the base only, diverging at about a right angle. Length 200  $\mu$ .

The large size of the dorsal and lateral processes, which occupy the whole surface, gives the animal an appearance very different from that of the type; and it may prove to be a distinct species. It agrees in pharynx and claws.

The variety has been seen in Scotland, but never recorded.

*Habitat.*—Salt-marsh, Clare Island; among Sphagnum, Blantyre Moor, Scotland.

**Macrobotus ornatus** Richters.

All the three forms described by Richters (*spinifer*, *spiniosissimus*, and *verrucosus*) occurred in Ireland.

Var. **verrucosus**. (Plate II., fig. 12A to 12C.) As Professor Richters identified my first drawing of *M. scabrosus* as this variety, it is here figured and described in order to point out the differences. Var. *verrucosus* is exactly like the other varieties of *M. ornatus*, except that the spines are greatly reduced or lacking. All these varieties are smaller than *M. scabrosus*; the papillae are in regular rows across the segments; there are no eyes; and the claws are Y's with short stem, rather than V's. The spines of the spiny varieties spring from the transverse ridges, and in the var. *verrucosus* these ridges are still represented by lines.

**Macrobotus scabrosus** sp. n. (Plate II., figs. 11A, 11B.)

*Specific characters.*—Small, papillose; papillae unequal and irregular; gullet narrow, pharynx with two short rods; dark eyes; claws V-shaped, united at base only, pairs equal, claws of each pair unequal.

Length about 250  $\mu$ . The slender gullet ends with conspicuous apophyses, and the two rods of the pharynx are little longer than broad. There is no

comma. The back, sides, and the basal parts of the legs are papillose. The papillae are scattered irregularly, not arranged in transverse rows, and some are very large. Some have the appearance of being the product of secretion; but if so, they are strongly fixed, and do not come off under rough usage. The claws diverge but moderately.

*Habitat*.—Among moss from the sea-shore, Clare Island.

This animal was recorded in 1905 (11) for Scotland as var. *verrucosus* of *M. ornatus* Richters; but I have since seen reason to doubt the identity with Richters' species. The differences are—the larger size, the possession of eyes, the irregularity of the papillae, and the relatively larger claws of different form.

All the forms of *M. ornatus*, including *verrucosus*, occurred in W. Ireland. All were smaller, without eyes, with papillae in regular transverse rows, and very small claws. The claws are partly united, forming little Y's, with the arms unequal.

Richters' name has not been adopted for the new species, because it is believed we are dealing with a different animal, and that there is a verrucose variety of *M. ornatus*.

*Distribution*.—Only known in Scotland and Ireland.

#### **Macrobotus augusti Murray.**

Although it has a fairly wide range, since it has been noted for the Arctic, Scotland, Ireland, and Australia, *M. augusti* seems to be rare, or extremely local. In Scotland it occurs in one patch of bog, and not in any of the numerous similar bogs in the same neighbourhood. Similarly, in Ireland, where the whole country seems suitable for it, it only occurred once.

#### **M. schaudinni Richters. (Plate III., figs. 16A, 16B.)**

As Richters gave no figure with his description of this species, it is here figured. It is a fairly large animal, and possesses eyes, three short rods in the pharynx, and claws of the Diphascion-type. There are some differences from Richters' animal, but they are too slight to justify its separation in the meantime.

Irish examples have not the rods very obviously increasing in size from first to third, and very often there is no comma.

Though only recently described from Spitsbergen material, the animal has long been known in Scotland, and has just been recorded for that country (16). It was abundant in some localities in W. Ireland, though it did not appear to be generally distributed.

## SUMMARY.

The Clare Island Survey has collected thirty-three species of Water-bears, besides some distinct varieties which may eventually be elevated to the rank of species.

The examination of the Irish Water-bear fauna will be instructive in so far as it brings to light some correspondence with the faunas of other countries, as well as peculiarities of its own.

It is natural to compare the Irish Arctiscoida first with those of Scotland, as the countries are so near, and so similar in physical features and climate. Scotland has fifty species of Water-bears, and Ireland has thirty-three. Scotland has been worked for a longer time and over a wider area. As the Irish list was compiled in one small corner of the island, the number of species may be considered very fair as a beginning.

The amount of difference between these two adjacent countries is considerable. There are twenty-two species common to the two countries, leaving twenty-eight Scottish species which are unknown in Ireland, and eleven Irish species which have not been recorded for Scotland. The difference is reduced by the recording here of three species previously known in Scotland, but not recognized as distinct.

Among the eleven species not found in the Scottish list there are five which are described as new species. *Macrobiotus richtersii* and *M. scabrosus* are here recorded for Scotland, so that there are only three species which at present appear to be peculiar to Ireland (*Echiniscus militaris*, *E. columinis*, and *Macrobiotus hibernicus*).

*Arctic Species in Ireland.*—It was expected that some Arctic species might appear on the Irish mountains, as they are known to occur in Scotland. Sixteen species, or nearly half of the Irish list, are common to Ireland and the Arctic Region; but the majority of these are cosmopolitan species. The following half-dozen species are at present limited in their known range to the north temperate and Arctic regions:—*Echiniscus crassus*, *Macrobiotus crenulatus*, *M. virgatus*, *M. arcticus* (also in the Antarctic), *M. schaudinni*, *Diphascon angustatum*.

*Canadian Species in Ireland.*—An interesting feature of the Irish list is the occurrence of three Water-bears which were recently discovered in Canada, and which were hitherto unknown in Europe:—*Echiniscus intermedius*, *Macrobiotus occidentalis*, and *M. virgatus*. The two first have now been found in Sweden by Herr Thulin, though I am not aware that the records have been published. *E. intermedius* is also on record for Australia and Hawaii; but it is very likely that the three forms will be eventually recognized as distinct

species. With the Canadian Water-bears there was associated in Ireland a Canadian Bdelloid Rotifer. This fact strengthens the idea that this "Atlantic" distribution may be due to some real community of conditions.

*Marine species.*—*Echiniscoides sigismundi* is the first marine Water-bear to be recorded for the British Isles, and the Irish form has some peculiarities not previously noted.

*Rare and local species.*—About one-half of the Irish species are cosmopolitan or widely distributed. The others are more or less limited in their range. Some of these have been already noticed under the Arctic, Canadian, and Marine species. Others show various peculiarities in distribution. *E. gladiator* is in the British Isles, Canada, and New Zealand, but the variety *exarmatus* only in Britain and New Zealand; *M. harmsworthi* in Europe, Australasia, and the Arctic; *M. hastatus* in Britain and Switzerland, *M. papillifer* in Britain and Australasia *M. annulatus* in Britain, New Zealand, and the Arctic; *M. schaudinni* and *Diphascion angustatum* in Britain and the Arctic.

No doubt further work in other countries will greatly modify our ideas of distribution, but some species (such as *M. argusti* and *M. hastatus*) appear to be, from some unknown cause, extremely restricted in their range, as among hundreds of apparently suitable locations they will be found only in one here and there, or even in a single spot.

*Conclusion.*—As the thirty-three species of Water-bears were all collected in a small part of one county, it cannot be supposed that the list is fairly representative of the whole of Ireland. When other parts of the country, offering varying conditions, come to be studied, it would not be surprising if the list were easily doubled. As there appear to be no earlier records of Irish Water-bears, all thirty-three species are new for Ireland. As indicated in the table on p. 3, there are eleven species which are new records for the British Isles, making the Britannic list up to sixty-one species. [See Murray (16) in Bibliography.]

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EXPLANATION OF PLATES.

PLATE I.

Fig.

- 1A. *Echiniscus militaris* sp. n.  
1B. The same : outer and inner claws, the latter with barb.  
1C. The same : part of the surface-markings.
- 2A. *Echiniscus crassus* Richters : larva.  
2B. The same : head of adult.  
2C. The same : part of the surface-markings.
- 3A. *Echiniscus columinis* sp. n.  
3B. The same : outer and inner claws, the latter with barb.
- 4A. *Echiniscus intermedius* Murray : head of adult, showing the "bearers"  
of the teeth, etc.  
4B. The same : surface texture, of two sorts of dots.
5. *Echiniscus*, probably a form of *E. columinis*.
6. *Echiniscus*, probably another form of *E. columinis*.

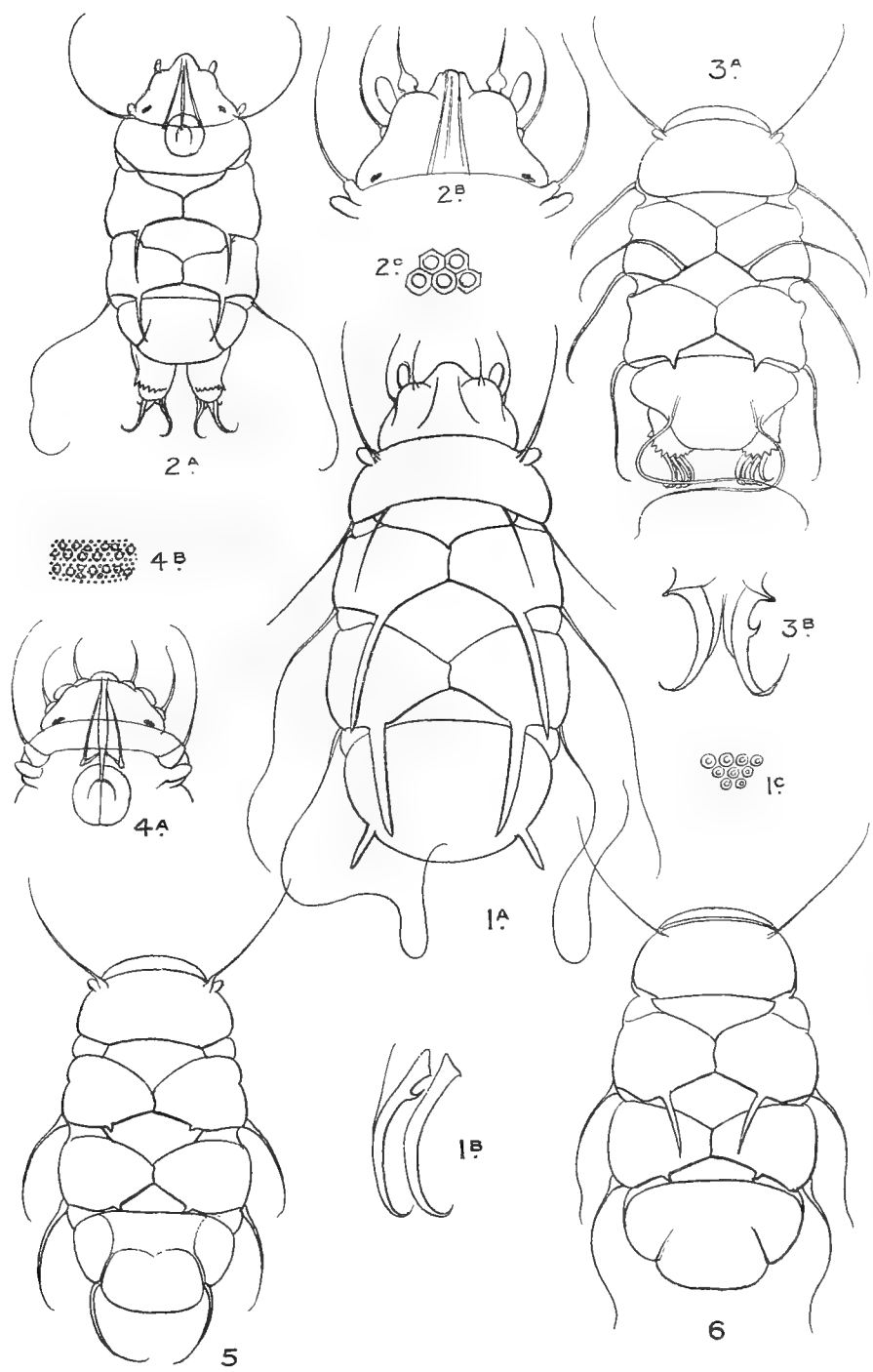
## PLATE II.

Fig.

- 7A. *Echiniscus testudo* Doy., variety.  
 7B. The same: claw.  
 8A. *Echiniscoides sigismundi* (M. Sch.).  
 8B. The same: claws, showing the web.  
 9A. *Macrobotus* sp.?: teeth and pharynx.  
 9B. The same: one process of the egg.  
 10A. *Macrobotus papillifer* Murray: variety with very large papillae.  
 10B. The same: teeth and pharynx.  
 10C. The same: claws.  
 11A. *Macrobotus scabrosus* sp. n.  
 11B. The same: claws.  
 12A. *Macrobotus ornatus* var. *verrucosus* Richters: skin with egg.  
 12B. The same: teeth and pharynx.  
 12C. The same: claws.

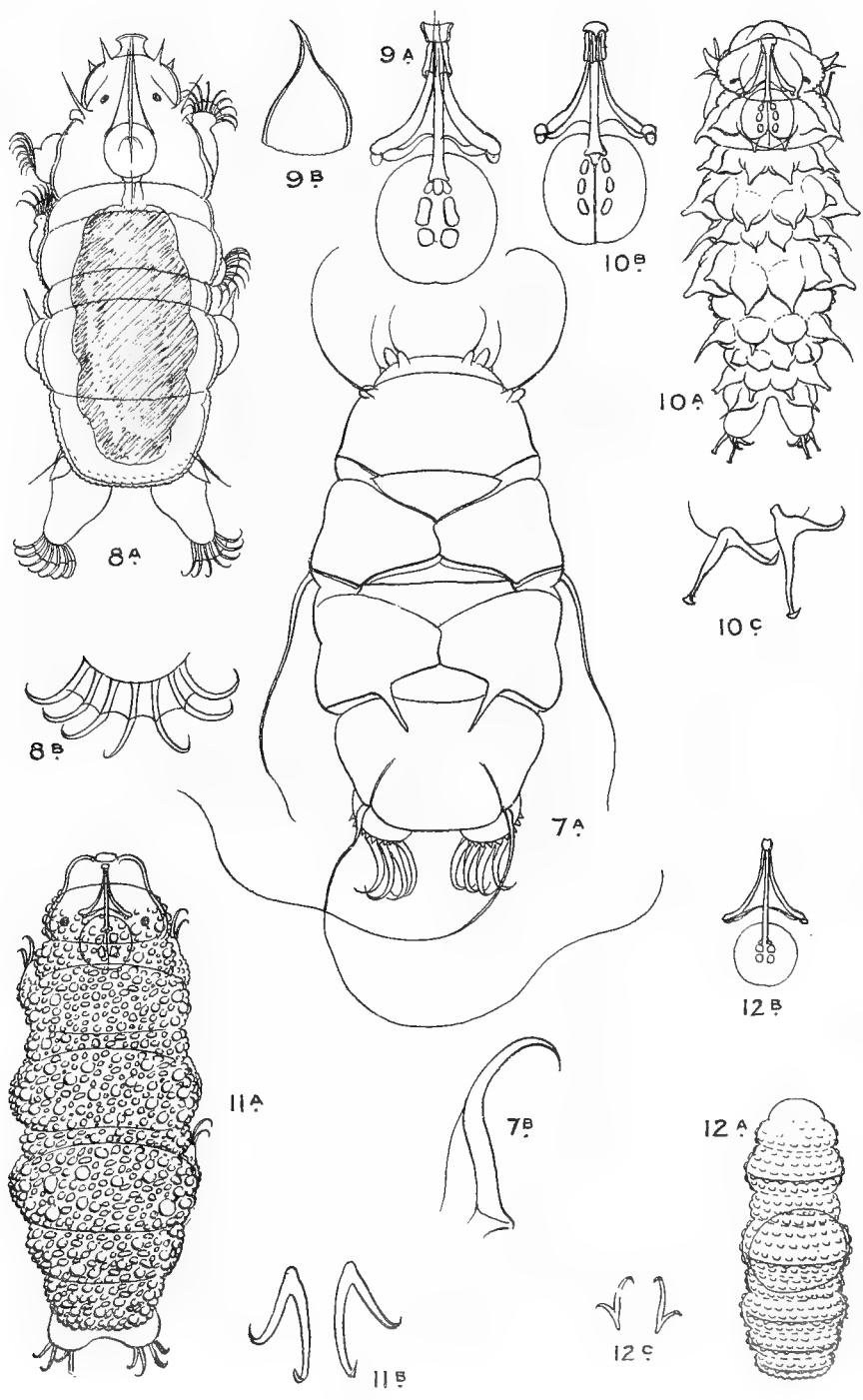
## PLATE III.

- 13A. *Macrobotus richtersii* sp. n.  
 13B. The same: teeth and pharynx of adult.  
 13C. The same: teeth and pharynx of young in the egg.  
 13D. The same: claws.  
 13E. The same: egg.  
 13F. The same: one process of the egg.  
 13G. The same: variety of the egg.  
 13H. The same: one process of the egg.  
 14. *Macrobotus occidentalis* Murray, showing the surface-markings in pairs.  
 15A. *Macrobotus hibernicus* sp. n. The egg.  
 15B. The same: teeth and pharynx of young in the egg.  
 15C. The same: the claws of the young, probably incompletely developed  
 16A. *Macrobotus schaudinni* Richters.  
 16B. The same: claws.



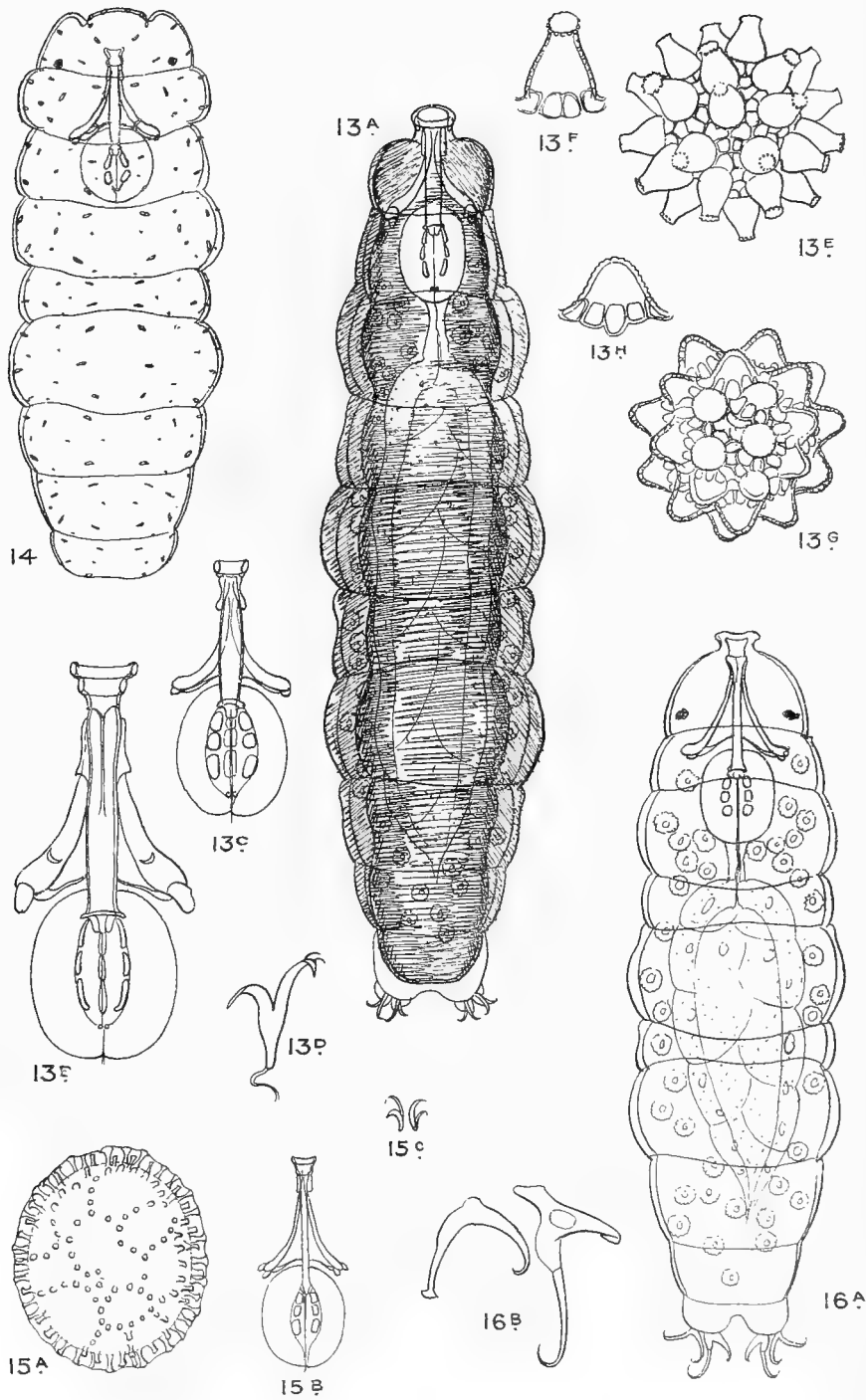
J. Murray, *del. ad nat.*





J. Murray, del. ad nat.





J. Murray, *del. ad nat.*





PSEUDOSCORPIONES.

By H. WALLIS KEW.

Read FEBRUARY 27. Published JUNE 15, 1911.

A CAREFUL examination of Clare Island for False-Scorpions was made from the 17th to the 22nd of June, 1910, when most parts of the island were visited, including the old castle and more modern buildings at the Quay, much of the coast-line, the broken cliffs of Toormore, the stony drift-covered region north of Kinnacorra, the small native scrub of Portlea, the low inland cliff near Ballytoohy, the northern flank of Knocknaveen, and the great southern slope and summit of Croaghmore. The writer was joined on one or two occasions by Mr. Thomas Greer and Mr. Robert Welch; and altogether a somewhat thorough search was more or less satisfactorily completed. As a result it appeared certain that the little animals for which we were looking were here unusually scarce; this fact being related in the main no doubt to the character of the island's surface, which is in great part more or less peat-covered and boggy. *Obisium maritimum* Leach—a false-scorpion of exceptional habitat—is doubtless by no means uncommon on the shore below high-water mark; but for the rest only a few individuals of *Chthonius tetrachelatus* Preys. and one of the common *Obisium muscorum* Leach were found. Of species which follow man none occurred. The byres were too damp for *Cheiridium muscorum* Leach and other species which are apt to live in such places; and even the common *Chthonius Rayi* L. Koch, which has, mainly as a low-land species, a wide range in Ireland, appeared to be absent.

OBISIIDAE.

*Obisium maritimum* Leach.

This animal lives on the shore between tide-marks—always below high-water mark—and generally in places subject to rather deep submersion at every tide. By taking out a geologist's hammer and chisels and splitting open narrow fissures in the slaty rocks we found it in some plenty in two places about Gubanoomeen, on the southern coast of the island. The rocks here had a moderate covering of *Fucus* and acorn-barnacles, and were studded over

with limpets and sea-anemones; and in their fissures were living, besides the *Obisium*, some of the usual associates of this animal, viz., the blue Collembolan *Anurida maritima*, the yellowish carabid-beetle *Aëpus*, and the blackish staphylinid *Micralymma brevipenne*. Of the *Obisium* itself were observed numbers of adult and partly grown individuals moving freely on the inner surfaces of the opened fissures; and in addition to these there were several females enclosed in their silken brood-nests and bearing the embryo-mass; we saw also one or two moulting-nests containing the cast-skin of the animal.

*Obisium maritimum*, already known on the shores of the bays of Kenmare, Co. Kerry, and Bantry, Co. Cork, is likely to have an extended range on the littoral zone of Ireland. Beyond, it is known in the Isle of Man, on the western and south-western shores of Britain, in Jersey, and on the northern and western shores of France.

#### ***Obisium muscorum* Leach.**

A common species among dead leaves, moss, under stones, etc., from sea-level to the tops of our mountains, but evidently scarce on Clare Island. One specimen was obtained, in the scrub of Portlea, by sifting dead-leaves and débris of ferns; and this was the only one seen on the island. On the adjoining mainland the animal has occurred at Delphi, Co. Mayo (Halbert) and Leenane, Co. Galway (Halbert).

*Obisium muscorum* is common and widely distributed in Ireland, being already known in the counties of Antrim, Tyrone, Armagh, Down, Dublin, Wicklow, Carlow, Cork, and Kerry, as well as in Mayo and Galway as above noted. It is generally distributed in Britain; and its range abroad extends from north of the Polar Circle in Norway to the Mediterranean.

### **CHTHONIIDÆ.**

#### ***Chthonius tetrachelatus* Preys.**

A species living under stones, etc., more especially in maritime and mountainous districts, and sometimes in old gardens. On Clare Island a few specimens were found, north of Kinnacorra, on a rough slope of drift; they were living here, in characteristic fashion, in cavities formed by fragments of rock which were irregularly massed together and more or less sward-covered. On the adjoining mainland the animal has occurred at Westport, Co. Mayo (Pack-Beresford).

*Chthonius tetrachelatus* is probably widely distributed in Ireland, where it is known in the counties of Antrim, Dublin, Cork, and Kerry, as well as in Mayo; it is common in Britain, and ranges widely in Europe.

ACARINIDA.

BY J. N. HALBERT, M.R.I.A.

SECTION I.—HYDRACARINA.

PLATES I.—III.

Read FEBRUARY 27. Published MAY 30, 1911.

THIS paper deals with the species of fresh-water mites (*Hydracarina*) inhabiting Clare Island and the neighbouring district. It is mainly the result of two collecting expeditions organized since the Clare Island Survey was begun in the spring of 1909, when nothing was known of the water-mite fauna of the district in which the island is situated.

The first of these expeditions was carried out in the beginning of June, 1909, when numerous gatherings of these interesting creatures were made in the neighbourhood of Westport and Castlebar, and also at Achill Island, in the lakes and bog-pools lying between Achill Sound and Dugort. On this occasion, also, a few days were devoted to the fauna of Clare Island. Towards the end of July in the following year about a fortnight was spent collecting in the district between Belclare and Louisburgh on the southern shore of Clew Bay; and it may be mentioned that this part was more thoroughly searched for *Hydracarina* than was the corresponding district to the north of the bay.

In order to make the list more representative, a few species collected in the neighbouring highlands of County Galway—which certainly belong to the same faunistic area—are also included. The localities are as follows:—

Ballynahinch Lake, Connemara, eleven species collected in June, 1900, by W. F. de V. Kane.

Glendalough Lake, Connemara, forming part of the same chain of lakes as the preceding, fourteen species collected by myself in September, 1905. Garranbawn Lake, near Ballinakill, ten species collected by G. P. Farran in June, 1901.

Cartron Mountain, near Letterfrack, three species collected by S. W. Kemp in March, 1904.

Lake near Clifden, seven species collected by W. F. de V. Kane in June, 1900.

The species recorded in the following list are fairly representative of the Hydracarid fauna of the district, as, with some experience of the habits of the species, a fairly satisfactory knowledge of this group can be obtained in a comparatively short time. The ordinary methods of netting, both from boat and shore, were carried out pretty thoroughly, often necessitating wading, especially in the case of the small, treacherous peaty lakes, to reach the water-plants amongst which these mites are mostly to be found. On account of the remote nature of many of these lakes, a boat was often unobtainable, otherwise a few additional species might have been found, more especially in the deep tarns of the mountainous parts.

As regards the general results of the Survey, it will be seen that thirty-one genera, represented by eighty species of fresh-water mites, were collected. It is satisfactory to be able to record the occurrence of four previously undescribed species. These are:—

*Eylais relicta* n. sp.

*Frontipoda Carpenteri* n. sp.

*Atractides* (*Torrenticola*) *brevirostris* n. sp.

*Unionicola* (*Atax*) *rivularis* n. sp.<sup>1</sup>

The first of these occurred in Glendalough Lake, Connemara; and I have also taken immature examples in Castlebar Lake, and in the mountain tarn on Cromaglaun, near Killarney, well known to British conchologists as the home of the rare water-snail *Limnæa involuta*. The new *Frontipoda* is, however, the most interesting species discovered during the Survey, as up to the present time the genus was represented by one widely distributed form—*Frontipoda musculus*, Müller—from which the new species is distinguished by well-marked characters. It is probable that *Frontipoda Carpenteri* will prove of distributional interest when its range in western Europe has been ascertained. The *Atractides* adds another to the four species described since the appearance of the "Tierreich" volume ten years ago. *Unionicola rivularis* is a remarkably small species apparently inhabiting rivers; the type specimens were found in the Westport River, and in the River Nore in S. E. Ireland.

A distinctive name (*montanus* n. var.) has been given to the interesting rapid-water form of *Megapus spinipes* (C. L. Koch). Features of this variety are the absence of swimming-hairs, and the enlarged claw-armature—modifications of structure to suit its usual habitat in rapid highland streams.

There will also be found in the following pages a reference to a second nymphal form which has not been previously observed in the genus *Protzia*.

<sup>1</sup> A fifth new species, *Arrhenurus bipapillosus*, found recently outside the Clare Island district, is also for convenience described in this paper (p. 39).

The following twelve species are now recorded for the first time from the Britannic area :—

<i>Protzia eximia</i> ( <i>Protz</i> ).	<i>Megapus nodipalpis</i> <i>Sig. Thor.</i>
<i>Sperchon undulosus</i> <i>Koenike.</i>	<i>Megapus tener</i> <i>Sig. Thor.</i>
<i>Lebertia fimbriata</i> <i>Sig. Thor.</i>	<i>Unionicola gracilipalpis</i> ( <i>Viets</i> ).
<i>Oxus plantaris</i> <i>Sig. Thor.</i>	<i>Aturus runcinatus</i> ( <i>Sig. Thor.</i> ).
<i>Atractides amplexus</i> <i>Koenike.</i>	<i>Feltria circularis</i> <i>Piersig.</i>
<i>Atractides Maglioi</i> <i>Koenike.</i>	<i>Feltria Rouxi</i> <i>Walter.</i>

With the exception of *Lebertia fimbriata* and *Unionicola gracilipalpis*, these are all forms inhabiting low-temperature streams and lakes (stenothermal forms); and as very little appears to be known of the occurrence of these species in Great Britain, it is extremely likely that they await discovery in the highland parts of that country.

In addition to the foregoing at least ten other species are additions to the recorded water-mite fauna of Ireland.

In the present state of our knowledge of Hydracarid distribution it is not possible to apply to them the geographical groupings which have been used for insects and other groups. There is no doubt that many of the species are local and of restricted range, yet, generally speaking, the water-mites are remarkably widely spread animals, a characteristic which they share with other fresh-water organisms. For the present, therefore, it is as well to adopt Dr. Zschokke's division of the fresh-water mites into two great faunistic groups—the Cosmopolitan, and the Northern and Alpine.

The Cosmopolitan group contains a great many species of very wide distribution, that mostly inhabit lowland waters of a higher temperature (eurythermal forms), although a few possess a high alpine range.

The Northern and Alpine group, on the other hand, live in waters of a lower temperature (stenothermal forms), inhabiting the rapidly flowing streams of upland districts, and cold alpine and sub-alpine lakes.

It will be seen that both of these groups are well represented in the Clare Island district.

Apart, however, from these two faunistic groups there is evidence of a distinct northern element inhabiting ordinary high-temperature waters. As examples we may refer to *Lebertia fimbriata* *Sig. Thor* and *Oxus plantaris* *Sig. Thor*, species which have hitherto been recorded only from Norway.

There is also evidence of a distinct moor-fauna in the Clare Island district, as well as in the west of Ireland generally. The more characteristic members of this group are rare in or absent from localities where peat does not

occur. The following would seem to belong to this peat-moor fauna:—*Thyas vigilans* Koenike, *Pionacerus Leuckarti* Piersig, *Arrhenurus Neumani* Piersig, and possibly *Oxus plantaris* Sig. Thor, and *Lebertia fimbriata* Sig. Thor.

Some interesting problems are concerned in the past history of the fresh-water fauna of the Clare Island district. It is generally agreed that the area of the island formed part of the mainland in former times, so that a Hydracarid fauna was doubtless established there. We are assured by those who have studied the evidences of ice-action that the district must have passed through a period of severe glaciation. This Ice Age is believed by some to have existed subsequent to the separation of the island from the mainland; so that, if the ice exterminated the fresh-water fauna, it must have been reintroduced in some way. On the other hand, it has been urged from the evidence supplied by the occurrence of peat bogs that are now partly submerged under the sea that the island may well have been united with the mainland after the cold period.

With regard to the extermination by ice of the original Hydracarid fauna, one can only say that, had the conditions been so severe as has been supposed, the survival of a water-mite fauna resembling the present one would have been impossible, especially as regards those species that inhabit water of a higher temperature (eurythermal forms). With those that inhabit low-temperature waters (stenothermal forms) the case is not so clear, as these forms reach their highest development in northern and alpine regions; indeed Dr. Zschokke, who has carefully studied the stenothermal forms, believes that they are relics of the Glacial Age.

The dispersal of the fresh-water mites is closely concerned with their larval stage, when they attach themselves to various winged aquatic insects. It is chiefly through the agency of these temporary hosts that they are carried from place to place, and in course of time reach the most remote localities. Numerous winged aquatic insects are found on Clare Island and throughout the neighbouring district—such are species of *Dytiscus*, *Agabus*, *Notonecta*, *Nepa*, and *Corixa*, all favourite hosts of Hydracarid larvae. One would imagine, however, that the wings of such insects as *Notonecta*, *Corixa*, and other aquatic Hemiptera are more suited for comparatively short flights than for facing a sea-barrier of from 3 to 14 miles over which sweeps an opposing westerly breeze.

In the case of *Dytiscus* and *Agabus*, however, the island must be considered as being in the "danger zone," as it is quite possible that these comparatively strong fliers do occasionally cross from the mainland with Hydracarid larvae attached to their bodies.

As far as the present water-mite fauna of Clare Island is concerned I am inclined to believe that it has survived there since the island formed part of the mainland; and that if glacial conditions did occur subsequent to the separation of the island they were probably not as severe as is generally supposed to have been the case. The occurrence of even a short summer—such, for example, as exists in Lapland at the present day—when permanent fresh-water pools were formed in sheltered places in the glacial clays, would probably be sufficient to have preserved a Hydracarid fauna on the island.

Sub-Order **HYDRACARINA.**

Fam. LIMNOCHARIDAE.

Sub-fam. LIMNOCHARINAE.

**Limnochares aquatica** (L.).

Sraheens Lough, Achill; common in the shallow margin of Lough Cahasy, Louisburgh; Garranbawn Lough, Ballinakill.

Sub-fam. EYLAÏNÆ.

**Eylais discreta** Koenike. (Plate I, fig. 1.)

Castlebar Lake; lake near Westport; Prospect Lough near Belclare; Lough Namucka near Louisburgh.

This fine species, one of the giants of the genus *Eylais*, occurred abundantly in the above localities in the southern part of the district.

Var. **stagnalis** Halbt. (Plate I, fig. 2 *a, b*.)

*Eylais infundibulifera* var. *stagnalis* (6).

The structure of the eye-plate shows considerable variation. The great majority of the Clare Island district specimens differ from the typical form, as this is figured by Koenike (12, etc.), in having a chitinous muscle-attachment projecting well beyond the front margin of the eye-plate in the middle line (Pl. I, fig. 2). The concavity of the hinder margin is deeper, and is usually rounded at the apex. This form agrees with the *Eylais* which I described under the name *E. infundibulifera* var. *stagnalis* some years ago. After a careful examination of the abundant material now in hand, there is little doubt that this form should be referred to a variety of *Eylais discreta* Koenike.

The palps in these specimens are decidedly shorter and stouter than in *E. infundibulifera*. The second segment is broad with nine to ten stout spines along the inner distal margin; those in the middle are pectinated. In the

third segment the prominence is only slightly developed, with about eighteen spines. The fourth segment shows a pronounced hump near the base, lower half of the inner surface with about twenty long spines, not including a row of strongly pectinated ones placed distally; the lower outer margin has about seven long bristles. Apex of the fifth segment furnished with eight or nine short, stout, and bluntly pointed teeth.

Many of the Mayo specimens are fully grown, the males measuring about 3 mm., while the females often reach 5 mm. in length. A figure of the male genital area, which has not apparently been previously figured or described, is given (Pl. I., fig. 2*b*), and it will be seen that it is very different from that of *E. infundibulifera* figured by Koenike (12, etc.).

**Eylais infundibulifera** Koenike. (Plate I., fig. 3.)

This species was found in the neighbouring parts of Galway. A figure of the eye-plate, which is large and variable in shape, is given on Plate I., fig. 3.

**Eylais relicta** nov. sp. (Plate I., fig. 5 *a-f*.)

During a visit to Connemera in September, 1905, an *Eylais* occurred in Glendalough Lake which I was unable to identify at the time. Another specimen, not quite fully developed, of the same species occurred in Castlebar Lough (June) during the Clare Island Survey, and a third still smaller specimen found in a tarn on Cromaglaun Mountain, Killarney, is also to be referred here. The species may be compared with *infundibulifera*, and appears to be undescribed.

The eye-plate (Pl. I., fig. 5) is highly chitinized, and rather smaller. The measurements are as follows:—

Breadth across anterior lenses,	·407 mm.
Breadth of bridge between the lenses,	·110 mm.
Breadth between the hair-pores,	·077 mm.
Length of eye-plate,	·142 mm.

The front margin of the eye-plate is produced in a broad prominence which is truncated at the apex, and shows, in the type-specimen (Glendalough Lake), a cone-shaped subcutaneous part resembling Thon's figure of *E. meridionalis*. The posterior concavity may apparently be either acute or somewhat rounded at the apex. The reticulated eye-plate is remarkably broad behind, and distinctly narrowed in front on the inner side, much as in *E. latipons* Thon, while the outer margin is only moderately sinuate. The anterior lenses are comparatively small and stalked. The hair-pores are placed at some distance from the eye-plates, and underlying them is a chitinous ring, which is more strongly developed in the smaller specimens.



The capitulum (Pl. I., fig. 5c) is very similar to that of *infundibulifera*; the length of the maxillary plate is 0.588 mm. Both the front and hinder processes are long and broad; the latter are evenly rounded at the apex. Air-tubes rather broad, sinuate on the front margins, and they slightly overreach the hinder lateral processes.

The mandibles are of the usual shape; a character which deserves mention however, is the shape of the projection—which Thon calls the *stigma*—on the front margin of the mandible. In the present species this is blunt (Pl. I., fig. 5d), while in the allied species it ends in a sharp point. (Pl. I., fig. 3b).

The palps (Pl. I., fig. 5e) measure about 1.356 mm. in length, being a little longer and more slender than in *E. infundibulifera*. A remarkable feature of the second segment is the absence of spines from the middle part of the inner distal margin; but there is a row of three pectinated spines towards the inner end, and two more are placed on the ventral surface; the dorsal surface of the segment carries seven or eight smooth bristles. The third segment shows scarcely any trace of a ventral prominence, being almost parallel-sided, lower part of the inner side with about eighteen or twenty spines, many of which are pectinated; about eight of these are placed in a group on the apex of the segment. The fourth segment is of very uniform breadth, not so strongly angled on the ventral side as it is in the allied species, lower half of the inner surface furnished with about thirty long spines; several of those placed towards the end of the segment are pectinated, and in addition to these there is a row of five or six strongly pectinated spines along the distal margin. The fifth segment is slightly bent towards the apex, inner side armed with from ten to twelve stout spines, while the outer side carries seven or eight; apex furnished with a group of five or six rather slender and sharply pointed spines, the dorsal surface with four or five long, smooth spines.

The leg-measurements of the Glendalough specimen are about as follows:—First leg, 2.892; second, 3.072; third, 3.302; and the fourth, 3.763 mm.

*Localities*.—Glendalough Lake, Connemara, September, 1905, a mature specimen; Castlebar Lough, immature, June, 1909; Crincaum Lough on Cromaglaun mountain, Killarney, immature, June.

#### **Eylais Soari** Piersig.

Glendalough Lake, Connemara, September, 1905.

#### **Eylais similis** Thon. (Plate I., fig. 6.)

Lakes on Clare Island; at Westport and Louisburgh.

A species which is apparently referable to *E. similis* Thon is abundant

in the Clare Island district. The eye-plates of this form are subject to considerable variation. In very young examples the bridge connecting the eye-plates is absent, and its subsequent development into the mature form can be seen in specimens of different growth. In fully grown individuals the eye-plate is distinctly humped on each side of the median incision (Pl. I., fig. 6), and in Irish specimens the central muscle-attachment is large and circular. A well-developed chitinous ring is usually present under the hair-bearing pores. The concavity of the hinder margin is generally rounded, as shown in the accompanying figure, or it may be more or less acuminate, as in the typical form figured by Thon (24). The lenses are comparatively large and unstalked.

In the palps the hump on the third segment is strongly developed, and carries about ten or twelve spines of moderate length, some of which are pectinated. The fourth segment is robust, with six or seven bristles along the inner lower margin; two or three of these are sometimes pectinated, and there is a row of four strongly pectinated spines along the distal margin of the segment.

*Eylais similis* is apparently a common form in Ireland; and though it seldom figures in local lists, I believe it will prove to be a widely distributed species.

***Eylais celtica* Halbt. (Plate I., fig. 4).**

*E. celtica* Halbt. (6).

This is one of the largest species of *Eylais*; the type measured about 4 mm. in length; the body is depressed in form, and the epimeral region relatively large.

The eye-plate is large, being about equal in size to that of large examples of *infundibulifera*, with a bridge of great length, which is only slightly concave on the hinder margin, and produced in front in a bluntly pointed prominence. There is a small central muscle-attachment connected by a very narrow band of chiton with the eye-plates. The latter are much wider in front than behind—a very unusual character in *Eylais*; they are sinuate both on the inner and outer margins, and the front lenses are large and cup-shaped. The hair-bearing pores are placed well within the margins of the plates.

The capitulum resembles that of *E. infundibulifera*, especially in the shape of the maxillary plate and pharynx. It measures about .550 mm., not including the posterior side-processes. The latter are short and curved inwards at their apices. The air-tubes reach to a point between the end of the maxillary plate and the chitinous ring near the apex of the pharynx. The latter is long and narrow. The palps are of the *infundibulifera* type. Second segment with

four or five spines along the inner distal margin, and a group of four pectinated spines is placed at the extreme inner corner. The prominence on the third segment is only moderately developed, and carries upwards of twenty long spines, many of which are strongly pectinated. The lower half of the inner surface of the fourth segment is crowded with numerous long bristles, while on the outer side there is a row of nine or ten similar ones.

The type-specimen of this interesting and well-marked species was found in Ballinahinch Lake, Connemara, by Mr. W. F. de V. Kane in June, 1900. It was not found in any of the lakes in the immediate vicinity of Clare Island visited during the survey. No doubt more specimens will be forthcoming when the larger lakes of Galway and Mayo have been more thoroughly searched for these mites.

[I take this opportunity to figure (Pl. I., fig. 7) the eye-plate of *Eylais Koenikei* Halbt., of which a specimen was found in a small lake at Ardfry, county Galway, some years ago. This specimen is more fully developed than the one from which the species was described. The eye-plate is much larger measuring about .80 mm. across both plates; the length of a single plate is about .44 mm. The eye-bridge is long and narrow, with a circular muscle-attachment in the centre, and the bristles springing from the hair-pores are of great length. The lens-bearing plates are very characteristic in shape, being somewhat quadrate in front, and distinctly sinuate on the inner margins. The general surface is faceted with peculiar diamond-shaped markings, which are very different from the usual sculpturing found on the eye-plates in this genus. The lenses are large.

The palps are long and slender (about 1.26 mm.). Second segment with about seven pectinated spines on the distal margin; the third is only slightly swollen, with about eight stout spines at the apex; the innermost ones are distinctly pectinated; fourth segment with about ten long spines close to the inner margin, a few of which are arranged in pairs; on the outer side there are seven long bristles.

A figure of the capitulum will be found on the accompanying plates.]

Sub-fam. PROTZIINAE.

**Protzia eximia** (Protz). (Plate I., fig. 8 *a, b*.)

Stream on lower slopes of Croaghpatrick, June, 1905.

A *Protzia* which I found in the above-mentioned locality amongst aquatic mosses is apparently to be referred to this species.

The general shape of this specimen (length about 1.228 mm., breadth .920 mm.) resembles that of Koenike's figures (12, fig. 45). The shoulders are

very marked, and the front is produced in a rounded prominence. The colour is a fine scarlet with black-pigmented eyes. The arrangement of the epimera differs from the figures given by Piersig and Protz. In both of these figures the genital area is placed considerably in front of the third and fourth epimera, and shows a row of cone-shaped discs arranged towards the inner margin of the genital field. In the Croaghpatrick example the end of the genital area lies between the third pair of epimera; and the discs are placed in a groove on the outer side, much as they are drawn in *Protzia rotunda* Walter (33).

In his recent useful handbook on German Hydracarina, Koenike figures what he considers to be *Protzia eximia*; and in this the above-mentioned characters are shown just as they are in the Croaghpatrick specimen (12).

*Protzia* occurs commonly in certain of the Dublin and Wicklow streams, though I have not yet ascertained whether all of the specimens collected are referable to one or more species. It is especially fond of small mountain burns, where it lurks in aquatic mosses, or clings to small granite boulders in the bed of the stream. On one occasion, towards the end of September, a number of specimens were collected in a stream on Kilmashogue, Co. Dublin, amongst which were two interesting nymphal forms.

NYMPH.—One of these, measuring .870 by .655 mm., resembled the adult in the shape of the body and the arrangement of the epimera. This specimen possessed four rather widely separated, cone-shaped, genital discs (Pl. I., fig. 8*b*) similar to those found in the provisional genital area of the nymphs of *Thyas*. The second specimen is an encysted nymph measuring about .790 mm. in length, ovate in shape, and covered with much longer papillae than occur in the adult. With the exception of the first and second legs of the right side, the nymphal appendages have disappeared. Inside this nymph-skin all of the folded legs and palps, and, in fact, all the chitinous parts of the adult *Protzia*, can be clearly seen. The interesting point is that the provisional genital area of this second nymph differs from the four-disked type in having ten rather small genital discs, arranged five on each side, much as in the accompanying figure (Pl. I., fig. 8*a*), and these discs are smaller and less cone-shaped. On the outer side of the field there is a row of short, sharply pointed spines. Immediately under this provisional area lies the apparently fully developed genital field of the adult mite. This observation would seem to show that in the genus *Protzia* there is a well-marked second form of the nymph, following on the four-disked type, somewhat similar in structure to the ten-disked type of *Thyas curvifrons* Walter, recently described (33) by Dr. C. Walter from Switzerland (Waldquelle bei Parpan, 1700 m.).

Sub-fam. HYDRYPHANTINAE.

**Hydryphantes ruber** (de Geer).

Common in bog-pools on Cartron mountain, near Letterfrack, March, 1904 (S. W. Kemp).

A few specimens with a somewhat longer eye-plate approaching the variety *prolongatus*, Piersig, occurred with the type-form in this locality. In these specimens the eye-plate measures about .410 mm. along the middle line, by .407 in breadth, so that it falls short of Piersig's description, which gives .6 mm. as the length of the eye-plate in *prolongatus*. Mr. Williamson has recorded the variety from Scotland (36).

**Thyas longirostris**, Piersig.

An example of this fine species was collected by Mr. W. F. de Vismes Kane in Ballynahinch Lake, Connemara, June, 1900.

I first met with this species at Kenmare, in the south-west of Ireland, where some extremely large specimens, nearly 3 mm. in length, occurred in a small pool full of Callitriche in the month of April. It has also been found in the county Dublin, and in Donegal (Bundoran).

Mr. Soar has recorded it from the Norfolk Broads, and Mr. Williamson met with it in the Island of Tiree, Scotland (40).

*Distribution*.—Germany (Koenike); Sweden (Piersig); Switzerland, Gotland, and Belgium (Walter); British Isles.

**Thyas vigilans** Piersig.

An adult specimen of this species was found in a Sphagnum-pool near Louisburgh in July, while the nymph occurred amongst moss on the edge of a small stream on Clare Island.

These are the first specimens of this interesting species that have been found in Ireland. The characteristic chitinous plate surrounding the pigmented median eye is well developed in the nymph.

The provisional genital area carries four rather large paired discs, separated by an oblong chitinous structure, which appears to be partly subcutaneous. Three long, stout bristles spring from the front margin and extend backwards across the genital field.

*Thyas vigilans* seems to affect pools containing Sphagnum, and the German specimens occurred in a very similar habitat (18, p. 399). According to Piersig the larvae of this mite are parasitic on gnats.

*Distribution*.—Germany (Koenike); England (Soar); Ireland.

Sub-fam. DIPLDONTINÆ.

**Diplodontus despiciens** (O. F. Müll.).

Achill Island; Westport River; lakes in the Westport, Belclare, and Louisburgh districts.

Sub-fam. HYDRARACHNINÆ.

**Hydrarachna scutata** Piersig. (Plate I, fig. 9.)

Lakes at Castlebar, Westport, and in the Louisburgh district.

Common, and, in company with *H. conjecta* Koenike, the prevalent forms of the genus found in the Clare Island district, and indeed throughout Ireland generally.

The shape of the eye-plate varies from the form figured under the name of *H. binominata* Thor, to the type as described by Piersig (18).

There seems little doubt that the immature (nymph) form of *Hydrarachna* which has been described as a separate species, under the name of *H. biscutata* Thor, is really the nymphal form of *H. scutata* Piersig. In Ireland it occurs frequently in company with the last-mentioned species; but never apparently in the adult condition. I have found a series of specimens showing different stages in the development of the eye-plate between the paired (*biscutata*) and the adult unpaired (*scutata*) condition. One of these is figured, showing the way in which plates of the *biscutata* form gradually unite in the frontal region, much as sometimes occurs in *H. globosa* (3).

Some of these nymphal forms were found in Lough Namucka near Louisburgh, and in Garranbawn Lake at Ballynakill, county Mayo, in the month of June by Mr. Farran.

**Hydrarachna conjecta** Koenike.

Common in shallow lakelets at Craigmore and in Creggan Loughs on Clare Island; Achill Island; lakes at Westport, Belclare, and Louisburgh.

Apparently common throughout the district.

**Hydrarachna distincta** Koenike. (Plate I, fig. 10*a-c*.)

Lough Avullin on Clare Island; lakes at Castlebar and Westport.

I have referred to this species certain specimens with eye-plates, &c., similar to those figured by Piersig in "Deutschlands Hydrachniden" (Plate I, fig. 180*c*). In his description of this species Dr. Koenike compares it with

*H. globosa* (de Geer); but if the Irish specimens are correctly named, they are much more closely related to *H. conjecta* Koenike; and I should not be surprised if they are really a variety of that species.

The eye-plates of two of these specimens, male (Plate I., fig. 10a) and female (Pl. I., fig. 10b), from the Clare Island district are figured in the present paper. It will be seen that they are very similar to the published drawing of *H. distincta* above referred to. The fourth epimeron also agrees in showing a somewhat broader inner end, outside of which there is a narrow chitinous rim, which is also present on the hinder margin, as in Koenike's figure (12, fig. 57).

What especially leads me to believe that this form is a variety of *conjecta* is the identity of the male genital area in the two forms. The specimen of which the eye-plate is figured (Pl. I., fig. 10c) is a male, and the genital area of this example agrees exactly with that of males showing the typical ribbon-shaped eye-plate of *H. conjecta*. The length of the male eye-plate is about .82 mm. The skin is covered with cone-shaped papillae, which are sharply pointed on some parts of the body. The palps of the male are remarkably short and thick; the length is about .66 mm. The mandible agrees in structure with that of *H. conjecta*; length about .972 mm. The genital area measures .512 mm. in length by .587 mm. in breadth.

This species has already been recorded from Lough Gill, Co. Sligo, and Mr. Soar says it has been found in Lincolnshire (23).

[**Hydrarachna Thoni** Piersig. (Plate I., fig. 11a-b.)

This species must be recorded with reserve; an immature form collected by Mr. W. F. de V. Kane in a lake near Clifden very closely resembles Piersig's figures and descriptions of this species. Unfortunately only the nymph-form of *H. Thoni* has been described.

The characters of the species are based on the structure of the eye-plates, the genital area, the fourth epimera, and the skin papillae. The eye-plate (length about .54 mm.) of the Irish specimen is very like that of *H. globosa*, except that the lower half of the inner margin is not so deeply concave as it is in that species; this is, however, a variable character. The genital plates are convex on their outer margin, and are shaped more as in the nymph of *H. scutata* Piersig—see preceding remarks on the nymph of this species. The third and fourth epimera agree almost exactly with Piersig's drawings, the subcutaneous chitinous margins of the fourth pair being well marked (Pl. I., fig. 11a). The skin papillae are long, and suggest the teeth of a saw in their regular arrangement (Pl. I., fig. 11b.)]

## Sub-fam. SPERCHONINAE.

*Sperchon brevirostris* Koenike var. *pachydermis* Piersig. (Plate II., fig 18.)

Abundant under stones in a stream on the lower slopes of Croaghpatrick; Bunowen stream, where it flows from Lugaloughaun, near Louisburgh, July, 1910.

The specimens from these and from other Irish localities do not altogether agree with Dr. Koenike's description of *S. brevirostris*. They are rather to be referred to the form described by Dr. Piersig as *S. pachydermis*, which is, I think, a variety of Dr. Koenike's species.

The Irish form is large, ovate in shape, and with prominent shoulders. The epidermis is remarkably thick, and there are strongly developed dermal glands, the arrangement of which is well shown in Piersig's figure (18, fig. 185*a*). The body is covered with low rounded papillae, which are often a little more prominent on the front margin; the only sharply pointed ones are on the anterior side margins.

The palps are also somewhat different; they are longer in the variety, and the chitinous peg on the ventral side of the second segment is a little longer. (Pl. II., fig. 18.) The rostrum of the mouth organs is also slightly longer.

The only character in which the Irish form would appear to disagree with *S. pachydermis* is in the structure of the first and second epimera. Dr. Piersig describes the inner ends of these as "nicht durch eine Brücke mit einander verschmolzen" (Tierreich, 1901). In the Irish examples they meet in the middle line, and are often undoubtedly ankylosed posteriorly through a subcutaneous band of chitin. This does not seem to be a character of much importance, especially as the joining of the epimera is not very evident, except in specimens that have been dissected.

I have sent Irish examples of this mite to Dr. Koenike, and he also is of the opinion that it should be referred to *pachydermis*, considering that form as a variety of *Sperchon brevirostris*. I am indebted to him for a loan of his type-specimen of that species.

In company with the ordinary form of *pachydermis*, a few specimens of a smaller size and brighter colouring occurred on Croaghpatrick. I think these are the males of the variety *pachydermis*. The chief difference is in the epimeral region, which is very much larger. The legs, especially the last pair, are decidedly longer and of more robust build, and the palps are also a little longer than in the ordinary form of the female.

Common in many Irish mountain streams; examples, in various stages of growth, may be found clinging to the undersides of submerged stones, often



where there is a very strong current of water. The greatest altitude at which I have taken the species is 1,500 feet in the stream flowing from Lough Eighter on Carrantuohill mountain in Kerry.

**Sperchon glandulosus** Koenike.

Abundant in streams on Croaghpatrick in June and July.

**Sperchon undulosus** Koenike.

*S. undulosus* Koenike, 1907 (11).

Streams on Croaghpatrick, June, 1909; stream flowing from Lough Namucka, near Louisburgh, July, 1910.

This mite is an addition to the recorded British species, and does not seem to have been found since it was described from Germany by Dr. Koenike four years ago. The four-disked genital area of the nymph is figured on Plate II., fig. 19.

**Sperchon setiger** Sig. Thor.

In stream flowing from Lough Avullin, Clare Island.

**Pseudosperchon verrucosus** (Protz). (Plate II., fig. 20.)

Clare Island in small streams flowing from the hills; Croaghpatrick. Found commonly in both of these localities in June and July. In the nymph of this species the nodules on the surface of the body are arranged much as in the adult mite. The provisional genital area is figured in the present paper (Pl. II., fig. 20).

*Pseudosperchon verrucosus* is an abundant species in Ireland; it occurs amongst mosses in mountain streams.

*Distribution*—Norway; Germany; Switzerland; Italy; Scotland; Ireland.

Fam. HYGROBATIDAE.

Sub-fam. TEUTONIINAE.

**Teutonia primaria** Koenike.

Owenwee River at Belclare; Carrownisky River near Louisburgh.

**Limnesia fulgida** C. L. Koch (*L. histrionica* Herm.).

Achill; lakes at Westport, Belclare, and Louisburgh, and in the Galway highlands.

Both this and the following species are common in lakes throughout the district, though they were not found on Clare Island.

***Limnesia maculata*** (O. F. Müll.).

In the same localities as the preceding species.

***Limnesia undulata*** (O. F. Müll.).

Glendalough Lake, Connemara, September. Not found in the immediate district of Clare Island.

***Limnesia Koenikei*** Piersig.

In rivers at Westport, Belclare, and Louisburgh.

Sub-fam. ATRACTIDINÆ.

Until the appearance of Dr. Koenike's paper (11) on *Atractides*<sup>1</sup> the species of this genus had not been critically examined by acarologists, and it was generally assumed that only one well-marked form was found in Europe.<sup>2</sup> In that paper he describes three new species; and Dr. Maglio has since characterized a fifth species from Italy (16). In the present paper a description is given of a sixth species found in the Clare Island district and elsewhere in Ireland.

***Atractides breviostris*** nov. sp. (Plate II., fig. 13 *a-e*).

This species may be compared with *A. anomalus* Piersig, which it resembles in the arrangement of the chitinous plates of the dorsal surface, where the frontal shield is not enclosed by the large dorsal plate.

The colour is rather dark yellowish brown; the eye region and parts of the epimera are tinged with carmine, legs yellow. The body is larger, less ovate, and the front margin is not concave in the female, as it is in *A. anomalus*. The chief differences between the two forms will be more readily seen in tabular form.

<sup>1</sup> *Torrenticola* of a thors.

<sup>2</sup> Under the name of *Rusetria spinirostris*, Sig. Thor has described an *Atractides* from Norway. It is difficult to say if this represents a distinct form. In the "Tierreich" it is referred to by Piersig as a doubtful species (18).

**Atractides anomalus** C. L. Koch.

*Female.* Length ·793, breadth ·665 mm.

Rostrum long and rather slender, greatest length of rostrum and maxillary part ·363 mm., breadth of capitulum ·132 mm. (Pl. II., fig. 14 *a, b.*)

Epimera well produced beyond the front margin of the body. Wedge-end of the first pair, acute, separated by a slightly greater distance from the *area genitalis*. Capitular recess deep and rather narrow.

Legs of moderate length, more slender and not thickened at the extremities.

Palps as figured by Piersig ("Deutschlands Hydrachniden," plate xxvii., fig. 69 *d.*). Lengths of the segments as follows:—first ·040; second ·100; third ·080; fourth ·130; fifth ·025 mm.

Mandible, length ·396 mm.

Genital area as figured by Piersig (18, pl. xxvii., fig. 69 *a.*)

*Male.* Length ·640, breadth ·512 mm.

Epimera—second and third pairs very long and much narrower at their hinder extremities, median furrow between the inner margins occupying more than half the distance between the genital area and the capitular recess. Well figured by Piersig (18).

Genital area smaller, only slightly longer than broad, and placed much nearer the hinder margin of the body. Length ·132, breadth ·121 mm.

*Localities.*—Owenwee River at Belclare, Co. Mayo, June, 1909; River Lee at Carrigrohane about three miles from Cork. Collected in the latter locality by Mr. F. Balfour Browne in July, 1907.

**Atractides amplexus** Koenike.

Carrownisky River near Louisburgh; Owenwee River at Belclare; stream flowing from Lough Namučka, July.

In Dr. Koenike's description of *A. amplexus* the large dorsal plate is said to enclose the hinder end of the second frontal shield; and in his drawing of

**Atractides brevirostris** n. sp.

*Female.* Length ·896, breadth ·742 mm.

Rostrum decidedly shorter, stouter, and tapering more rapidly towards the apex; greatest length, along maxillary shield to tip of rostrum, ·320 mm., breadth of capitulum ·154 mm. (Pl. II., fig. 13 *b, c.*)

Epimera less produced in front, end of the first pair approaching close to the *area genitalis*, much as in *A. complexus*. Capitular recess broader.

Legs longer and more robust, with thickened terminal segments.

Palps, third and fourth segments a little shorter, teeth on the second and third segments stouter, central hump on the ventral side of the fourth not so prominent, and the distal spine on the inner side of the same segment is more strongly developed. Lengths of the segments: first ·040; second ·100; third ·075; fourth ·115; fifth ·025 mm. (Plate II., fig. 13 *e.*)

Mandible, length ·352 mm.

Genital area much as in *A. anomalus*. (Pl. II., fig. 13 *d.*)

*Male.* Length ·768, breadth ·614 mm.

Epimera—second and third pairs much shorter and broader, median furrow between them occupying less than half the distance between the genital area and the capitular recess. (Pl. II., fig. 13 *a.*)

Genital area larger, decidedly longer than broad, and placed further away from the posterior margin. Length ·209, breadth ·154 mm.

the dorsal surface (11, fig. 18) a distinct groove is shown between the two plates in question. In all of the Irish specimens the thick chitinous margin of the dorsal plate is anchylosed with the frontal plate posteriorly. I am convinced, however, that the specimens from the above localities are to be referred to *A. amplexus*, as the general structure agrees well with the description of that species.

[*Atractides anomalus* C. L. Koch was not found in the Clare Island district; it is common, however, in the mountain streams of Dublin and Wicklow. The epimeral area of the nymph is figured on Plate II., fig. 14c; the genital area is triangular in form and carries four long, narrow discs.]

#### *Atractides Maglioi* Koenike.

Glendalough Lake, Connemara, September. Elsewhere in Ireland I have taken this very distinct species in the River Dargle, county Wicklow, where males were found in August, 1907.

*Distribution.*—Known range Germany (Koenike); Italy (Maglio); Ireland.

It may be useful to give here a synoptical table pointing out characters for the separation of the six species of *Atractides* that have now been described, more especially as I have had opportunities of examining specimens of all of them from Irish localities. A table of the four German species has been published by Koenike (12).

- |   |  |
|---|--|
| 1. Hinder part of the second frontal shield enclosed by (or anchylosed with) the chitinous margin of the dorsal shield,   | . . . . . 2  |
| Hinder margin of frontal shield not enclosed,   | . . . . . 3  |
| 2. Wedge-shaped end of the first pair of epimera approaching close to the genital area; shape ovate; front margin of the body straight between the eyes,  | . . . . . <i>A. amplexus</i> Koenike.              |
| End of first epimera separated from the genital area by slightly more than a third of the space between the capitular recess and the genital area; shape decidedly less ovate; front margin concave between the eyes, | . . . . . <i>A. connexus</i> Koenike. <sup>1</sup> |
| 3. Anal ring placed on the posterior margin of the body,  | . . . . . <i>A. Maglioi</i> Koenike.               |
| 4. Anal ring placed at some distance from the posterior margin,   | . . . . . 5  |

<sup>1</sup> The male of *Atractides connexus* Koenike has been found in Glendalough Lake, county Wicklow, in the month of April. Not previously recorded from Britain.

5. Shape of the body elliptical, only slightly narrowed in front; frontal setae very long; anterior side corners of the large dorsal plate blunt, . . . . . *A. ellipticus* Maglio.<sup>1</sup>
6. Shape ovate, strongly narrowed in front; anterior corners of dorsal shield angled, . . . . . 7
7. Rostrum long and slender; capitulum narrower; wedge end of the first pair of epimera<sup>2</sup> removed a short distance from the genital area; front margin of the body strongly concave; legs more slender. Male with the second and third pairs of epimera much longer, and the genital area placed further back, . . . . . *A. anomalus* C. L. Koch.
8. Rostrum decidedly shorter and stouter; capitulum broader; wedge-end of first pair of epimera approaching closer to the genital area; front margin straight between the eyes; legs longer with thickened terminal segments. Male with the second and third pairs of epimera shorter and broader; genital area placed further forward, . . . . . *A. brevirostris* n. sp.

## Sub-fam. HYGROBATINAE.

**Hygrobat** *longipalpis* (Hermann).

Achill; Westport; Louisburgh, &c. Common throughout the district, but it was not found in Clare Island.

**Hygrobat** *naicus* Johnson (*reticulatus* Kramer).

Clare Island, stream from Lough Avullin; Westport; Carrownisky River, Lugloughaun, and other lakes near Louisburgh.

**Hygrobat** *calliger* Piersig.

Found in the Bunowen River near Louisburgh.

This is a stenothermal form occurring in rapidly flowing water. It is common in mountain streams in county Wicklow. The nymph of this species

<sup>1</sup> I have found the males of this elegant species amongst mosses growing on submerged stones in the River Dodder at Friarstown, county Dublin, in July; and the female has occurred in the River Flesk, near Killarney. The species may be easily recognized by its peculiar elliptical shape, which is quite different from the remaining species of the genus. The known range is Germany and Italy. This is the first record for the British Isles.

<sup>2</sup> The female of *A. anomalus* C. L. Koch has been described and figured showing the wedge-shaped end of the first epimera reaching the genital area. In the Irish examples, however, there is always a short intervening space.

has been described from Switzerland by Dr. Walter (32, p. 529). The provisional genital area of one of these immature forms is figured in the present paper (Pl. II., fig. 17).

*Distribution.*—The known range is Norway ; Germany ; Switzerland ; Italy ; and Britain (7).

**Megapus spinipes** (C. L. Koch), nov. var. **montanus**. (Plate II., fig. 15).

Stream on Croaghpatrick ; Bunowen stream at Louisburgh.

The specimens from these localities are to be referred to the large stenothermal form of *M. spinipes*, for which it would be convenient to have a distinctive varietal name. Compared with the smaller eurythermal form this variety, for which I propose the name *montanus*, is distinguished by the following characters:—

**montanus** nov. var.

Decidedly larger, the Irish specimens ranging from 1 to 1·40 mm. in length. More richly coloured than the typical form, some specimens are suffused with a pinkish tinge ; the legs are hyaline or pale yellow.

The most distinctive character is the absence of swimming-hairs (in the typical form, as it occurs in stagnant and slowly flowing water, there are a few of these hairs on the last three pairs of legs). The claw-armature, especially of the first pair, is more strongly developed, with a large blade-like basal part. The terminal segment of the first leg (Pl. II., fig. 15) is rather more strongly bent.<sup>1</sup> Length of first pair of legs 1·280 mm., fourth pair 1·740 mm.

The palps (·480 mm.) are relatively longer, and of more robust structure than in the lowland form, with a less truncated apex to the fourth segment, and the sword-like spine on its inner side is much stronger. Certain of these characters are such as we should expect to find in a stenothermal form. The absence of swimming-hairs, combined with the greater development of the claw-armature, is an adaptation for life amongst aquatic mosses, or for lurking under the stones of the rapid highland streams in which this form reaches its greatest development.

The variety *montanus* brings to mind the interesting stenothermal form, *Diplodontus torrenticolus* recently described by Dr. Walter from Italy ("grossen Quelle bei Sarno"). In this species there is a great reduction in the number

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<sup>1</sup> The terminal segment of the first leg of the typical eurythermal form is figured (Pl. II., fig. 16) for comparison ; the specimen from which it was drawn occurred in quarry holes near Crumlin, Co. Duilin.

of swimming-hairs present on the legs, as compared with the lowland *Diplodontus despiciens*; the legs are also shorter, stouter, and are furnished with more strongly developed claws (34).

This variety is no doubt widely distributed. I have found it commonly in the River Dodder and in various rivulets on the Dublin and Wicklow mountains, as well as in other localities in Ireland.

#### **Megapus tener** Sig. Thor.

Carrownisky River near Louisburgh, Co. Mayo, July.

A male of this little-known species occurred in the above locality, and I have also taken both sexes in the River Dodder near Dublin.

Length of male about .66 mm. The epidermis is remarkably thick and exceedingly finely lined; front margin indented and furnished with very long antenniform bristles.

First pair of legs with the terminal segment short, stout, and less bent than it is in *M. spinipes*. There are two swimming-hairs on the fifth segment of the last pair of legs. In males from the River Dodder (Co. Dublin) the last pair of legs are a little shorter and stouter, and swimming-hairs are absent. The palps are more slender than the basal segments of the first pair of legs; the fourth segment, seen from above, is decidedly swollen, and its dorsal surface is crowded with numerous short hairs; sword-like bristle on the inner side strongly developed. A figure of the male palp is given by Maglio (16).

The epimeral area is large; between it and the hinder margin of the body there are three pairs of large gland-openings with strongly chitinized margins.

The female may be easily recognized by the fact that the three genital discs are arranged in a triangular form instead of in a linear row as they are in *M. spinipes*.

*Distribution*.—The ascertained range is Norway; Germany; Italy; and the British Isles.

#### **Megapus nodipalpis** Sig. Thor.

Clare Island, in a rivulet flowing from hills, June; Bunowen River, Louisburgh, July; Croaghpatrick, June.

This species occurs in rapid streams and is widely spread in Ireland. The specimen found on Croaghpatrick is in the nymph stage.

*Distribution*.—Norway; Switzerland; N. Italy; and Britain.

Sub-fam. LEBERTIINAE.

*Lebertia insignis* Neuman.

Glendalough Lake, Connemara, September.

*Lebertia porosa* Sig. Thor.

Owenwee River, Belclare; Bunowen River, Louisburgh.

*Lebertia fimbriata* Sig. Thor. (Plate III., fig. 31.)

Clare Island, in peaty drains on the north-east side of the island between the Harbour and Maum, June, 1909.

Two examples occurred in the above-mentioned locality. They are of a golden-brown colour, with darker markings on the dorsal surface; the legs and palps are greyish.

This is one of the smallest species of the genus *Lebertia*; and it may be easily recognized by the elongate form, indented front margin of the body, and the scarcity of swimming-hairs. A full description of this mite will be found in the "Zoologischer Anzeiger" (29, pp. 41-52).

Although the Clare Island specimens (Plate III., fig. 31) agree in measurement (length .896, breadth .614 mm.) with Thor's description of this species, yet they are decidedly more elongate in form, and the epimera are narrower than is shown in his figures in the paper just referred to. The latter difference may, however, be due to the process of mounting of the original specimens from which these drawings were made, as a slight pressure causes the epimera to appear wider. The swimming-hairs are greatly reduced; there are only two of these, placed on the fifth segment of the last pair of legs, in the Irish specimens.

*Distribution.*—*Lebertia fimbriata* is apparently a local species; it has not been previously recorded from the Britannic area, nor, as far as I can ascertain, from any European country except Norway, where the original specimens were found by Dr. Sig. Thor near Kristiania and Bergen.

*Frontipoda musculus* (O. F. Müll.).

One example found in Lough Bann, near Louisburgh, July, 1910.

*Frontipoda Carpenteri* nov. sp.<sup>1</sup> (Plate II., fig. 12a-e.)

This new and very distinct species must be compared with *F. musculus*,

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<sup>1</sup> Named in honour of Professor G. H. Carpenter, B.Sc., M.R.I.A., whose researches on the arachnid fauna of Ireland are well known.



the only previously known representative of the genus, from which it differs amongst other characters in its smaller size and shorter and stouter legs.

The average size is a little smaller than in *F. musculus*; the length of the Westport example is .92 mm. and the height about .71 mm. The colour of the living mite was not observed; specimens that have been preserved in glycerine solution are of a pale brown or pinkish-brown tinge; and the eyes are pigmented with black.

The skin-sculpture is much as in *F. musculus*; the general surface appears to be closely and finely punctured, and presents in places a striated appearance, while immediately surrounding the eyes there is a small reticulated area resembling the skin-markings of *Hygrobatas naicus*.

The dorsal groove is moderately wide and straight-sided, showing as a deep cleft on the hinder margin of the body. A short distance behind the eyes in this groove there are two chitinous hair-pores placed close together in the middle line.

In side view (Pl. II., fig. 12*a*) the body is scarcely so strongly arched as in *F. musculus*; a row of about ten hair-bearing pores are arranged in a line close to the margin of the dorsal groove, and a few others are scattered on the sides of the body. The epimeral shield in front of the genital area is straight, and comparatively longer than in *F. musculus*.

The capitulum is rather long, narrow, and pointed in front. The epimeral region resembles that of *F. musculus*; the first pair are bluntly rounded or truncated at the apex.

The genital area (Pl. II., fig. 12*d*) measures .143 mm. in length along the frontal plates, and the breadth across the field is .110 mm.; it is placed closer to the hinder margin than in *F. musculus*. Seen from the side it is prominent and angled at the hinder end. The genital discs are rather narrow, and distinctly pointed at the ends in some specimens.

The anal plate is remarkably short, broad and rounded at the apex (Pl. II., fig. 12*d*), and quite different from that of *F. musculus*, which is prolonged and rather pointed posteriorly.

The palps (Pl. II., fig. 12*e*) are short and much thinner than the first pair of legs; the length is about .155 mm. At the end of the first segment there is a strong, curved bristle, which is also finely pectinated. The second segment is only very slightly longer than the first; it is furnished with four or five stout spines, and a long, fine hair springs from its inner distal corner. The third segment is shorter than the first, and on its upper part there are about four very long, fine hairs; two of these are situated on the inner side. Fourth segment (length .050 mm.), stout, curved outwards on the ventral

side, where there is a fine forwardly directed hair close to the base of the segment. The fifth segment is blunt at the apex.

As may be clearly seen in the figure (Pl. II., fig. 12*a*), the legs of this species are much shorter and stouter than in *F. musculus*; segments 2-5 of the last three pairs are more or less clavate at the extremities.

The swimming-hairs are remarkably well-developed. There are three long terminal spines at the end of the fourth pair of legs; the longest of these usually equals or is slightly longer than the sixth segment, whereas in *F. musculus* it is shorter. One of these terminal spines is much shorter than the other two, and all of them appear, under a high magnification, to be finely pectinated.

Male. Specimens which are presumably the males of this species appear to differ from the females only in their smaller size, as far as the external characters are concerned.

NYPH.—A *Frontipoda* nymph dredged from shallow water in Castlebar Lough is, judging by its short, robust legs and other characters, to be referred to the present species.

This example measures .495 mm. in length by .253 mm. in breadth.

The legs, palps, and highly chitinized parts of the body were of a greenish tint in the living mite, the coecal area being yellowish, surrounded by a darker brown colour. The large black-pigmented eyes are situated on the front margin of the body, and when viewed from above they show clearly through the dorsal plate.

The general form (Pl. II., fig. 12*b*) is oblong, narrowed, and evenly rounded in front, and somewhat truncated at the end of the body. The dorsal surface has a thickly chitinized rim, and is slightly sinuate at the posterior margin. There is a comparatively wide dorsal furrow with sinuate margins between which and the side margins of the body there are at least four pairs of large hair-bearing glands, while in the groove itself are embedded five more pairs of these glands. Two long bristles are present on both the upper and lower front margins of the body. The ventral area is very similar to that of the nymph of *Frontipoda musculus* figured by Koenike (10, Pl. XIV., fig. 9), except that the end of the body is produced in a truncated manner, and is longer. The apex of the first epimeron is capped by two broad, spade-shaped spines, one lying immediately behind the other, and the edges of these are extremely finely serrated, much as they are in *Oxus ovalis* (O. F. Müller).

The provisional genital area carries the usual four discs, the inner margins of which are flattened. There are four hair-bearing glands surrounding the anal plate (Pl. II., fig. 12*c*).

*Localities.*—Lake at Barley Hill near Westport amongst *Myriophyllum* and

Ranuncululus, June, 1909; nymph in Castlebar Lough, June, 1909. Elsewhere in Ireland I have found this species in a pond on the bank of the River Corrib (close to Galway, June, 1903); and it also occurs in lakes in the Killarney district. The specimens of Frontipoda taken in the eastern parts of Ireland are all to be referred to the common *F. musculus*, so that the new species would appear to have a western range in Ireland.

**Oxus plantaris** Sig. Thor. (Plate II., fig. 21 *a-c.*)

Bog pool in Cartron Mountain, near Letterfrack, County Galway, March, 1904.

A female *Oxus* collected in this locality by Mr. S. W. Kemp is apparently to be referred to *O. plantaris* Sig. Thor, a species which has hitherto only been recorded from Norway. In his short description of the species, Thor compares it with *O. ovalis*, which it resembles in size, shape, and colour. The characters by which he distinguishes it are the spines on the first pair of epimera, and the peculiar shape of the genital discs.

The Galway specimen is the only representative of the genus *Oxus* hitherto found in Ireland. It is preserved in balsam, so that the exact size cannot be given. The colour of the living mite is noted as reddish-brown, with a darker central dorsal area, and the legs are slate-coloured.

The epimeral region is shorter and broader than in female *ovalis*; and the posterior concavity to receive the genital area is a little wider, with more bluntly rounded corners. The first epimeral process is longer and more slender, with a distinctly sinuate inner margin. In this respect it would appear to resemble *O. quadriporus* Piersig (12, fig. 116 *b*). Unfortunately the terminal spine-armature is damaged in the Irish specimen, and only one of the modified spines remains at the apex of each. This is, however, the long claw-shaped spine (Pl. II., 21 *c*), described and figured by Thor as one of the characteristics of the species.

The genital area lies deep in the epimeral region. A decided difference from *O. ovalis* will be noticed in the peculiar shape of the genital discs. These have remarkably small external apertures, with the chitinous basal part much larger; and in the case of the first two pairs these bases are acuminate at the extremities. Thor points out their resemblance, in this respect, to the discs of *Lebertia brevipora*.

The palps are longer than in *O. ovalis*; they measure about .235 mm. in length. Two long, stout spines spring from the upper distal extremity of the second segment. Two rather similar spines are situated near the middle of the third segment on the dorsal side, and there is a long, fine hair at the

extremity. The fourth segment is long (.09 mm.), and concave in its dorsal outline (Pl. II., fig. 21 *b*).

The legs are very similar to those of *O. ovalis*; they are, however, noticeably longer in the present species.

*Distribution.*—Norway, and West of Ireland.

Sub-fam. UNIONICOLINÆ.

**Unionicola (Atax) crassipes** (O. F. Müll.).

Clare Island in Lough Avullin; lakes at Westport, Belclare, and Louisburgh.

**Unionicola gracilipalpis** (Viets).

A female of this species occurred amongst water-plants in Lough Namucka, a peaty lake a few miles from Louisburgh, July, 1910.

The present species was briefly described by Viets (30), from specimens taken near Bremen. In a subsequent paper (31), the differences between it and the common *U. crassipes* were fully defined. It may be easily separated from the last-mentioned species by the structure of the palps, which are longer and much more slender; the chitinous pegs on the fourth segment are much less developed. In the Irish specimens the palps measure 1.05 mm. in length, agreeing in every respect with Viets' description of the species.

The legs are slightly longer and more slender in *U. crassipes*, this being especially noticeable in the case of the first pair; and the pegs on which the long bristles are placed are weaker. Measurement: first pair of legs, .312; second, .373; third, .268; fourth, .360 mm.

The eyes are large and much pigmented with black.

I have also taken this species in Lough Nafin, County Donegal, in the month of September.

**Unionicola rivularis** sp. nov. (Plate III., fig. 32 *a-c*.)

Westport River, June, 1909.

This is a small free-living species of *Unionicola*, which appears to inhabit rivers, as the only specimens I have found are from the Rivers Nore and Barrow, as well as from the above-mentioned locality. It is closely allied to *Unionicola crassipes* Müller, which it resembles in general structure; but is readily distinguished from that species by its much smaller size, and especially by the palp-characters.

The palps (Pl. III., fig. 32 *a*) are extremely small, being only about half as long as in average examples of *U. crassipes*. The second segment is rather strongly arched dorsally, furnished on its inner side with two small stout spines. The third segment carries two long and rather stout bristles, one situated distally, the other springing from near the middle of the outer surface, and reaching to near the end of the fourth segment. This outside spine is very much shorter in *U. crassipes*. Both of these bristles are decidedly bent towards their extremities, and under a high magnification ( $\times 386$ ) they are seen to be excessively finely pectinated.

The fourth segment is short and stout in comparison with *U. crassipes*, and the three chitinous pegs (length of longest, .085 mm.) appear rather close together in side view; near the base of the segment on the outer side is a very fine long hair.

The form of the body is oval, except at the posterior end, where it is flattened, or slightly sinuate. The length of the female is .89, and the breadth .69 mm. The colouring is much as in *U. crassipes*. Some of the female specimens, collected in the month of June, contained numerous eggs, the average diameter of which is about .143 mm.

The capitulum has the sides remarkably straight; and overlying the basal part in some specimens is a thin plate of chitin forming a bridge between the first pair of epimera. The latter meet or are separated by a slight distance on the middle line of the body. The sub-cutaneous processes (Pl. III., fig. 32 *c*) of the second pair vary a little in length, but they appear to be longer and more slender than in *U. crassipes*.

The genital area closely resembles that of *U. crassipes*. A figure of that of the male will be found on Plate III., 32 *b*.

The male of this species is a little smaller than the female. The measurements are as follows:—

	<i>Male.</i>	<i>Female.</i>
Length of palp . . .	.37 mm.	.40 mm.
„ first leg . . .	1.05 mm.	1.25 mm.
„ second leg . . .	1.71 mm.	1.74 mm.
„ third leg . . .	1.07 mm.	1.17 mm.
„ fourth leg . . .	1.03 mm.	1.74 mm.

*Localities.*—Westport River, June; River Barrow, at Monasterevan, September; River Nore, near Thomastown, June.

***Neumania spiniipes* (O. F. Müll.).**

Glendalough Lake, Connemara, September.

**Feltria Rouxi** Walter. (Plate III., fig. 30 *a-b*.)

Amongst aquatic mosses in a stream on the lower slopes of Croaghpatrick, at Murrisk, County Mayo, July.

The female of *F. Rouxi* was described by Walter from Swiss specimens, and apparently the male was unknown. A description of it, with figures, is given in the present paper.

The colour of this mite is pale yellow, with black pigmented eyes. In the female, the dorsal surface is occupied by a large shield, which projects between the eyes, much as in the ♀ of *F. circularis*; but the small anterior separate plates present in that species are wanting, and there are only two small circular plates placed behind the dorsal shield instead of the three found in *F. circularis*. The posterior marginal cleft is similar to that of *F. muscicola* ♀, and there is a large anal plate. The antenniform bristles spring from well-developed frontal prominences, and are usually directed towards the sides of the body.

The MALE of this species occurred on Croaghpatrick.

It is considerably smaller than the female, measuring only .286 mm. in length by .253 mm. in breadth. The appendages are much stouter. It differs from the males of the described species in having the dorsal surface almost entirely covered by a well-developed chitinous shield (Pl. III., fig. 30 *a*), with the exception of an extremely narrow marginal rim, in which are placed the prominent hair-bearing papillae. This plate shows the coat-of-mail sculpture so characteristic of some genera of Hydracarina. About half way between the middle and the sides of the body, on each side, there is a row of small hair-bearing glands. The end of the body is double-margined, the upper ledge carrying two papillae.

The arrangement of the epimera is very similar to that of the allied species. The processes of the first two pairs are rather long, and the outer margins of the fourth pair are strongly sinuate. The sub-cutaneous margins are separated by a very narrow space in the middle line.

The male genital plate resembles that of *F. muscicola*, except that the front margin is not pointed in the middle; and, judging by Piersig's figures, the hinder margin is not so deeply cleft. The number of genital-discs varies. In the Croaghpatrick specimen there are about twenty-two on each plate.

The legs are remarkably stout, much more so than in the female. The secondary sexual structure, found on the last segment of the third pair of legs, consists of three modified spines placed close together on the swollen ventral margin of the segment (Pl. III., fig. 30 *b*).

The palps are short, and a little stouter than the first pair of legs. Length,

·02 mm. The second segment is strongly convex, and the ventral surface is produced in a prominent rounded knob. Fourth segment suddenly swollen outwards at the middle of the under side, and at the distal end of the evenly rounded hump thus formed is placed a forwardly directed hair.

*Distribution.*—The known range is Germany, Switzerland, and Ireland; this being the first British record of the genus *Feltria*.

***Feltria circularis*** Piersig.

Found in the same locality as the preceding species.

Occurs also in streams on the Dublin Mountains.

Sub-fam. PIONINAE.

***Piona nodata*** (O. F. Müll.).

Lakes in the north-east of Achill Island; Lough Cahasy near Louisburgh. The brightly coloured form figured by Piersig (18, pl. xi., 30*b*) occurred in the latter locality.

***Piona longipalpis*** (Krendowsky).

Clare Island (Lough Avullin); lakes at Castlebar, Westport, Belclare, and Louisburgh.

A fine bright red form of this mite is not uncommon in lakes in west and central Ireland.

***Piona stjørdalensis*** (Sig. Thor).

Loughs Baun and Cahasy, near Louisburgh.

Occurred abundantly in these lakes in July; a few specimens of the nymph were also found, the genital area of which greatly resembles that of the common *Piona nodata* (O. F. Müll.).

*Distribution.*—Scandinavia (Thor); Switzerland (Walter, 34); Great Britain (Norfolk Broads, Soar); Ireland (7).

***Piona carnea*** C. L. Koch.

Clare Island; Achill; lakes at Westport, Belclare, and Louisburgh. Common, especially in lakes on peaty ground.

***Piona circularis*** (Piersig).

Clare Island, Lough Avullin, June.

***Piona discrepans*** (Koenike).

Lough Namucka near Louisburgh.

***Piona rotunda* (Kramer).**

Doo Lough and Carrownisky River near Louisburgh; Garranbawn Lough near Ballynakill.

Much less common in the Clare Island district than the following species. The number of acetabula present in the female varies from about 18 to 23 on each plate.

***Piona rotundoides* (Sig. Thor). (Plate III., fig. 33 *a-b*.)**

Loughs Cahasy and Lugaloughaun near Louisburgh; Lough Conn; Glendalough Lake, Connemara; lakes near Clifden.

A *Piona* which agrees well with Thor's description (26) of the present species is widely spread in Irish waters, being especially abundant in the larger lakes of the west of Ireland. At Lugaloughaun a deep sub-alpine lake, this species and *Hygrobates naicus* were the only water-mites found.

The chief character by which it may be separated from *P. rotunda* Kramer is the greater number of discs on the genital plates. The latter are larger than in *rotunda*; the Irish specimens that I have examined carry from twenty-eight to thirty-five discs on each plate, and occasionally as many as forty (Pl. III., fig. 33 *b*). In addition to these there are from two to six discs lying free between the plates on each side. The hair-bearing pores on the lower extremity of each plate are arranged in a row close to its margin. In the male the genital plates are also larger and carry more discs than the allied species (Pl. III., fig. 33 *a*).

*Distribution*.—Scandinavia (Thor); Great Britain (Norfolk Broads, &c., Soar); Ireland.

***Piona rufa* C. L. Koch.**

Common in lakes at Westport and Louisburgh.

***Piona paucipora* (Sig. Thor). (Plate III., fig. 34.)**

Lough Conn, June, 1903.

A number of examples were collected in this, the only known Irish locality, by Mr. W. F. de V. Kane.

*Piona paucipora* is closely allied to *Piona rufa*, but may be easily distinguished from that species by the structure of the genital area; the colour of the mite is yellowish, with dark blotches on the upper side.

In the male there are about ten genital discs; one of these lies free within the genital plates. The latter are sickle-shaped and are very characteristic of



the species. The long spine at the apex of the third pair of legs is armed at the base with two strongly curved processes, and the chitinous peg at the end of the fourth palp segment is strongly developed. The third and fourth pairs of epimera are very large and resemble those of *P. rufa*, except that their inner margins are much wider apart than they are in that species.

In the female the chitinous genital plates are very feebly developed, rarely uniting more than about five discs in one piece. The number of discs in the Irish specimens varies from eight to twelve on each side. (Pl. III., fig. 34.)

*Distribution.*—The records of this species are few—Scandinavia (Thor); Gotland (Walter, 35); Germany (Koenike and Thienemann, 14); Turkestan (Thor); England (Lincolnshire, George); Scotland (Edinburgh, Rannoch, Lydoch, Williamson); Ireland.

***Piona conglobata* C. L. Koch.**

Lakes in the Louisburgh district.

A few specimens taken in the Carrownisky River in the above locality are apparently to be referred to the variety *conjugula* Koenike. This variety may be recognized by the absence of the small peg which in the typical form is present at the base of the tooth on the inner side of the fourth segment.

***Hydrochoreutes ungulatus* (C. L. Koch).**

Glendalough Lake, Connemara, September.

***Hydrochoreutes Krameri* Piersig.**

Clare Island; Carrownisky River and Cahasy Lough near Louisburgh.

Much commoner than the preceding species in the Clare Island district, while the reverse is true of the East of Ireland.

***Wettina podagrica* (C. L. Koch).**

One specimen found in the Westport River, June.

This is the first record of the species from Irish waters.

*Distribution.*—Norway (Thor); Switzerland (Walter); Germany (Piersig); Italy (Maglio); England and Scotland (Oban, Soar); Ireland.

***Pionacercus Leuckarti* Piersig.**

Clare Ireland, in bog pools, June.

The specimens (♂, ♀) from this locality should perhaps be referred to the variety *scutatus* Sig. Thor, though they differ somewhat from the description of that form. The male of *scutatus* is said to have the terminal segment of

the third leg only weakly thickened, with but few bristles. The fourth and fifth segments of the last pair of legs are described as being furnished with smooth bristles, and the sixth segment of the same pair is not much swollen.

In the Clare Island specimens ( $\sigma$ ) the terminal segment of the third leg is decidedly less thickened than in Piersig's figure (18, pl. xvii., fig. 43*b*) of the typical form; it seems to be slightly concave on the lower margin, and there is a moderate number of hairs. At first sight the bristles on the fourth and fifth segments of the last pair of legs appear to be smooth, but under a high magnification a few of them are seen to be extremely finely pectinated along one side. The terminal segment of the last pair of legs is of the usual crozier shape, with a row of ten chitinous pegs on the moderately swollen basal part; an additional one is placed in the deep concavity, and there is another at the end of the segment.

I have taken this form in various localities in Ireland, where it is not uncommon in pools on peat moors.

***Acercus (Pionopsis) lutescens* (Herm.).**

Ballynahinch Lake, Connemara, June.

***Forelia (Tiphys) liliacea* (O. F. Müll.).**

Lough Cahasy near Louisburgh.

The females occurred commonly in this locality in July; the male appears to be much rarer.

Sub-fam. ATURINAE.

***Aturus scaber* Kramer.**

Streams on Croaghpatrick; Carrownisky River; stream flowing from Lugaloughaun, June and July.

***Aturus runcinatus* (Sig. Thor.).**

Streams on Croaghpatrick, June and July.

Some of the females from these localities contain a single elliptical egg of huge size in comparison with the mite; one of these eggs measures  $\cdot 154$  by  $\cdot 110$  mm.

Common amongst aquatic mosses growing on stones in company with the preceding species. They are probably the most abundant of all of the stenothermal forms occurring in Irish streams.

***Brachypoda versicolor* (O. F. Müll.).**

Westport River; Cahasy Lough near Louisburgh.

Sub-fam. MIDEOPSINAE.

**Midea orbiculata** (O. F. Müll.).

Crott Lough near Belclare, Co. Mayo.

**Mideopsis orbicularis** (O. F. Müll.).

Owenwee River at Belclare; Lakes near Westport; Prospect Loughs at Belclare.

Sub-fam. ARRHENURINAE.

**Arrhenurus securiformis** Piersig.

Clare Island, Lough Avullin, June.

Widely spread in Ireland, though rather rare and usually met with singly as far as the male is concerned. No doubt both this and the following species escaped observation on the adjacent mainland.

**Arrhenurus cylindratus** Piersig.

Clare Island, Lough Avullin, June.

**Arrhenurus globator** (O. F. Müll.).

Lough Baun, Louisburgh.

**Arrhenurus Kanei** Halbt. (Plate III., fig. 26 *a-d*.)

A female example of this species occurred in a small peaty lake in the north-east of Achill Island, in the month of June.

*Arrhenurus Kanei* would seem to be a rare lake-frequenting species; it was described from a few specimens discovered by Mr. W. F. de V. Kane in the north of Ireland (4). The species is closely allied to a Swedish mite, *Arrhenurus nobilis*, described by Neuman in his well-known monograph on Swedish Hydracarina (17); and it is a question whether the Irish mite should not be referred to a variety of that species. If Neuman's description and figures of *A. nobilis* are correct—and judging by their excellence in other cases there is no reason to doubt this—certain differences are apparent between the two forms. *Arrhenurus nobilis* has not been found since Neuman's time, and unfortunately the single type-specimen<sup>1</sup> is missing from his collection of water-mites now preserved in the Gottenburg Museum (Piersig, 19).

The following is a translation of the Swedish description of *Arrhenurus nobilis*, for which I am indebted to my friend, D. Freeman, M.A. The modern names of the structures referred to are inserted in square brackets:—

“Male: The body is oval, rounded anteriorly, posteriorly prolonged to a long and broad appendage, which at the end is roughly rounded off, and in

<sup>1</sup> “I obtained only one example in October, 1868, at Mälaren, near Kungshamn, at a depth of from 20 to 30 feet” (17, p. 92).

the median line furnished with a transparent, long and narrow lesser appendage, which at its end is somewhat broader and roughly truncated [petiolus]. On each side of this proceeds another appendage, which is crescentic and tolerably broad [club-shaped organs]; these two meet at their ends outside the median lying appendage. On each side of this [pair] are two long hairs, twice the length of the appendage. Examining the creature from the upper side, there appears (as in *A. tricuspikator* and *A. emarginator*) above this appendage in the median line another short appendage, of equal length and breadth, transparent, furnished at its hinder end with two incurvations; upon this at each side stands a short knob, and at the apex a long hair [hyaline-appendage]. The 'impressed line' is posteriorly invisible, and more obscure than in other species within the genus; the part of the back included is inconsiderable. The epimeral groups are divided by a very inconsiderable interval, the inner ends of the fourth pair almost touching each other. These epimera are nearly square, more than twice the breadth of the third pair. *Labium* short and broad, rounded semicircularly behind. *Anus* situated and shaped as in the last species [*A. papillator* Müller], but without the enclosing elevations. In colour it is bright green, somewhat approaching to yellow, with two inconspicuous brown patches on the back. Under side, legs and palpi yellow-green."

The length of the Irish species is about 1.2 mm., breadth .88 mm. The colour is yellow tinged with green, with reddish brown markings, and the legs, palps, and epimera are pale green.

The body (Pl. III., fig. 26 *a*) is oval in shape, hinder end suddenly contracted and produced to form a well-defined appendage. The dorsal groove encloses rather less than half of the upper surface; it is evenly rounded in front, sinuate at the sides, and ends on the side margins of the appendage. The hyaline-appendage, the petiolus, and the enclosing club-shaped organs (Pl. III., fig. 26 *b*) appear to agree closely with those of *A. nobilis*. In *A. Kanci*, however, there is a blade-like chitinous process on each side of the hyaline-appendage which is not indicated by Neuman in his description or figure of the Swedish species. The petiolus and club-shaped organs spring from a rounded prominence on the underside of the body appendage. The epimera are extremely large, fourth pair quadrate approaching quite close to the genital area.

The legs are long and robust, and the spur on the fourth segment of the last pair is very strongly developed.

The palps (Pl. III., fig. 26 *c*) are short and stout; the inner end margin of the second segment is curved outwards and carries about three moderately long hairs; on its dorsal surface are three or four bristles, one of which is

pectinated. Fourth segment very broad at the base, strongly narrowed towards the apex. The sword-bristle reaches well beyond the end of the segment.

The female (Pl. III., fig. 26 *d*) of this species may be easily identified by its large size and peculiar shape. An example from Dartrey Lough measures 1.53 mm. in length, by 1.20 mm. in breadth. The body is very strongly narrowed in the anterior half, and the front margin is evenly rounded, posterior corners very slightly raised in a rounded prominence. The epimera are very much smaller than in the male. The genital area lies close to the fourth epimera, and is widely removed from the end margin of the body. The front margin of the tongue-shaped plates springs from the middle of the chitinous rim of the genital orifice. Legs shorter than in the male.

*Localities.*—Upper Lough Erne, September, 1899; Dartrey Lough, County Monaghan, October, 1899; lake in the north-east of Achill Island, County Mayo, June, 1909.

**Arrhenurus forpicatus** Neuman, var. **perforatus** George. (Plate III., fig. 28–29.)

Lakes near Westport, June; Lough Baun near Louisburgh, amongst a dense growth of Chara, July.

The specimens found in this district are all to be referred to the variety *perforatus* George. It may be readily separated from the typical form by the structure of the petiolus. In the males of *forpicatus* the ends of the dorsal furrow are continued obliquely on the appendage, enclosing the highly chitinized petiolus. This is oblong and swollen at the centre; and as it is rather complex, its structure may be best shown by a figure (Pl. III., fig. 29). In the *perforatus* form, on the contrary, the ends of the dorsal groove run parallel for a short distance on the appendage, and are evenly rounded at the apex. The petiolus (Pl. III., fig. 28) is much simpler, being a small prominence placed close to the concavity of the hinder margin of the appendage. As Piersig has pointed out, there are some differences in the shape of the appendage between the two forms, but the structure of the petiolus is quite sufficient to distinguish them. In the female of the *perforatus* form the genital plates are somewhat narrower and more pointed at the free extremities than are those of the typical form.

The variety *perforatus* would seem to be the prevalent form in Ireland; all of my Dublin specimens are to be referred here. The only Irish examples of *forpicatus* that I have hitherto met with are from Loosecaunagh Lough near Killarney.

**Arrhenurus sculptus** Halbt. (Plate III., fig. 25 *a-c*.)

Bog pools on Cartron Mountain, near Letterfrack, County Galway, March, 1904.

A preliminary description of this mite appeared in the "Zoologischer Anzeiger" some years ago (5). The species is allied to *Arrhenurus solidus* Piersig, but may be easily recognized by the shape of the appendage and other characters. A short description of the female is given in the present paper.

The colour of the type-specimens (Raheny Ponds, County Dublin) is noted as greenish-yellow, with brown dorsal markings, and the legs are yellow. Length, including the appendage, slightly over one millimetre.

Compared with *A. solidus* the body is longer and not so strongly narrowed towards the front margin, where it is truncated in outline. The chief difference is in the shape of the male appendage, which is longer, narrower, and much more distinctly marked off from the body than it is in that species. A small petiolus structure, which appears to be forked at the extremity, is placed near the middle of the appendage. The dorsal groove is strongly narrowed in front and encloses a larger area of the back. The epimera are much as in *A. solidus*, fourth pair rather strongly angled at the middle of the posterior margin.

The palps measure about .32 mm. in length. In side view the distal extremity of the second segment is armed with a long spine, and on the inner side there is a small group of long stout spines. The sword-bristle on the inner side of the fourth segment is short and sharply pointed, and in the Galway specimen barely reaches to the end margin of the segment. The legs are decidedly longer and more robust than in *A. solidus* Piersig, last pair devoid of a spur.

The female (Pl. III., fig. 25 c) is a little shorter than the male; the actual length is 1.05 mm. The body is of a regular oval shape, resembling in this respect the ♀ of *A. Stecki* Koenike ("Deutschlands Hydrachniden," Taf. xxxvi., fig. 95 b), but more oblong. The plates of the genital area are very broad at the base, and narrow rapidly towards the free end. The delicate plates protecting the orifice are without chitinous thickenings ("chitinflecke" of Koenike).

*Localities.*—A male and female of this species occurred amongst refuse taken from a bog-pool on Cartron Mountain, County Galway, in the month of March, by Mr. S. W. Kemp; ponds at Raheny, County Dublin, April; and a female example has been found in bog-pools near Bundoran, County Donegal, in the month of September. Mr. C. D. Soar has met with it in England.

*Arrhenurus ornatus* George. (Plate III., fig. 27.)

Achill Island, frequent in bog-pools and lakes, June.

A common and widely spread mite in Irish, as well as in British waters

generally (2). On the other hand, although the species is very distinct and easily recognized, it would appear to be rare on the continent of Europe. The only extra-British record that I know of is a recent one from Switzerland (Walter, 32).

**Arrhenurus cuspidifer** Piersig.

Lough Baun, Louisburgh, July.

Not uncommon, amongst a growth of Chara.

**Arrhenurus tricuspidator** (O. F. Müll.).

Achill Island, June.

The colour of the specimens from this locality is a dark reddish-brown; the bright red form is rather rare in Ireland. The mite recorded here is the *A. bicuspidator* of (12) and other references.

**Arrhenurus Neumani** Piersig.

Achill Island in lakes and bog-pools, June; Glendalough Lake, Connemara, September.

This species is very characteristic of the lakes and peat-moors of the west. I have not yet found it in the eastern parts of Ireland.

*Distribution.*—Widely spread in Europe, ranging from Finland to Italy.

**Arrhenurus claviger** Koenike.

Lough Cahasy, Louisburgh.

**Arrhenurus crassicaudatus** Kramer.

Prospect Lough, Belclare; Loughs Cahasy and Baun near Louisburgh.

[In the lowland part of Galway, outside the limits of the district dealt with in the present paper, I have found three additional species of *Arrhenurus*. These are:—

*Arrhenurus Stecki* Koenike.—In a sphagnum-pool near Ross Lake, September.

*Arrhenurus crenatus* Koenike.—River Corrib. In a small deep lake on the limestone at Ballindooley, near Galway, a beautiful bright red form of this species occurs, which is strikingly different from the dull purplish form found in the Royal Canal and other places in the east of Ireland.

*Arrhenurus albator* (O. F. Müll.).—Lakes at Moycullen.].

With the exception of some slight changes in the arrangement of the genera and species, the classification made use of in the foregoing list is that

published last year by Dr. Koenike. Perhaps the most notable innovation found in Dr. Koenike's arrangement is the inclusion of the genus *Sperchon* in *Limnocharidae*—the recent discovery of the larval form proving its affinity with that family (13).

In connexion with the Clare Island Survey it may be of interest to indicate here a few species of *Hydracarina* which, judging by their known range, are not unlikely to prove characteristic of the west central as opposed to the east central parts of Ireland.

In the first column of the following list are recorded the species which have been found in the west (counties Mayo and Galway) which would appear to be absent from the east (counties Dublin and Wicklow). The second column contains eastern species.

A number of evidently widely spread forms are omitted from the lists, as their discovery in both districts is probably only a matter of time. It should also be pointed out that the east has been more thoroughly searched for these creatures, although little is known of the fauna of the Wicklow lakes.

At the present time we do not know enough concerning the local distribution of the fresh-water mites to endeavour to account for their absence from the districts in question. With regard, however, to the western forms it will be seen that they are largely denizens of lakes and peat-moors, and, as has already been mentioned, some of these forms apparently belong to a Scandinavian or northern element in our fauna (page 3).

Those species marked with an asterisk have not been previously recorded from the Britannic area.

WEST.	EAST.
<i>Eylais Koenikei Halbt.</i>	<i>Eylais hamata Koenike.</i>
<i>Eylais celtica Halbt.</i>	<i>Eylais undulosus Koenike.</i>
<i>Eylais relicta Halbt.</i>	* <i>Panisus torrenticolus Piersig.</i> <sup>1</sup>
* <i>Hydryphantes placationis Thon.</i>	<i>Hydrarachna maculifera Piersig.</i>
<i>Thyas vigilans Koenike.</i>	* <i>Sperchon tenuabilis Koenike.</i> <sup>2</sup>
* <i>Sperchon undulosus Koenike.</i>	* <i>Sperchon papillosum Sig. Thor.</i> <sup>3</sup>
* <i>Lebertia fimbriata Sig. Thor.</i>	* <i>Sperchon mirus Koenike.</i> <sup>4</sup> (variety).
<i>Frontipoda Carpenteri nov. sp.</i>	* <i>Atractides connexus Koenike.</i>
* <i>Oxus plantaris Sig. Thor.</i>	<i>Acercus latipes (O. F. Müll.).</i>

<sup>1</sup> Stream in the Devil's Glen, county Wicklow, in moss on submerged stones.

<sup>2</sup> Under stones in the River Dodder, county Dublin.

<sup>3</sup> and <sup>4</sup> Found in stream ("back drain") running between "levels" of the Grand Canal near Clondaikin, county Dublin.



## WEST—continued.

- \**Atractides amplexus* Koenike.  
*Atractides brevirostris* nov. sp.  
*Unionicola rivularis* nov. sp.  
*Wettina podagrica* (C. L. Koch).  
*Piona paucipora* (Sig. Thor).  
*Arrhenurus Kanei* Halbt.  
*Arrhenurus Stecki* Koenike.  
*Arrhenurus Neumani* Piersig.

## EAST—continued.

- Forelia parmata* Koenike.  
 \**Aturus intermedius* Protz.<sup>1</sup>  
*Arrhenurus mediorotundatus* S. T.  
*Arrhenurus Freemani* Halbt.  
*Arrhenurus affinis* Koenike.  
*Arrhenurus battilifer* var. *dilatatus*<sup>2</sup>  
*Arrhenurus truncatellus* (O. F. M.).  
*Arrhenurus bipapillosus* nov. sp.<sup>3</sup>

<sup>1</sup> In the River Liffey at Blessington, county Wicklow.

<sup>2</sup> Differs from the typical form chiefly in the shape of the petiolus, which is a little shorter and is distinctly swollen on each side beyond the middle. Seen from above the ends of the genital plates do not project beyond the sides of the body appendage as they do in the typical form (8) sent to me by Dr. Koenike. Found in old ponds at Rabeny and Sntton, county Dublin (Plate III., fig. 23 a-c) (5).

<sup>3</sup> *Arrhenurus bipapillosus* nov. sp. Male:—Length .72 mm., breadth .61 mm. Colour yellow with brown markings, and paler coecal area. Outline of the body rounded in front and slightly flattened on the sides. At a point a little in front of the posterior third it is gradually narrowed towards the body appendage. The latter is rather small, and its sides are almost continuous with those of the main body. The apex of the appendage is truncated and distinctly indented (depth about .033 mm.) at the centre somewhat as in the American species *A. ovalis* Marshall. On each side of this central notch there is a small hyaline papilla and close to this a long straight hair. Near the base of the upper side of the appendage there is a curious wedge-shaped petiolus (Plate III., fig. 23 b), and on each side of this there is a stout bristle of moderate length which is curved outwards at the extremity. The third and fourth epimera are narrow and of great breadth, their inner ends separated by a very slight interval. Capitular recess very wide. The genital plates are deep at their bases, and narrow rapidly towards the sides of the body, which they do not overreach. Inner face of the second palp segment with a small group of rather long pectinated spines; fourth segment narrowed towards the extremity (Plate III., fig. 23c).

*Locality:* Found amongst weeds dredged from the Grand Canal near Clondalkin, county Dublin, by Miss J. Stephens, in October, 1908.

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## DESCRIPTION OF PLATES.

## PLATE I.

Fig.

- 1 *Eylais discreta* Koenike. *a*, Eye-plate  $\times 115$ . *b*, End of fifth palp segment.
- 2 *Eylais discreta* Koen. var. *stagnalis* Halbt. ♂. *a*, Eye-plate  $\times 115$  (lake at Westport). *b*, External genital organ of ♂.
- 3 *Eylais infundibulifera* Koenike. *a*, Eye-plate  $\times 115$ . *b*, Stigma.
- 4 *Eylais celtica* Halbt. Eye-plate  $\times 115$ .
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- 6 *Eylais similis* Thon. Eye-plate  $\times 115$ .
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- 8 *Protzia eximia* (Protz). *a*, Provisional genital area of nymph. *b*, The same of another nymphal form.
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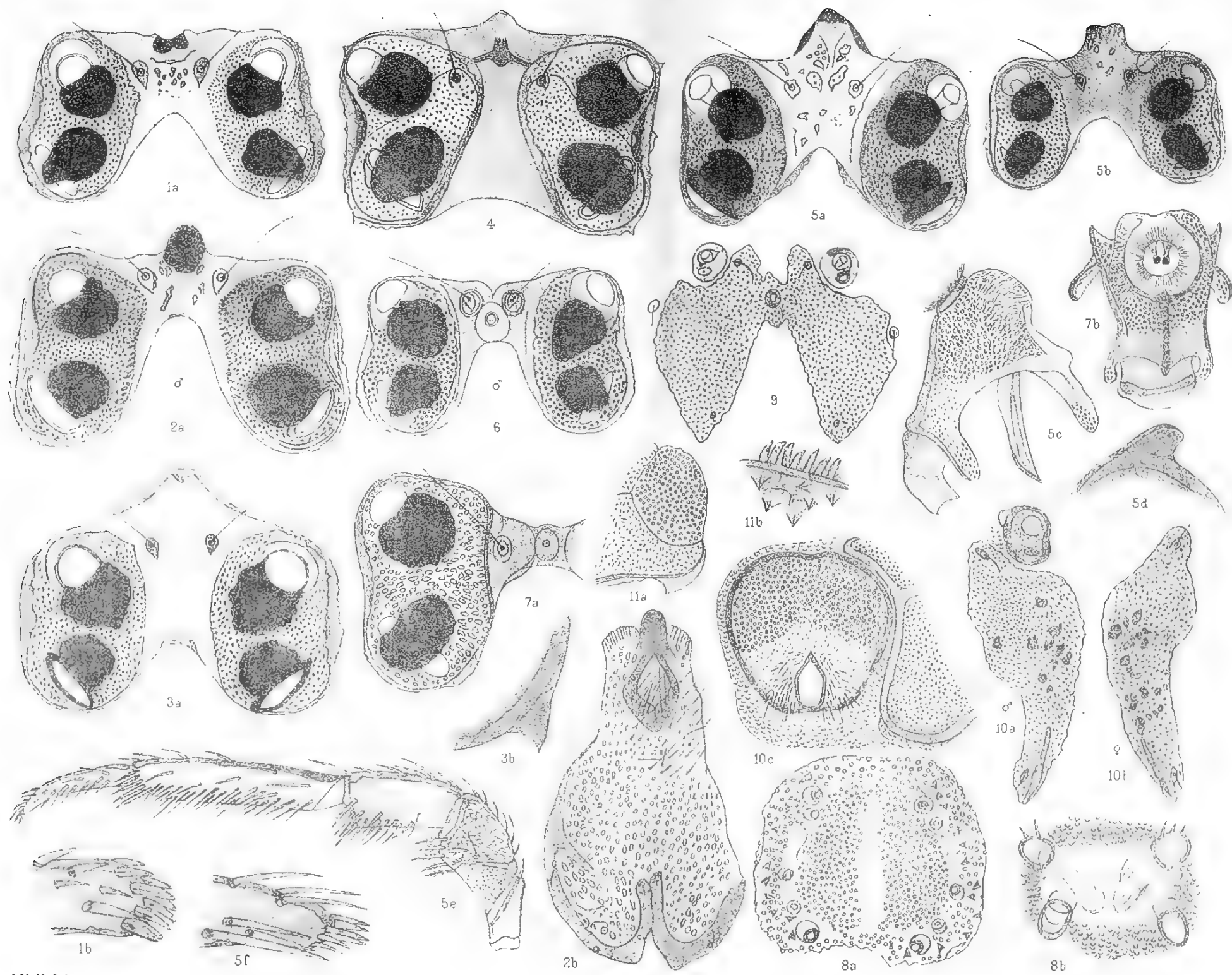
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- 13 *Atractides brevipalpis* sp. nov. *a*, Ventral view ♂. *b*, Ventral view of capitulum ♀. *c*, Side view of same  $\times 115$ . *d*, Genital area ♀. *e*, Palp ♀.
- 14 *Atractides anomalus* (C. L. Koch). *a*, Ventral view of capitulum. *b*, Side view of same. *c*, Epimeral region of nymph (all  $\times 115$ ).
- 15 *Megapus spinipes* var. *montanus* nov. Terminal segments of first leg  $\times 224$ .
- 16 *Megapus spinipes* (C. L. Koch). Terminal segments of first leg  $\times 224$ .
- 17 *Hygrobates calliger* Piersig. Provisional genital area of nymph.
- 18 *Sperchon brevirostris* var. *pachydermis* Piersig. Palp of female  $\times 115$ .
- 19 *Sperchon undulosus* Koenike. Provisional genital area of nymph.
- 20 *Pseudosperchon verrucosus* (Protz). Provisional genital area of nymph.
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## PLATE III.

Fig.

- 23 *Arrhenurus bipapillosus* nov. sp. *a*, Dorsal view of male. *b*, Petiolus organ. *c*, Palp of male  $\times 224$ .
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- 27 *Arrhenurus ornatus* George. Dorsal view of male.
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29. *Arrhenurus forpicatus* Neuman. Petiolus region  $\times 115$ .
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- 33 *Piona rotundoides* (Sig. Thor.). *a*, Genital area of male. *b*, Genital area of female  $\times 85$ .
- 33 *Piona paucipora* (Sig. Thor.). Genital area of female.

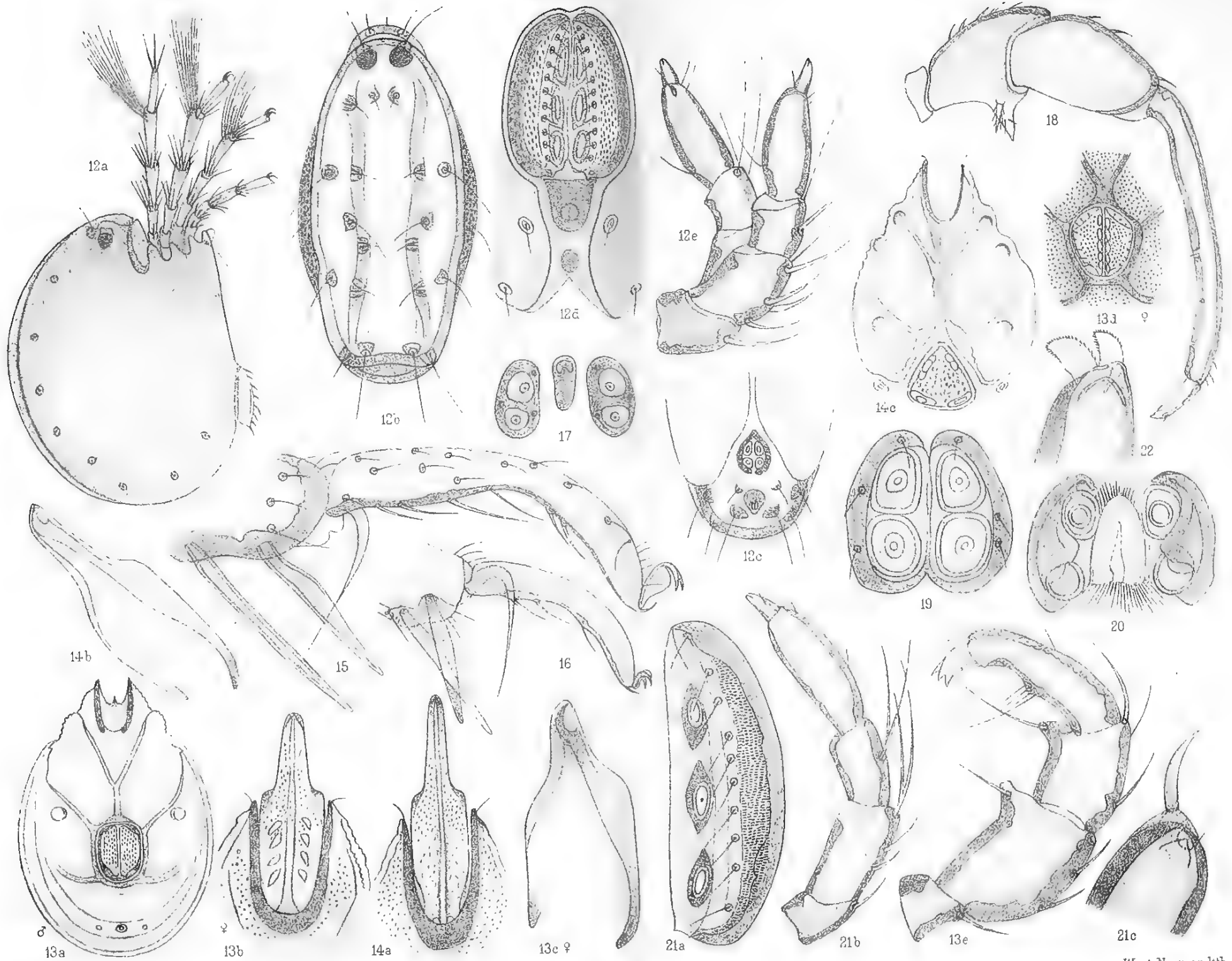


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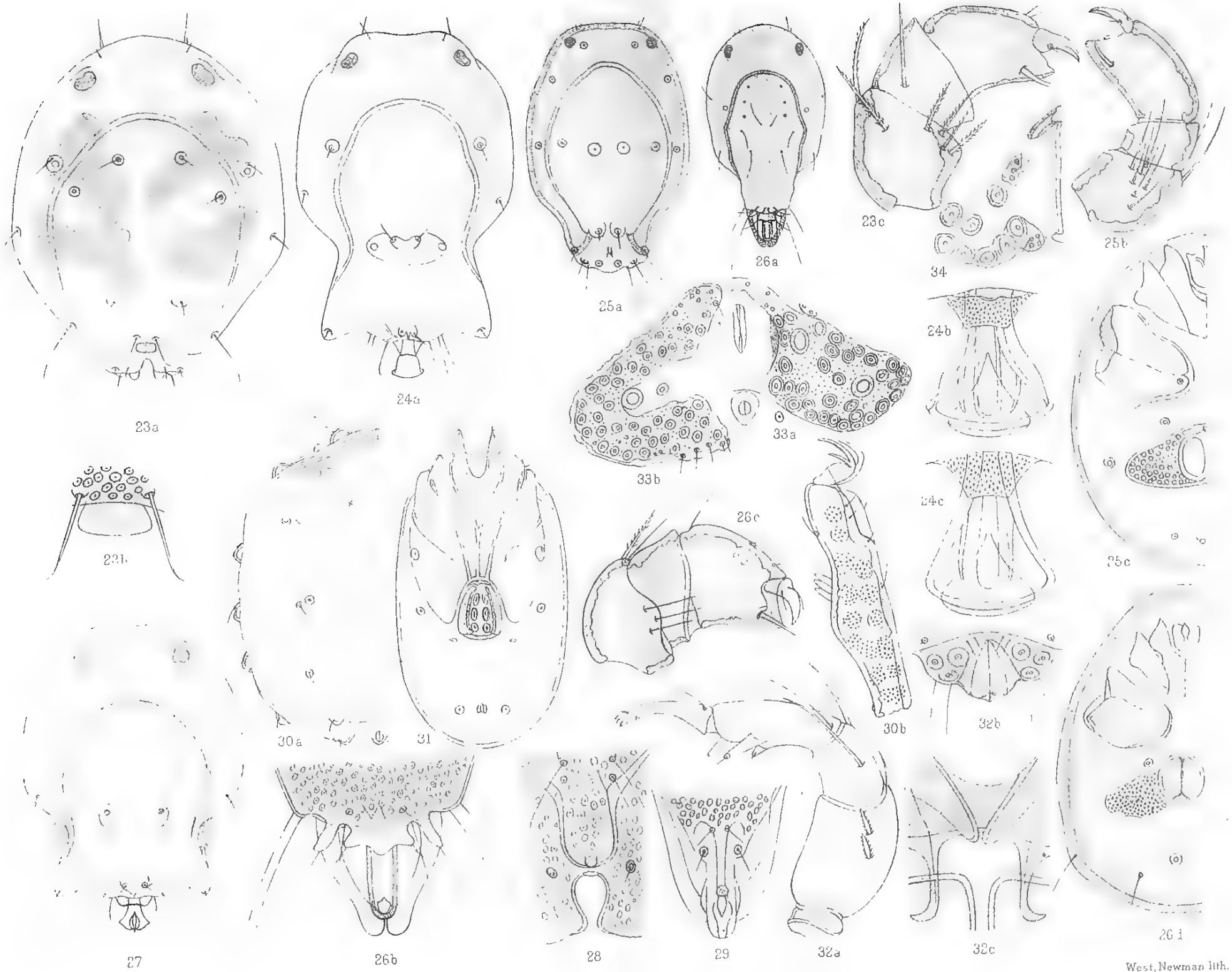




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CLARE ISLAND SURVEY - HYDRACARINA.

West, Newman lith.



ACARINIDA.

BY J. N. HALBERT, M.R.I.A.

SECTION II.—TERRESTRIAL AND MARINE ACARINA.

PLATES IV–VIII.

Read JUNE 8, 1914. Published MARCH 27, 1915.

INTRODUCTION.

THE following report contains a record of certain groups of the terrestrial mites and also of the marine species belonging to the family Halacaridae found during the recent Survey of Clare Island and the surrounding district.

Except as regards one or two of these groups the list must be looked on as very incomplete. During the field work of the Survey it was necessary to give a good deal of attention to insects and other invertebrates so that little time was available for collecting the Acarina. Gradually, however, a number of species were got together, especially during my later visits to the district, and through the help of friends in sending gatherings of moss and other materials in which these small creatures may be found.

As a result, there is now available a list of 186 species which, together with the 80 fresh-water mites, recorded in the previous section of this paper (39 i), bring the known acarine fauna of the district up to 266 species. Incidentally, there are included some records of mites from other parts of Ireland identified while the present paper was being prepared; these are printed in italics, and include the only records of Irish mites outside the limits of the Clare Island district, at least in so far as the groups dealt with are concerned.

The bulk of the species belong to those two dominant groups of the free-living mites, the Gamasoidea and the Oribatoidea. As a matter of fact the list is made up as follows:—

Gamasoidea,	. 72 species (including Labidostomma).
Ixodoidea, .	. 1 species.
Oribatoidea,	. 60 species.
Sarcoptoidea,	. 5 species.
Thrombidoidea,	. 48 species (including the Halacaridae).

In some respects the most interesting mites found during the Survey belong to the group Gamasoidea. These are small and medium-sized Acarina of extremely varied habits and structure. The free-living forms may be found in moist places amongst moss, in fungi, under the bark of decayed trees, &c. Some peculiar forms are found only in ants' nests while others must be sought for between tide-marks on the sea-shore. Many species of this group live parasitically on the bodies of other animals, with the exception of two kinds found on field mice no attempt was made to collect these parasitic forms.

This group is apparently in need of a general revision, and as the species pass through two or three nymphal stages during their life-history the identification of one's captures is not always an easy matter. On this account and partly also because there are several new species to be described, it was necessary to enter into considerable detail in the following list. It is hoped that the accompanying figures of the new and little-known species will leave no doubt of their identity in the light of future work on the Acarina in this country.

Dr. Berlese's well-known work (1) on the Italian mites is of the greatest help in this as in other groups, and the same author has recently published an excellent account of the species of *Gamasus* (13) which greatly simplifies identifications in so far as that genus is concerned. If we except Mr. Michael's paper on the family Uropodidae (49) and Mr. Donisthorpe's notes on the Acarina living in ants' nests very little is known of the gamasid fauna of these countries, so that many of the species in the following list are new British records.

Amongst the Oribatoidea, the so-called "Beetle Mites," exactly sixty species were collected including many not previously recorded from Ireland. This list is doubtless incomplete, yet it is probably fairly representative of the oribatid fauna of the district. These mites are very uniformly distributed and may usually be found in numbers in their favourite habitats especially amongst mosses. In contrast to the previous group the British species are fairly well known, thanks to Mr. Michael's admirable monograph (48). Thus, of the sixty kinds recorded in the following paper, representing many hundreds of specimens collected in an unexplored part of the country, only two species and a few varieties are not mentioned in Mr. Michael's work. One of these, *Oribata alpina* n. sp., is not uncommon amongst moss in the mountainous parts of the district, while a *Notaspis* found in numbers on the sea-shore at Mulranny agrees with a form recently described by Berlese under the name of *Oribatula venusta*.

Very few tyroglyphid mites were observed, but the occurrence of the

marine species *Hyadesia fusca* on the British coast is of interest, a number of specimens were found amongst coralline sea-weeds in rock-pools on the shore of Clare Island. Another interesting species is the ants' nest mite *Tyroglyphus Wasmanni*, the hypopial nymph occurred in nests of the common black ant, *Formica fusca*, at Mulranny, apparently the first definite record of the species from Britain.

The mites of the group Thrombidoidea, including such creatures as the earth mites, spinning mites, &c., were but little collected, except for the aquatic kinds. Indeed this part of the list is a record of casually collected species often represented by single specimens. For the sea-mites of the family Halacaridae I am mainly indebted to Mr. R. Southern who kindly collected a number of these minute acarids during the scientific expeditions of the Fisheries cruiser "Helga." Of the seventeen forms collected two species and a variety are undescribed; two of these were dredged in Clew Bay in 24 f. on what has been described as "Polygordius ground." This consists of a bottom of gravel and shelly sand yielding a very interesting fauna of polychaete worms and other creatures (see Parts 47 and 67).

A special search was made on the coast of Mayo for examples of the interesting littoral fauna recorded by Berlese, Trouessart and others from the coasts of southern Europe. I am glad to record success in this respect; quite a number of these mites were found in their characteristic habitat including a few new forms, the most interesting being *Thinozercon Michaeli* sp. nov. a peculiarly isolated acarid which must be regarded as the type of a new family of the Gamasoidea, while the new genus Haluropoda is represented by two species found commonly on the sea-shore and in salt marshes.

The more truly maritime forms are found well below high-tide mark where they survive continual immersion by the sea. During the tides they retire into minute crevices in the rocks, or under stones partly embedded in sandy mud where small quantities of air are imprisoned; such species are—*Halolaelaps glabriusculus*, *Gamasus Trouessarti*, *Cyrrhydroaelaps hirtus*, *Pachylaelaps littoralis* n. sp., *Hydrogamasus Giardi* (Dublin coast), *Thinozercon Michaeli* n. sp., *Phaulocylliba Berlesii* n. sp. (Dublin coast), *Bdella decipiens*, *Bdella capillata* (or var.), *Ryncholophus rubripes*, *Rhagidia halophila* and *Halotydeus hydrodromus* var. *albolineatus*. Of the *Pachylaelaps* and *Phaulocylliba* only single specimens were found, both are apparently undescribed and in common with the other species mentioned they occurred under stones well below high-water mark.

There are also some species which live under stones and seaweed at or about high-water mark yet they do not appear to relish the continuous

submergence to which the more decidedly maritime forms are subjected; to this fauna belong *Gamasus Kempersi*, *Gamasus immanis*, *Halolaelaps celticus* n. sp., *Gamasolaelaps aurantiacus*, *Haluropoda interrupta* n. sp., *H. minor* n. sp. and the oribatid mites *Scutovertex bilineatus* and *S. corrugatus*.

Much observation is needed with regard to the exact "zoning" of these littoral forms, and there are some interesting points in their structure and life-history which would repay investigation. In the species *Halolaelaps glabrinusculus*, for instance, the ambulacra are highly modified from the ordinary gamasid type, while in the allied *Halolaelaps celticus*, occurring higher up at about high-water mark, these organs, though of similar type, are less highly specialized. Similarly in the protonymph of *Cyrthydroelaps* the ambulacra are less modified than in the adult.

It is well known that many kinds of mites are only found in ants' nests where they live on friendly terms with the ants. Mr. Michael was the first acarologist to study these interesting creatures (48A), and Berlese has published a very useful paper (12) with descriptions of all of the known myrmecophilous forms, these belong, with few exceptions, to the group Gamasoidea. The district is not rich in these mites, the following species occurred:—*Urotachytes formicarius*, *Urodiseella philoctena*, *Loelaps montanus*, *L. vacuus*, *L. styliferus* n. sp., *L. acutus*, and the hypopial nymph of *Tyroglyphus Wasmanni*.

An undoubted sphagnum fauna occurs in very wet places on the mountains and also in sphagnum pools on the moors, the following species may be referred to in this connexion:—*Crytolaelaps transisalar*, *Paraseius serratus* n. sp., *Scius minutus* n. sp., *Oribata sphagni*, *Notaspis lacustris*, *Nothrus glaber*, *N. tardus*, and *N. monodactylus*, *Smaris expalpis*, *Microthrombidium valgum*, and others. The last two species I have found in sphagnum pools in company with the *Arrhenurus Stecki* and other water mites on the Mulranny moors.

As regards the general results obtained in the present report it may be mentioned that this is apparently the first attempt to record a local fauna dealing with more than one group of the Acarina in this country, or, indeed, in the British Isles. It has been found necessary to define three new gamasid genera and there are descriptions and figures of 22 new species and 5 new varieties of the Acarina. Apart also from the extension in the known range of many species at least 90 are recorded from Britain for the first time, due to the scarcity of British records in the groups Gamasoidea and Thromboidea, while at least 156 species were previously unrecorded from Ireland.

The classification made use of is mainly that proposed a few years ago by



Dr. E. Reuter,<sup>1</sup> at least as regards the super-family and family groups. It is difficult not to agree with the same writer's remarks on the undesirability of changing the well-known name Gamasidae in favour of the less suitable one Parasitidae as has been done recently by some acarologists. *Gamasus* is retained in the present paper.

## Order ACARINA.

### Sub-Order **GAMASOIDEA.**

#### Family GAMASIDAE.

##### **Gamasus (Gamasus) fimetorum** Berl.

An immature male example of this species occurred under bark in the Westport demesne in July.

*Distribution.*—Germany (Voigts and Oudemans); Italy ("in fimetis totius Italiae" Berl.); Corfu (Thon).

##### **Gamasus (Gamasus) Kempersi** Oudms.

1902. Oudemans **74**, p. 36. 1906. Berlese **13**, p. 143.

Westport, ♂ and ♀ under stones on the sea shore, July; Mulranny, ♂, ♀ and nymphs on the shore of Bellacragher Bay, September.

This species is apparently common, where it occurs, on the sea-coast. I have also found it in numbers under stones between tide-marks at Howth, County Dublin.

*Gamasus Kempersi* is a rather weakly chitinized species which may be recognized by the armature of the second legs in the male, the bilobed process on the basal segments of the palps, and the absence of a tritosternum, a structure which is present, however, in the female of the species.

In his original description of this mite Oudemans remarks that the patella of the second legs is armed with a *bifid* process, and that the epistome "does not show any spines," which has led Berlese to conclude that the Dutch specimens represent a variety for which he suggests the name var. *denticulata*. However this may be, the Irish specimens agree with those described by Berlese, in which the patella has a small cone-shaped process, and the epistome carries the usual three spines.

*Distribution.*—Sea-shores of southern Italy (Berlese); Norway; Holland (near Nijkirk, Oudemans).

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<sup>1</sup> Zur Morphologie und Ontogenie der Acariden. Acta Soc. Scient. Fennicae. Tom. xxxvi n. 4.

**Gamasus (Gamasus) lunaris** Berl.

1882. *G. rubescens* G. et R. Canestrini **23**, p. 40. 1892. *G. rubescens* Berlese **1**, Fasc. lxxix, n. 9. 1903. *G. rubescens* Oudemans **60**, p. 78. 1906. *G. lunaris* Berlese **13**, p. 147.

A female of this species occurred on the sea-shore at Westport in company with *Gamasus Kempersi*, to which it bears a superficial resemblance, chiefly due to similarity in the outline of the endogynium. A careful comparison of the two forms shows many differences.

*Distribution.*—Throughout Italy and elsewhere in Europe (Berlese).

**Gamasus (Gamasus) coleopratorum** (Linn.).

Immature specimens of both sexes occurred under bark of decayed trees near Westport in July; the nymph was also found on the sea-shore at Mulranny in September.

*Distribution.*—Common and widely distributed in Europe. This species has been noted in Scotland as an ectoparasite of the Red Grouse (Proc. Zool. Soc. London, 1909, p. 309).

**Gamasus (Eugamasus) magnus** Kram.

1876. Kramer **36**, p. 91. 1906. Berlese **13**, p. 177.

Found amongst moss in Knappagh Wood near Westport, August.

*Distribution.*—Germany (Kramer); Italy (northern, Berlese); Holland (Oudemans); France (Moniez). A variety of this species, *cavernicola*, Trägårdh, has been described from caves in France.

**Gamasus (Eugamasus) immanis** Berl.

1903. Berlese **6**, p. 262. 1906. Berlese **13**, p. 179.

Under stones at high-water mark on the sea-shore close to Westport, July. Has also occurred, in a similar situation, at Howth, and at Glandore on the Cork coast.

This fine species, the largest of the sub-genus *Eugamasus*, was first described by Berlese from Norwegian specimens. Apparently it has not yet been found in southern Europe. The largest of the Irish specimens measures 2510 $\mu$  in length.

*Distribution.*—Already recorded from the Irish coast by Berlese (**13**, p. 180); Norway. Mr. King has recently found this species at Millport in the Firth of Clyde, and gives an interesting account of its life-history (Proc. Roy. Phys. Soc. Edinb. xix, p. 129).

**Gamasus (Eugamasus) Trouessarti** Berl.

1889. *G. thalassinus* Berlese et Trouessart **17**. 1892. Berlese **2**, p. 67.

Both sexes occurred commonly under stones at high-water mark on the sea-shore at Westport, July. It is also an abundant species on the Dublin coast.

It should be noted that this species appears under the name of *G. excurrens* in Berlese's tabular synopsis of the species of *Eugamasus* (**13**, p. 165).

*Distribution*.—Has been recorded from the coasts of Norway and France.

*Gamasus (Eugamasus) Kraepelini* Berl.

I have found the male of this species on decayed fungi in woods at Glendalough, Co. Wicklow, September.

*Gamasus (Eugamasus) cornutus* G. et R. Can.

Male found under bark at Stepside, Co. Dublin, April.

**Gamasus (Amblygamasus) septentrionalis** var. **norvegicus** Berl.

1902. *P. septentrionalis* Oudemans **60**, p. 39. 1906. **1**, p. 190.

The remains of an adult male of this species were found in moss at Delphi in county Mayo.

The type-form of this distinct species was described from Holland by Oudemans. In his monograph of the species of *Gamasus* Berlese subsequently described two varieties under the names of *germanicus* and *norvegicus*. The Irish specimen is to be referred to the latter form.

*Distribution*.—The species is now known to occur in Norway, Germany, Holland, and Britain.

**Gamasus (Pergamasus) runcatellus** Berl. (Pl. IV, fig. 1.)

1903. Berlese **5**, p. 237. 1906. Berlese **13**, p. 209.

Clare Island, amongst moss, in July.

The single male specimen found in this locality is not quite typical in the armature of the second legs. The processes of the patella and tibia are distinctly larger, in proportion to the segments from which they spring, than they are shown in Berlese's drawings of *P. runcatellus*. In this respect they approach *P. minor* Berl. The chelicerae agree closely with those of the Venetian form figured by Berlese (**13**, pl. xii, fig. 8a).

*Distribution*.—Italy and Germany (Bremen, Poppe).

**Gamasus (Pergamasus) runciger** Berl. et var. **armatus** nov. (Pl. IV, fig. 2a-g.)

1903. Berlese **6**, p. 263. 1906. Berlese **13**, p. 214.

Achill Island, male found under bark of decayed fir trees, September.

Mulranny, in rotten wood, September. Has also been found on Lambay Island in November.

*Distribution.*—Norway; Holland.

A form of *G. runciger* found amongst decayed wood at Mulranny, county Mayo, in all probability represents a variety of that species. It is of about the same size (length  $819\mu$ ), and differs in the armature and smaller size of the second legs (fig. 2e). Compared with the type the femoral spur is longer and more slender, and there is no trace of a protuberance at its base; the axillary process is comparatively long and knife-shaped, resembling that of *G. runcatellus*. The process of the patella is more decidedly cone-shaped; the process of the tibia is also larger. The last pair of legs measures about  $768\mu$  in length; the lower outline of the trochanter (fig. 2f) is interrupted by a small process. The chelicerae (fig. 2g) greatly resemble those of the type-form, as figured by Berlese, but the two teeth on the fixed chela are not so distinct. As this is possibly a permanent form of *G. runciger* I propose for it the varietal name *armatus*.

*Gamasus (Pergamasus) parvulus* Berl.

A male of the type-form has been found at Lucan, county Dublin; and I have also found an adult male of the variety *dilatatellus* Berl., in rotten wood, at Glendalough during September. This variety is recorded by Berlese from the Apennines.

*Gamasus (Pergamasus) robustus* Oudemans.

Clare Island, adult males taken in March, June, and July. Achill Island, adults and nymphs, in moss and under fallen pine-needles, September. The Bills, male and female, June. Westport, Knappagh Wood, in moss, August.

Apparently common in the district. It is a very distinct species, remarkable for the strong armature of the second legs in the male. Originally described as a variety of *Gamasus longulus*, its specific distinctness was recognized later, both by Oudemans (65, p. 82) and Berlese (13, p. 219).

*Distribution.*—Norway and Swedish Lapland, Germany, Holland, Britain. I have seen specimens taken at Barmouth, in Wales, by Mr. C. D. Soar.

*Gamasus (Pergamasus) alpestris* Berl.

A fine male example of this species was found amongst moss, at Lucan, in February.

*Gamasus (Pergamasus) diversus* sp. nov. (Pl. IV, fig. 3a-e.)

This species has the usual characters of the sub-genus *Pergamasus*, so that it is unnecessary to give a detailed description of the entire animal. It

is clearly intermediate between *Gamasus robustus* and *Gamasus lapponicus*, differing from both of these species in the armature of the second legs, and in the male chelicerae. A notable feature is the presence of a sharply pointed process on the inner margin of the maxillary lobes.

MALE, length about 800 $\mu$ . Femoral process of the second legs (fig. 3a) long, comparatively straight and bluntly pointed; immediately in front of this there is a broad knife-like process; the outer distal margin of the segment is bordered with a chitinous ridge, which is produced at one end in a blunt point; patella unarmed, except for a long ventral bristle. On the tibia there is a discoidal prominence, which appears in side view as a crescentic ridge. On the outer side of this there is a long bristle, bent at the tip. Trochanter of the fourth pair of legs strongly convex on its dorsal side, and there is a rounded ventral prominence (fig. 3b).

Capitulum as in the allied species, hair armature of the maxillary plate consisting of four pairs of long bristles, three of which are placed near the base of the maxillary lobes. The latter are moderately sinuate, armed on the inner side with a *sharply pointed spur* (fig. 3c). Chelicerae robust; fixed chela armed beyond the middle with one blunt tooth, behind which are three or four extremely minute teeth; free chela also with one strong tooth (fig. 3d).

*Locality.*—Under stones on the shore of Castlebar Lough, Co. Mayo, July.

***Gamasus (Pergamasus) lapponicus* Trägårdh.**

1910. Trägårdh 88, p. 408.

Clare Island, ♂ in moss, July; Achill Island, ♂ and ♀, under bark and fallen fir-cones, September; Westport district, under bark; Knappagh Wood, ♂ ♂, August; Lough Fenagh, ♂, ♀, October; Croaghpatrick, ♂, immature, October.

Apparently a common species in the district; both sexes were usually found in moss gatherings in company with *G. robustus* Oudms., to which species it is allied; it is, however, a smaller mite, and the armature of the second legs is characteristic. I have also found it at Glendalough, Lambay Island, and elsewhere in the Dublin district.

*Distribution.*—Swedish Lapland (Sarekgebirge, Trägårdh).

***Gamasus (Pergamasus) processiferus* sp. nov. (Pl. IV, fig. 4a-c.)**

This species is allied to *G. decipiens* and *G. lapponicus*, differing from both in the armature of the trochanter of the fourth legs, also in the chelicerae and the structure of the area genitalis.

FEMALE.—Length  $742\mu$ , breadth  $384\mu$ . Shape, a long oval, shoulders only slightly marked. The fourth leg measures  $691\mu$  in length, process of the trochanter (fig. 4*a*) large, the outer margin of this process is straight, extremity pointed and slightly hooked, lower margin rounded, and there is a blunt conical papilla at its inner corner where the process joins the trochanter. Central foramen of the endogynium triangular, with a much smaller triangular aperture appearing beneath the apex of the larger opening (fig. 4*b*). Fixed chela with about six teeth, the third from the extremity truncated, free chela with three distinct teeth, the proximal one being the strongest (fig. 4*c*). The male was not found.

*Locality*.—An ovigerous female of this form occurred amongst moss in the Westport district in July.

**Gamasus (Pergamasus) crassipes** L. (Pl. IV, fig. 5*a-c*.)

Clare Island, Achill Island, and in the Westport district, occurs commonly in moss and under bark.

At least two forms of this common species are found in Europe; the type form is very widely distributed, while the variety *longicornis* Berl. is found in the north.

In his monograph of the species of Gamasus Berlese figures (13, Pl. viii, fig. 9) the second leg of the type-form. I can only say that, compared with this figure, the form, which presumably represents the type in Ireland, has a somewhat different armature, at least as regards the large tibial process. I have seen, however, an Italian male of this species obtained some years ago from Dr. Berlese. This male, which was found at Florence, agrees closely with my Irish specimens in the armature of the second legs. As it is difficult to describe in words the exact shape of these processes, a figure of the armature of the femur, patella, and tibia of one of these Irish specimens is given (fig. 5*a, b*).

The variety *longicornis* Berl., is also common in the district. I have specimens from Clare Island, Achill, Delphi, and the Westport district. A figure of the tibial armature of the second leg is given (fig. 5*c*). Dr. Trägårdh records its occurrence in French caves (89, p. 523).

**Gamasus (Ologamasus) calcaratus** C. L. Koch.

The variety *excisus*, Berlese, occurred commonly in moss on Achill Island, also on the seashore at Westport and Mulranny. Type form not definitely determined.

*Distribution*.—This and the two following species are no doubt widely distributed in Europe.

**Gamasus (Ologamasus) pollicipatus** Berl.

A female *Ologamasus* found amongst moss on Clare Island is probably to be referred to the present species.

The genital area of this specimen does not agree very well with Berlese's figures of the typical form, but resembles more closely that of the variety *excipuliger*. The species must be recorded with reserve until male examples are found.

**Gamasus (Ologamasus) inornatus** Berl.

Found amongst moss on Clare Island in March.

Berlese does not attempt to tabulate the females of *Ologamasus*, but the present species is mentioned on account of the simple structure of the endogynium. In the other known species the females have this structure more or less elaborated.

**Gamasoides carabi** (G. et R. Can.).

1885. *Poecilochirus carabi* G. et R. Can. **24**, pp. 56 and 99. 1892. *Poecilochirus fucorum* Berl. **1**, Fasc. lxxix, n. 4. 1892. *Poecilochirus carabi* Berl. **2**, p. 73. 1906. *G. carabi* Berl. **13**, p. 291. 1903. *G. carabi* Berl. **6**, p. 280.

Westport, a single specimen in the coleoptrate nymph stage found attached to a ground beetle (*Pterostichus niger*).

The genus *Poecilochirus* contains a few species of acarina which were known only as *nympha coleoptrata*, or mites in the wandering nymphal stage. The essential characters of Berlese's account of the genus, originally described by Canestrini, are as follows:—"Mandibulae digitus fixus saepius apophysa hyalina anterius porrecta auctus.—Corniculi labiales aliquando curtiores, forcipem quasi cum malis maxillarum interioribus sistentes." (**1**, Fasc. lxx, n. 11.)

In the same reference Berlese characterizes another genus, *Iphidosoma*, for certain species of *Poecilochirus*, which was also based on immature forms, and in a later work (**2**, p. 73) his arrangement of the species is as follows:—*Poecilochirus carabi* Can.; *P. spinipes* Koch; *P. interruptus* Koch; *Iphidosoma fimetarium* Can.; *I. ovatum* Berl.

The genus *Gamasoides* was proposed by Berlese in 1903 (**6**, p. 280), with *G. carabi* Canestrini as the type species.

**Gamasoides spinipes** (C. L. Koch).

The Bills Rocks, in old nests of Puffins and Black-backed Gulls, June; Achill Island, in fungi, September; Mulranny, under stones on the sea-shore, September.

The specimens from these localities are in the coleoptrate nymph stage, with armed second legs as figured by Berlese (1, Fasc. lxxix, n. 4), also by Oudemans (73).

*Distribution*.—A wide-spread form, ranging from Siberia to Italy.

**Gamasoides bispinosus** sp. nov. (Pl. IV, fig. 6, a, b.)

Closely allied to *G. spinipes*, with which species it agrees in general structure, differs, however, in the armature of the second legs.

*Nympha coleoptrata*. MALE, length  $539\mu$ , breadth  $341\mu$ . Second legs (fig. 6a), instead of the single knife-shaped spine present on the underside of the femur in *G. spinipes*, this species is armed with two such spines; patella with a single strong spine placed on the distal margin of the segment; tibia unarmed; tarsus with two spines, the terminal one is, however, closely adpressed, so that it looks like a strong keel along the underside of the segment. Epistome trispinous, side teeth strongly developed. The chelicerae resemble those of *G. spinipes*, fixed chela with at least five distinct teeth; free chela with a very long proximal tooth, and two smaller ones between this and the end of the segment (fig. 6b).

*Localities*.—Found amongst moss near Lough Fenagh, Co. Mayo, in October. I have also found it amongst moss sent from Poyntzpass, Co. Armagh.

**Halolaelaps glabriusculus** Berl. et Trouess.

1875. *Gamasus marinus* Brady 19, p. 307. 1889. *H. glabriusculus*  
Berlese et Trouessart 17, p. 2. 1890. *Zercon marinus* Moniez 52, p. 13.  
1902. *Parasitus marinus* Oudemans 60, p. 281. 1906. *H. glabriusculus*  
Berlese 13, p. 109.

A few specimens, including the male and female, of this interesting species were found under stones between tide-marks on the sea-shore at Westport in July.

The genus is remarkable for the structure of the ambulacra, and for the fact that the second and third pairs of legs are armed with stout spines in the male. There is also a short bristle-like spine on the underside of the femur of the first pair of legs, and in the following species there are three stout spines in this position. In common with certain other shore-frequenting mites, the ambulacra are of peculiar structure. In the present species they are armed with two pairs of plates, i.e., a pair of leaf-like central lobes, and a pair of long acuminate lateral lobes. It is of interest to note that the ambulacra of the first pair of legs which in the *Gamasidae* are used as tactile organs are less modified from the ordinary type than in the case of the other pairs.



Berlese is of opinion that the mite described by Brady as *Gamasus marinus* is synonymous with the present species, which is probably the case, although the description scarcely contains anything by which one can fix the identity of his species. Practically the only character which would lead one to believe that he had a *Halolaelaps* before him is furnished by the drawing of one of the leg extremities; this shows, in side view, an ambulacrum which is suggestive of that of the present genus.

*Distribution.*—Evidently a south and west European form, as it has been recorded only from the sea coasts of France and Spain and also of Great Britain. Brady records it as occurring "pretty commonly in crevices of magnesian limestone rocks, between tide-marks, near Sunderland." I have found the species commonly in a very similar habitat at Malahide on the Dublin coast. Firth of Clyde (King in *Proc. Roy. Phys. Soc. Edinb.* xix, p. 135).

***Halolaelaps celticus* sp. nov.** (Pl. IV, fig. 7a-e.)

Occurring in a very similar habitat to *H. glabriusculus* is another species which seems to me to belong to the present genus; it is apparently undescribed. This form resembles *H. glabriusculus* in the presence of two dorsal shields, and in the arrangement of the plates of the ventral surface. It is, however, a smaller species with stouter and differently armed legs; the epistome is produced in a long central spine, and the ambulacra, though of very similar structure, are less highly modified; other differences are also apparent.

MALE (fig. 7a). Length 716 $\mu$ , breadth 409 $\mu$ . Shape much as in *H. glabriusculus*. The dorsal shields almost cover the upper surface, extremely finely punctured, first shield with a few scattered hairs, second shield with numerous spine-like hairs placed close to the side margins; the hinder ones have pectinated extremities, and there is a central spatulate hair on the end of the body. Sternum separated by a short interval from the ventro-anal plate, with long processes between the last three pairs of legs; two strong spines replace the usual fifth pair of hairs on the hinder margin of the sternum. Genital foramen circular, with a short duct. Ventro-anal plate very large, occupying most of the end region of the body, finely punctured with about eight pairs of hairs. Peritreme placed close to the lateral outline of the body, slightly undulate; stigma in the normal position.

Capitulum quadrate, with the usual hair armature; maxillary lobes small, curved, and widely separated. Epistome (fig. 7e) produced in a long, spinous, central process, at the base of which there are strong, lateral teeth. Chelicerae (fig. 7c) rather slender; the free chela has two teeth, the hinder

one is bifid at the extremity; the free chela has a strong triangular tooth. Palps small and weakly armed.

The leg measurements are approximately  $517\mu$ ,  $440\mu$ ,  $451\mu$ , and  $605\mu$ . The last three pairs are stout, and the second pair is a little thicker than the others. Armature consisting of short hairs and spines, many of the latter spring from peduncles, and some are pectinated. The following are the more important characteristics:—First pair, a row of three stout pedunculated spines on the ventral side of the femur; second pair, femur with a blunt conical tooth; beside this there is a sharp spine springing from a slightly raised base, and there are two other spines on the lower side of the segment; third pair, a strong posteriorly directed spur on the femur; fourth pair without special armature, but there are two strong bristles on the femur. The ambulacra (fig. 7*d*) are reduced to two pairs of appendages, as in *H. glabriusculus*, but the upper lobes are longer; the lateral lobes consist of short triangular pieces; the inferior lobe is reduced. In fact the ambulacra are somewhat intermediate in structure between those of *H. glabriusculus* and the typical gamasid.

FEMALE (fig. 7 *b*). Length  $742\mu$ , breadth  $435\mu$ . Shape oval, relatively broader than the male, hinder lateral margins with five or six pairs of bristles. First dorsal shield large, finely punctured, hinder margin produced in a rounded prominence; second shield smaller and narrower, concave in front and widely rounded behind. Sternal plate small and narrow, with the usual hairs. The three pairs of triangular endopodial plates are widely separated from the sternum, and send off long processes between the coxae. Genital plate trapezoidal, as in the type species, anal plate large and of semicircular form, the width is about  $341\mu$  (in *H. glabriusculus* it is smaller, measuring only  $165\mu$ ). Peritreme, capitulum, epistome and palps like those of the male. Chelicerae straight, free chela with a group of three teeth set close together at a little distance from the terminal tooth; fixed chela with a large channelled tooth. Legs, with the exception of the second pair, a little shorter than in the male, approximate length  $506\mu$ ,  $440\mu$ ,  $407\mu$ , and  $517\mu$  without the special armature of the male.

*Localities*.—Under stones just below high-tide mark on the sea-shore at Westport, in July. I have also found it commonly in a similar habitat at Howth on the Dublin coast in September.

#### *Gamasolaelaps aurantiacus* Berl.

1879. ? *Seius excisus* L. Koch **35**, p. 122. 1903. *Cyrtolaelaps* (?) *aurantiacus* Berlese **5**, p. 241. 1904. *Metaparasitus suboles* Oudms. et Voigts **75** p. 655. 1906. Berlese **13**, p. 101.

Coast of Mayo at Westport and Mulranny, the *nympha coleoprata* occurred in both of these localities in July and September. I have also found the adult female under stones in a brackish place a little above high-water mark at Howth, county Dublin, in September.

This species may be readily recognized by its golden-brown colour, the incised dorsal shields, and the peculiar form of the epistome, which, as Berlese points out, is intermediate in character between the species of *Cyrtolaelaps* and *Gamasus*. The legs, especially the last pair, are very long.

Although Berlese's name for this species was published before that of Oudemans, it is a question whether Koch's *Seius excisus* is not identical with the present species and should, therefore, have priority over both. The figure of the dorsal surface of his *Seius excisus*, shows clearly the incised dorsal plate, the undulate outline of the second dorsal shield, the prominent spines of the epistome, and the long attenuated legs. While his figure of the ventral surface of the animal, though not complete, is sufficiently like that of *Gamasolaelaps*.

Berlese considers that *Metoparasitus suboles*, Oudemans, is certainly identical with the present species, in spite of the fact that the figures accompanying Oudemans and Voigts' later description of the species depict the male genital foramen on the sternal shield a short distance from the front margin. There is evidently some discrepancy here as Berlese illustrates it on the front margin of the sternal shield, the usual position for it in the family Gamasidae.

*Distribution.*—Assuming that L. Koch's species from northern Siberia is identical with the British form, this species must have a very wide range on the western coasts of the Palaearctic region. The recorded localities are Bremen under stones (Oudemans and Voigts). Siberia; Yenisei: south of Troitzkoj (L. Koch).

#### ***Cyrthyrolaelaps* Berlese.**

This interesting genus was described by Berlese from specimens taken on the Spanish coast by Dr. Trouessart. A short account of the male previously unknown, the protonymph, and the *nympha coleoprata* is contained in the present paper. As Berlese points out the general characters are very similar to those of the genus *Cyrtolaelaps* except for the curious structure of the ambulacra. Instead of the usual hyaline lobes present on the ambulacra of the typical gamasid, these organs are reduced, in the adult, to form two pairs of long blade-like hairs. This modification would appear to be an adaptation to suit the peculiar aquatic habitat of the species, which lives between tide-marks on the sea-shore.

What I assume to be the protonymph of *C. hirtus* occurs abundantly on the Irish coast. I was at first inclined to believe that it belonged to another species, chiefly on account of the rather differently armed ambulacra, which have two *broad* upper lobes, however, there is no reason why these organs should not undergo modification as the creature reaches maturity.

***Cyrtidrolaelaps hirtus* Berl. (Pl. V, fig. 8a-g.)**

1904. *C. hirtus* Berlese 7, p. 19.

Mulranny, the ♀, ♂ and nymphs occurred under stones partly imbedded in sandy mud. about four or five feet below high-water mark, September; Westport, July. I have also found this species on the Dublin coast (Malahide and Howth), running actively on the exposed limestone rocks, and also under stones between tide-marks in May and June.

FEMALE.—Length 1331 $\mu$ , breadth 768 $\mu$ . Colour a golden-brown, resembling *Gamasolaelaps*. Shape, oblong ovate, end of the body double-margined. Dorsum with the usual two plates, clothed with long bristles; the second plate smaller, with a truncated hinder margin. Sternal shield long, reaching to the end of the third coxae, emarginate in front, and there are three pairs of long hairs. Jugularia absent. Genital shield narrow in front, widening into a broad, bilobed extremity; the front margin has a small, deep concavity at each side, from which springs a spur-like process, and between these is the circular genital foramen. Ventral and anal shields much as in *Cyrtolaelaps*. The peritreme originates opposite the base of the first legs, and runs in a slightly sinuate line to the stigma opposite the fourth legs. Tritosternum with a long, slender stem and two filaments. The epistome is described by Berlese as follows—"Epistoma spina media longa, acuta, nuda, utrinque ad basim mucronato-bispinosum." In Irish specimens the long central spine is undulate, ornamented by minute spines. Maxillary processes of moderate size, curved and articulated much as in *Eugamasus*. On the maxillary plate are four pairs of long hairs, the hinder pairs are widely separated. Chelicerae, fixed chela armed, distally, with three low, rounded teeth; free chela with one blunt tooth in addition to the more acuminate terminal one. Legs very long, clothed with long bristles.

MALE (fig. 8a).—The largest of my specimens measures 1228 $\mu$ , by 716 $\mu$ , shape and armature of the dorsum much as in the female, the second shield is larger, reaching to the posterior margin of the body. Sternal shield very broad in front, terminating in a rounded extremity close to the small anal shield, and with lateral extensions which partly enclose the last pair of coxae. The genital foramen lies in a concavity in the front margin of the

sternal shield, there are seven pairs of long, median bristles. Stem of tritosternum very long and slender. Peritreme and anal shield as in the female. Capitulum cup-shaped, with four pairs of long hairs on the maxillary plate. Chelicerae (fig. 8*b*), fixed chela with a truncated apex inside of which there is a group of three or four very minute teeth and separated from these by a wide interval is a strong, pointed tooth; free chela without distinct teeth, articulated on the outer side of the base is a broad hyaline process, about two-thirds as long as the free chela. Palps normal. The leg measurements are approximately 1920 $\mu$ , 1280 $\mu$ , 1280 $\mu$ , and 1664 $\mu$ . Second legs (fig. 8*e*) very thick, trochanter with a blunt prominence on its ventral side; femur feebly armed with two small teeth, proximal one conical, distal one thorn-like and directed forwards, patella and tibia unarmed; there is a small hump on the dorsal side of the tarsus. Ambulacra (fig. 8*d*).

PROTONYMPH (fig. 8*e-j*). FEMALE.—The dorsal plates are like those of the adult, except that the second shield has a deep longitudinal incision in its front margin. Sternal plate narrower, with three pairs of bristles. A small tongue-shaped plate lies immediately in front of each of the second pair of legs. Genital plate (fig. 8*e*), rounded posteriorly, fitting into the cavity of the ventral plate, the side indentations of the anterior margin are without the horn-like processes of the adult; genital foramen trapeziform. Peritreme originating near the front margin long and curved. Epistome (fig. 8*f*), as in adult. Legs robust, with shorter bristles, inner margin of last three pairs of coxae emarginate. The dorsal lobes of the ambulacra (fig. 8*g*) are reduced to a single pair of rather broad membranous plates which are pointed at their extremities.

MALE (fig. 8*h*).—Length 500 $\mu$  to 570 $\mu$ , breadth 308 $\mu$ . Shape as in the female, dorsal shields larger, especially the second one, which is not incised in front and encloses the sides of the body. The sterno-genital plate widens out beyond the fourth legs and extends in a broadly rounded extremity to the small anal plate. Peritreme a bowed line, stigma opposite the fourth coxae. Legs very similar to those of the female, second pair unarmed. The epistome (fig. 8*i*) differs from that of the female, in having a short central spine reaching only a little beyond the side processes, the latter may have two or four spines on each side. The chelicerae (fig. 8*j*) are very small, fixed chela straight with two distinct teeth, free chela more slender, armed with one tooth at a little distance from the apex, a large hyaline process springs from its base.

NYMPHA COLEOPTRATA.—Found in company with the adult; easily recognized as belonging to the present species by the characteristic form of the epistome and ambulacra.

The dorsal surface is like that of the female, except for the smaller size of the plates; the hinder one is not so truncated at the extremity. Hair armature, much as in the adult. The ventral surface has the usual V-shaped sternal plate, with four pairs of long marginal bristles.

One of the specimens is apparently a male; in this the sternal plate is larger, and the legs are decidedly stouter, especially the second pair; on the underside of the tarsus there is a small rounded papilla. This specimen measures  $1049\mu$  in length.

*Distribution.*—Spanish coast (Finisterre, Berlese). There seems little doubt that the male recorded by Tietze from the Italian coast as “*Gamasus* sp.?” (82, see also 22, p. 948) is the protonymph of the present species. The variations which he describes and figures in the shape of the epistome represent the different form of this organ in the two sexes.

#### *Cyrtolaelaps nemorensis* (C. L. Koch).

Females of this very distinct species were found in moss on Clare Island in July; and also on Achill Island under the bark of fir trees in September.

*Distribution.*—Probably a common European species; has been recorded from Germany, Holland, and Italy.

#### *Cyrtolaelaps cervus* (Kramer).

Apparently not uncommon; Achill Island, under bark, September; Mulranny, under stones in nest of *Lasius niger*; Knappagh Wood and Lough Fenagh, in moss.

*Distribution.*—Widespread in Europe.

#### *Cyrtolaelaps transisalae* Oudms. (Pl. V, fig. 9.)

1902. Oudemans 60, p. 28, Plate iii, figs. 43–46.

Clare Island, in moss on Croaghmore, July; Achill Island, under bark, September; Knappagh Wood, August; Coolbareen Lough, several in sphagnum, July.

Apparently a common species in suitable localities in the district, especially on the hills; quite a number were obtained from a small quantity of sphagnum gathered on the slopes of Croaghpatrick.

The species may be easily recognized by the shape of the epistome (fig. 9). The side incisions of the dorsal plate are comparatively straight, and less bent downwards than in the allied species.

Amongst my specimens there are a few which are presumably in the deutonymphal stage. These are smaller and less chitinized than the others

and carry two separate dorsal plates, shaped almost exactly as in the deutonymph of *C. Kochi* Trägardh. Oudemans has figured a similar nymphal stage in the case of *C. cervus* (Kramer).

*Distribution.*—Probably widespread in western Europe; recorded from Holland and France (Pyrénées orientales, Trägardh).

***Cryptolaelaps Kochi* Trägardh.** (Pl. V, fig. 10.)

1910. Trägardh 88, p. 416, figs. 78, 79.

Of this delicately organized species a single female example was found amongst mosses in Clare Island during July.

A full description of this mite will be found in the above reference. The Clare Island specimen is an ovigerous female of rather broad shape, in comparison with its length, which is  $768\mu$ . The epistome (fig. 10) is rather like that of *C. nemorensis* (Koch).

*Distribution.*—Trägardh records this species from Siberia, Novaya Semlya, Greenland, and Swedish Lapland (Sarekgebirge).

***Pachylaelaps pectinifer* (G. et R. Can.). var. *magnus* nov.**

To a variety of this species must be referred a female *Pachylaelaps*, found amongst moss in the Westport district. Compared with the typical form, this specimen is remarkable for its large size, the length being about  $1280\mu$  and the breadth  $793\mu$ . It agrees in this respect, however, with one of the Italian specimens which the authors refer to as an "esemplare gigante" (23, p. 64).

Compared with the type, this large Irish form is also remarkable for the more quadrate shape, and the pointed anterior extremity is much more acuminate. The epistomal process has a decidedly shorter stem than is shown in Berlese's figures of the species, and the broad comb-like extremity is armed with at least six strong teeth, most of which are finely branched at their extremities. The length of the last pair of legs is about  $1075\mu$ .

As it seems likely that this form represents a variety of *P. pectinifer*, I would suggest for it the varietal name *magnus* (n. var.).

There are few records of this species. Trägardh has recently described a female *Pachylaelaps*, which he identifies, with reserve, as the present species. Judging by the structure of the epistome and other characters detailed in his paper (89, p. 560), not to mention the unusual cave habitat, the form probably represents a distinct species or variety.

*Distribution.*—Italy; France (Lille, Moniez; Département de l'Ariège, Grotte de Capetes); N. Africa (Tunis).

**Pachylaelaps littoralis** nov. sp. (Pl. V, fig. 11a-d.)

On the sea-coast at Mulranny there occurred a male *Pachylaelaps*, which is apparently unrecorded. The species is remarkable on account of the broad, dagger-like process of the chelicerae, the structure of the epistome, and the processes of the second pair of legs.

MALE (fig. 11a).—Length 819 $\mu$ , breadth 410 $\mu$ . Colour yellow, with black patches showing through the dorsum. Body strongly produced in front, shoulders sufficiently pronounced, sides slightly emarginate, width across posterior third equal to that of the shoulders, end of the body evenly rounded. Dorsal surface smooth, with four rows of rather stout bristles, including one marginal, upturned, row. There are two pairs of frontal bristles. Ventral surface protected by the usual large bluntly pointed shield, leaving a free marginal area, which is wider than in *P. pectinifer*. The genital foramen is small and circular; two minute inguinal plates are fused in the margin of the ventral shield. Peritreme undulate with a rather large circular stigma.

The epistome (fig. 11c) ends in a rather broad process, the apex of which is concave, with about eight teeth, which are distinctly branched at their extremities, somewhat resembling in this respect *P. furcifer* Oudemans (10). On the ventral plate there are four pairs of bristles, three of which are placed close to the maxillary lobes. Movable finger of the chelicerae (fig. 11d) with two strong teeth, under surface raised, and immediately in front of the prominence there is articulated a broad, dagger-like process, which is distinctly sinuate at the base. Apex of fixed chela bidentate. Palps of the usual type, fourth segment not armed. The tritosternum is weakly developed, base long and narrow, terminal filaments with strong widely separated pectinations (fig. 11d).

Legs comparatively long, the respective lengths are about 793 $\mu$ , 563 $\mu$ , 486 $\mu$ , and 665 $\mu$ , second pair (fig. 11b), thick; femur armed with a stout conical spur, which is weakly serrated in front, at its base is a bristle-bearing papilla; patella with a much smaller bluntly pointed tooth, and the tibia is unarmed. The tarsus carries the usual two terminal spurs, which are rather long and slender in the present species. Ambulacra wide, upper membranes consisting of a three-lobed central piece, and a pointed lateral lobe on each side.

*Locality*.—The male of this species occurred under stones about four or five feet below high-tide mark on the shore of Bellacragher Bay, near Mulranny, in the month of September.



**Pachylaelaps longisetis** sp. nov. (Pl. V, fig. 12a-d.)

Compared with *P. pectinifer*, the present species is remarkable for its very regular oval shape, the much longer hair vestiture of the body, the rather narrow anal plate, and other details of its structure, notably of the peritreme.

**FEMALE** (fig. 12a).—The length is  $793\mu$ , breadth  $460\mu$ . Shape a long oval, shoulders scarcely at all indicated. Dorsal surface smooth, with very long, scattered hairs, consisting of a regular marginal row, and at least two double inner rows. Ventral surface with the usual plate armature, sternal shield with four pairs of long hairs; metapodial shield extending backwards in a sharply pointed process. The peritreme is bent sharply inwards between the acetabula of the second and third legs, much as in *P. furcifer* Oudms.; stigmata small, placed opposite the front margin of the last coxae. Genito-ventral plate of the usual shape, slightly flattened on the hinder margin. Anal plate as long as it is broad, differing in this respect from the allied species. The hair vestiture of the ventral surface is also very long; apart from marginal hairs, there are at least six long curved hairs on each side of the anal plate.

Capitulum short and broad; epistomal process (fig. 12b) very broad and only slightly constricted, terminal comb with nine or ten uniform teeth. Seen from the side the chelicerae (fig. 12c) are short and stout, the free chela has too strong widely separated teeth; the fixed chela has one tooth and the sinuate membranous flap behind this tooth is very finely striated at the margin. Maxillary lobes long and slender. Palps small, much as in *P. pectinifer*, ventral face of second segment with two stout bristles. Tritosternum feebly developed, filaments with fine, closely set pectinations.

Legs rather slender; the lengths are approximately  $561\mu$ ,  $495\mu$ ,  $363\mu$ , and  $517\mu$ . Femur of second pair with only a slight distal prominence. There is a small conical papilla on the dorsal side of the trochanter. Hair and tarsal spine armature much as in *P. pectinifer*, except that the hairs are longer in the present species (fig. 12d).

**Locality.**—The female of this species occurred in a decayed tree trunk at Glendarary, Achill Island, during November.

*Hydrogamasus Giardi* (Berl. et Trouess.).

This is evidently a true tide-mark species. I have found it commonly on limestone rocks, exposed by the tide, on the seashore near Malahide, Co. Dublin.

**Holostaspis longispinosus** (Kramer).

Clare Island, in moss, during March; Achill Island, in moss and under bark, *nympha generans* and mature female, September.

*Distribution*.—A widespread European species; recorded from Germany; Holland; Italy, &c.

**Holostaspis longulus** Berlese.

1887. Berlese 1, Fasc. xliii, n. 9. 1902. Oudemans 74, p. 42.

Clare Island, ♀ in moss, during March; Mulranny, ♀ in rotten wood, September; Castlebar, *nympha coleoptrata* under stones on lake shore, July. I have also found it on the sea shore at Howth, Co. Dublin.

In his "New List" (74) Oudemans points out that the epistome has a straight spinous margin, and is not produced at the centre as it is shown in the original figure. This is also true of the few Irish specimens that I have seen. In one of these the bifurcated apex of the central process is distinctly rebranched so that there are, on each side, at least four finely pointed extremities. The dorsal shield is very distinctly punctured, and has crenulate side-margins, clothed with a number of stout pectinated spines, and there are some plain bristles on the central part of the dorsum.

*Distribution*.—Italy (Berlese records this species as occurring in moss in Sicily); Holland (Oudemans, among decayed leaves); France (Moniez 53).

**Holostaspis tridentinus** G. et R. Can.

Clare Island, ♂ in moss, July; Achill Island, ♀ in moss and under bark in September; Croaghpatrick, ♀ in sphagnum, 600 feet, October; Knappagh Wood, near Westport, in moss, August.

*Distribution*.—Evidently a common European species, the recorded localities ranging from Lapland (Trägårdh) to Italy, where, according to Berlese, it occurs chiefly in mosses on mountains.

**Holostaspis terreus** (Can. et Fanzago). (Pl. V, fig. 13.)

1877. Canestrini et Fanzago 25, p. 48. 1882. G. et R. Canestrini 23, p. 27. 1889. Berlese 1, Fasc. lii, 7. 1902. Oudemans 74, p. 43.

Achill Island, ♀ in fungi, September; Kappagh Wood, near Westport, in moss, August. I have also found it under bark of old pine stumps at Howth, Co. Dublin.

This beautifully sculptured species was first described, without figures, by Canestrini and Fanzago. Berlese referred it to a variety of his *Holostaspis alpinus*, a form which he subsequently identifies as the *nympha generans* stage of *H. longispinosus* (2, p. 70).

The specimens here recorded are females, apparently in the deutonymphal stage, they are of a pale yellowish-brown colour, the length is about  $717\mu$ . The dorsal shield is large, gradually narrowed, and just reaches the hinder margin of the body. Surface finely punctured and marked with a hexagonal pattern which is more distinct in front and along the side margins. The latter are minutely crenulate, there is a hair armature of strongly pectinated spines.

Margin of the epistome (fig. 13) toothed, the long central process has a finely spinous stem, and terminates in two flattened branches, the extremities of which show three or four deep indentations. Over this central process there are two shorter, outwardly curved processes. Sternal shield widely separated from the genital plate. Anal shield circular, with two pairs of spinous hairs. Lying between the genital and anal shields are a number of small plates, at least two of these carry hairs. Legs rather long and of robust build, hairs of the last pair very finely spinous, stronger than those of the other pairs. Fixed chela with one large tooth, free chela with two rather small teeth.

*Distribution.*—Canestrini says this species lives under plants, in moss, and in damp earth (Italy), and Oudemans records it from a number of Dutch localities where it occurs amongst decaying leaves.

**Holostaspis marginatus** (Herm.) var. **littoralis** nov. (Pl. V, fig. 14a.)

On the sea-shore at Westport I have found both sexes of a *Holostaspis*, which is probably referable to a variety of *H. marginatus* (Herm.).

The male example found is not mature, but the females are fully developed. It closely resembles the mite described by Berlese under the name of *H. badius* (1, Fasc. lii, 3). In a later reference (2, p. 70) he definitely identifies this species as the tritonymph of *H. marginatus* (Herm.).

The following is a short description of the male (fig. 14a):—Length,  $600\mu$ , breadth,  $380\mu$ . Colour yellow, outline of the body strongly emarginate in front of the shoulders, which are well marked, and from thence the side margins become gradually narrower, end of the body somewhat truncated. The skin is finely punctured and scaly, and the hair vestiture is short; the two frontal bristles are very small and close together. Sternal plate, with five pairs of short hairs, separated from the anal plate; male genital foramen funnel-shaped. The peritreme runs straight down from the shoulders, only slightly sinuate, with the usual club-like stigmal area.

The capitulum (fig. 14b) is nearly quadrate, hair armature of ventral plate normal. Maxillary lobes lanceolate, placed rather close together. Epistome (fig. 14c) shaped much as in *H. marginatus* (Herm.), extremities of

both processes finely pointed. Mandibles small, teeth much as in Berlese's figure of *H. badius* (1, lii 3, fig. 4), free mandible with a strongly bent spur directed posteriorly. Palps slender, the ventral armature is as follows:—First segment, with two bristles near middle; second segment, a strong distal spine; fourth segment, with two stout distal spines on the outer face of the segment. Legs, lengths about  $550\mu$ ,  $462\mu$ ,  $407\mu$ ,  $616\mu$ , femur of second leg (fig. 14e) armed with a stout spur undulated in front and with neighbouring bristles, there is a small conical papilla on the ventral side of the patella and the tibia. Fourth pair with two small sharply pointed femoral spurs, one of these springs from an equally long peduncle.

FEMALE (fig. 14e), length  $896\mu$ , closely similar to *H. badius*, as figured by Berlese (1, Fasc. lii, 3). The chelicerae are short and robustly built, fixed chela with one very large triangular tooth, and between this and the apex there is a smaller tooth; free chela with two stout teeth placed close together and another much smaller one a little in advance of these (fig. 14d). Capitulum, epistome, frontal bristles as in the male.

It seems likely that this mite is a shore-frequenting form of *H. marginatus*.

#### *Dendrolaelaps* n. gen.

Shape subquadrate. Dorsal shield divided near the middle. Sternum separated from the ventro-anal shield. The latter is very large, incised on the front margin, and in the male sex it is continuous with the second dorsal shield. In the male the second legs are very stout, and the tarsus is armed on the inner side with a stout, sharply pointed spur; ambulacra present on all legs. Male chelicerae with a long process. Epistome trispinous. Type species *D. Oudemansi* sp. nov.

This genus is allied to *Gamasellus*, Berlese, which was originally described as a subgenus of *Cyrtolaelaps*. The presence of a strong tarsal spur, and the fused ventro-anal plates would appear to distinguish it from that genus.

#### *Dendrolaelaps Oudemansi* n. sp. (Pl. VI, fig. 15a-d.)

A small species which greatly resembles *Gamasellus captator* (Berlese) in superficial appearance, especially in the shape and hair armature of the body.

MALE (fig. 15a).—Length  $484\mu$ ; breadth  $253\mu$ . The sternum is narrow in front, with a cup-shaped hollow for the genital foramen, ending in a pointed extremity at the end of the last pair of coxae; sides strongly produced between the second and third legs, and to a lesser extent between the two last pairs of legs, hair armature consisting of five pairs of short spines. Immediately behind the sternum is a pair of small, triangular plates,

each with a hair, and behind these are two small plates placed transversely. The ventro-anal shield is of peculiar structure, it is very large, and is certainly continuous with the second dorsal shield; its anterior margin is incised, leaving a wedge-shaped piece projecting from the centre of the shield. The peritreme runs in a sinuate line close to the body margin, stigma opposite the last acetabula.

Capitulum transverse, hinder margin strongly convex, and there are four pairs of hairs on the maxillary plate; the lobes are rather club-shaped with pointed extremities. Epistome trispinous, central spine shorter than the others. Chelicerae (fig. 15*b*), the free chela is greatly swollen at the base, and the claw-like terminal part is without teeth, a very long, slender process springs from the base, it is like that of *Gamasellus captator*, but its extremity is not curved round, as it is in that species, but is continued on a sinuate line; fixed chela with one strong tooth. Palps small and rather stout, inner side of last segment with a bifurcated spine at the base. Legs short and robust, second pair extremely thick, femur with a strong curved spine, patella and tibia with a small tooth; on the inner side of the tarsus (fig. 15*c*) there is a stout knife-like spur with a pointed extremity reaching as far as the end of the segment; fourth leg stouter than the third, upper side of femur with two stout hairs.

FEMALE.—A figure of what I believe is the female of this species will be found on Pl. VI, fig. 15*d*. The length is  $352\mu$  and the breadth  $154\mu$ .

*Localities*.—Found under bark of decayed trees in the Westport demesne in July; the above-mentioned female specimens occurred on fallen pinecones on Achill Island in September. I have also found the male under bark of fir trees at Friarstown in the Dublin mountains during April and at Drimnagh near Dublin in January.

#### Family LAELAPTIDAE.

##### *Laelaps (Eulaelaps) stabularis* C. L. Koch.

A number of specimens, including both young and adult forms, were found on a field mouse caught on Clare Island by Dr. Patten.

*Distribution*.—Europe, parasitic on rodents.

##### *Laelaps (Eulaelaps) agilis* C. L. Koch.

A single specimen of this species occurred in the same habitat in company with the preceding species.

*Distribution*.—Widespread in Europe.

**Laelaps (Pseudoparasitus) meridionalis** G. et R. Can.

The Bill Rocks off Clare Island, in debris from nests of sea birds. I have also found this mite in an ant's nest (*Formica fusca*) at the Scalp in county Dublin, possibly an accidental occurrence. Oudemans suggests (74, p. 29) that as in the male of this species the second legs are much stronger than the others it should be referred to the family Gamasidae instead of to the Laelaptidae, and proposes a new genus, *Pseudoparasitus*, for its reception.

*Distribution.*—Berlese records this species from central and southern Europe.

**Laelaps (Ololaelaps) tumidulus** C. L. Koch.

Females of this common species were found amongst moss on Clare Island in August; also on Achill Island in September.

*Distribution.*—A widespread European species.

**Laelaps (Ololaelaps) confinis** Berl.

Found amongst moss on Achill Island in November.

This species is briefly described by Berlese (6) as follows: "Facies *L. placentulae* Berl. sed setis corporis, praecipue posticis, minimus. Foem. tantum nota. Ad 750 $\mu$ . long. (maior quam *L. venetus* Berl.)" There is little doubt that a female specimen collected in the above-mentioned locality is to be referred here. Its length is 742 $\mu$ , and the hairs on the upper surface of the body are decidedly shorter than in *L. placentulae*: I may add that the outline of the body is more spherical. This species may be easily overlooked as *L. tumidulus* Koch.

*Distribution.*—Collected by Thor in Norway.

**Laelaps (Hypoaspis) oblongus** sp. nov. (Pl. VI, fig. 16.)

The following is a short description of a *Laelaps* which was found under bark of decayed trees in the Westport demesne during the month of July. It is allied to *L. myrmecophilus* Berlese, an ants' nest species, but differs in form, in the presence of a prolonged peritrematic shield, as well as in other characters.

FEMALE (fig. 16).—Shape oblong ovate (length 691 $\mu$ , breadth 384 $\mu$ ), shoulders fairly well marked. Dorsal shield almost entirely covering the upper surface, with scale-like markings, which are more distinct and tend to become hexagonal towards the side margins; the hair vestiture is scanty, frontal bristles strong. The sternum is wide in front, hind margin straight reaching a little beyond the middle of the second acetabula. The genito-ventral plate is large and trapezoidal, much as in *L. myrmecophilus*, it is

devoid of hairs except for two pairs placed on the actual margins of the plate. Anal shield triangular (breadth  $140\mu$ ), pedal plates well developed, enclosing the last pair of acetabula; peritreme slightly waved, strengthened in its outer side by a chitinous plate which is prolonged well beyond the last acetabula.

The capitulum is transverse, end margin rounded, central part of the maxillary plate produced, lobes small and straight, and there are four pairs of hairs, one pair set further back near the lateral margin. Epistome hood-like, indistinctly serrated; chelicerae, fixed chela with four teeth, two of these much stronger than the others, and on the free chela are two strong teeth placed rather close together. Palps small and slender, length about  $260\mu$ , of the usual laelapid type. Legs long and robust, length of last pair  $528\mu$ . An immature specimen occurred with the adult, it is small and transparent (length  $665\mu$ , breadth  $358\mu$ ).

**Laelaps (*Hypoaspis*) ovatulus** sp. nov. (Pl. VI, fig. 17*a, b*.)

This species is closely allied to the preceding in most of the details of its structure, the following differences may be noted:—

**FEMALE** (Pl. VI, fig. 17*a*).—The size is smaller (length about  $550\mu$ , breadth  $297\mu$ ), and the shape is more regularly oval. Dorsal shield similarly sculptured, but narrower, leaving more of the body margin uncovered. Sternal shield narrower in front, hinder margin rounded. The small jugular plates are united by a porous chitinous plate. Peritreme not bordered externally, post-stigmatic part continuous with the outer margin of the pedal plates as it is in *L. oblongus*. The epistome is wide, but little produced in the centre and very minutely serrated on its front margin.

Chelicerae (fig. 17*b*), fixed chela with two strong teeth and in front of the distal one is a row of four or five minute, closely set teeth; free chela with two widely separated teeth. Legs comparatively shorter, basifemur of second pair with a short, stout spine near the centre of its ventral surface, the posterior tarsi are also less elongate.

*Locality*.—Found in the flowers of *Campanula* on the sandhills at Mulranny in September.

**Laelaps (*Hypoaspis*) acutus** Michael.

Mulranny, in nests of the ant *Myrmica scabrinodis* under stones, September.

*Distribution*.—Austria (Tyrol, in ants' nests, Michael). Probably widespread in Europe, though Berlese says it has not been found in Italy (12).

*Laelaps (Hypoaspis) longipes* sp. nov. (Pl. VI. fig. 18a-b.)

This is a long oval, weakly chitinized species with a rather dense hair vestiture, and the male chelicerae are peculiarly armed.

**MALE** (fig. 18a).—Shape an elongate oval, colour very pale yellow. Length about  $742\mu$ , breadth  $384\mu$ . Dorsal shield entire, widest at the shoulders, narrowing to a blunt point posteriorly, surface smooth, frontal bristles stout and finely setose. Hair armature rather long and dense. The fused ventral plates are of the laelaptid form, narrower and more pointed posteriorly than the dorsal shield (indicated by dots in drawing, hairs on the sternal part long. Pedal-plates present, but weakly developed; peritreme bent slightly inward towards the stigma.

Capitulum distinctly transverse, with four pairs of long, finely setose hairs on the maxillary plate, three pairs of these are grouped at the base of the maxillary lobes, the latter are straight. Epistome produced at centre, but not strongly so, margin serrate. Chelicerae, free chela with a strongly curved apex and one triangular tooth, the male process projects slightly beyond the end of the segment, and sends off a short spur which, in dorsal view, is seen to be directed upwards; fixed chela without teeth, and with a marked concavity for the reception of the tooth on the free chela (fig. 18b). Palps rather long and slender, on the ventral surface the first segment has two strongly setose hairs, the second segment has a stout setose hair both on its outer and inner side near the apex, third segment with two stout curved spines, fourth segment with a long ventral hair, and on its upper surface one or two very stout spines project over the last segment. Legs very long, the approximate lengths are  $742\mu$ ,  $540\mu$ ,  $563\mu$ ,  $793\mu$ , with long hair armature, tarsi of last pair elongate.

*Locality*.—There is no note as to the actual habitat in which this species occurred, except that it was found in the Westport district in July.

*Laelaps (Cosmolaelaps) vacuus* Michael.

Occurs commonly at Mulranny in nests of the ants *Lasius niger* and *Myrmica scabrinodis*.

Berlese has described two varieties of this species. The Mulranny specimens vary a little in colour and size; yet, I believe, they are all referable to the type form.

*Distribution*.—Probably widespread in Europe; has been recorded from the Austrian Tyrol, Italy, and Britain.



**Laeleps (Cosmolaelaps) styliferus** sp. nov. (Pl. VI, fig. 19*a-c.*)

Allied to the preceding species, but it is smaller, and the male armature of the legs and palps is different.

MALE.—Length 473*u*, pale straw colour. Second leg very stout, trochanter armed on its outer side with a strong spur (fig. 19*a*), fourth pair (fig. 19*b*) equally stout, seen from the under side the corners of the trochanter are slightly produced and spur-like, the end margin of the patella has a short stout spine, which is apparently much stronger than in *L. vacuus*; tibia with three well-marked prominences. Chelicerae small (fig. 19*c*), free chela with two very distinct teeth, fixed chela with a strong tooth, the male appendage is comparatively straight with a tooth-like process near apex, thence strongly narrowed. Near the middle of the ventro-anal region there is a long dagger-shaped process which is directed forwards, and reaches to about the middle of the last pair of acetabula.

A female specimen found in the same nest probably belongs to this species. The length of the body is the same (473*μ*). The genital plate is of uniform breadth, and its truncated hinder margin lies close to the anal shield.

Locality.—Found in a nest of the small yellow ant *Lasius flavus* at Mulranny in September.

*Laelaps (Cosmolaelaps) claviger* Berl.

I have found females of this well-marked species at Lucan and Howth in Co. Dublin, and in moss received from Birr, King's County, in November.

**Laelaps (Oolaelaps) montanus** Berl.

Mulranny, females found in nests of the ant *Formica fusca*, in September.

A few specimens of a *Laelaps* found on the lower slopes of the Curraun mountains are to be referred to the present form which does not appear amongst the recorded British species of ants' nest mites. It is closely allied to *L. oophalus* Wasm., but the smaller size (484*μ*, in the Irish specimens) more elongate chelae, and the somewhat longer legs, serve to distinguish it from that species.

Distribution.—With *Formica fusca* in Italy (Berlese 12).

**Seiulus.**

The acari belonging to the *Seiulus* group of the family Laelaptidae are, as regards their genera, badly in need of revision. It seems clear that the generic name *Seiulus* must be restricted to Koch's *Seiulus togatus*, a peculiar form which happens to be the first species described by Koch under that genus. Berlese has recently founded a new genus *Ameroseiulus* (2, p. 258)

without any diagnosis, but *Seius echinatus* Koch was indicated as the type-form. This seems to be an unfortunate selection for the reason that it is admittedly synonymous with *Seius hirsutus* Koch, and Berlese had already proposed the name *Seiulus* (1, Fasc. xli, n. 3) for the *nympha generans* stage of that species. As a matter of fact Koch's *Seius hirsutus* has been selected as the type species of no less than three genera, these are, *Seiulus* Berlese, *Echinoseius* Ribage, and *Ameroseius* Berlese.

In the following paper only two genera are made use of in the *Seius* group, namely, *Paraseius* Trägårdh (88, p. 432), and *Seiulus* Berlese. To the first of these are referred three species, with the undermentioned characters, for which *Ameroseius italicus* Berlese may well serve as a type. Trägårdh selects *Seius mollis* (Kramer) as the type of the genus, but this species belongs to a different genus (*Epicrius*).

I have found three species of *Paraseius* in Ireland, two of these occurred amongst wet moss growing on stones in mountain streams, and the third (*P. serratus* sp. nov.) is common in very wet sphagnum, also on mountains. In all probability the peculiar armature of the acetabula is an adaptation to a semiaquatic habitat, as it is quite different from that of the typical *Seiulus*, and reminds one of the ambulacra of certain gamasid mites found living between tide-marks on the sea-shore.

#### *Seiulus spathuliger* (Leonardi).

Achill Island, not uncommon in moss, November.

The original description (39, p. 6) of this well-marked species may be supplemented in a few particulars. The Achill specimens measure about  $396\mu$  by  $253\mu$ . The dorsal plate is large and has serrated margins, anterior surface with granules which tend to form short transverse ridges; hairs ornate, those of the hinder part of the plate are broad, with a median keel and deep pectinations, the last three pairs of the marginal series are strongly clavate and stand out conspicuously from the end margin of the body; the latter is distinctly crenulate. Ventro-anal plate completely covering the epigastric region, the hinder part of the shield is granulated. Tritosternum feebly developed with two pairs of lateral spines close to the filaments. The peritreme is strengthened by a porous shield, and its canal lies close to the acetabula.

Capitulum rather short and broad; epistome trispinous. Fixed chela with four teeth almost equidistant from one another, and there are two teeth on the free chela. In his description of the jaw armature Leonardi evidently includes the apical tooth, as he mentions one more tooth for each chela.

*Distribution.*—Italy (found on plants, in moss, and in decayed wood, Leonardi). Holland. Berlese suggests that the species described by Oudemans (74, p. 17) under the name of *Seiulus plumosus* represents two distinct forms, one being identical with the present species (16, p. 276).

***Seiulus remiger* (Kramer).** (Pl. VI, fig. 20.)

Achill Island, the female occurred commonly in the hollow stems of a large agaric at Glendarary in September; also at Mulranny. I have found both sexes at Glendalough, Co. Wicklow, under the fungus-grown bark of decayed birch trunks during the month of November.

This beautifully sculptured mite does not seem to have been noticed since Kramer described it under the name *Gamasus remiger* (36, p. 93), in reference to the curious oar-like hairs on the end margin of the body. It undoubtedly belongs to the *Seius* group, and as the male is undescribed it may be useful to give a short account of the species.

**FEMALE** (fig. 20).—length about  $665\mu$ , breadth  $378\mu$ . Shape sub-oval, shoulders but slightly marked, fore body strongly produced, frontal bristles small. On the dorsal shield there are two circular pits, surface with distinct network pattern, also with squamous and granulate markings. Hair armature feeble, the marginal series increases in length towards the hinder corners of the body where the hairs spring from tubercles, the last pair of hairs are long, and have a narrow apical blade. Sternal and genital plates of the usual laelaptid type, the latter reticulated in front. Ventro-anal plate large and rotund, lying in front of it is a transverse row of six small plates. The peritreme is protected by a narrow chitinous border fusing beyond the stigma with the pedal plates.

Capitulum longer than broad, hair armature as usual, maxillary lobes small. Epistome trispinous, the lateral spines are minutely pectinated on their outer margins, and the central spine is longer than the others, with a widened and spinous extremity. Each chela of the chelicerae is furnished with two teeth. Palps normal. Legs of moderate length, spine armature rather weak, in part pedunculate, a pair of long, up-curved hairs spring from the upper side of the tarsus of the last three pairs of legs.

**MALE.**—Smaller, length about  $517\mu$ , breadth  $286\mu$ . Sternal plate reaching the end of the fourth coxae, with five pairs of short hairs; genital foramen rather large. The ventro-anal shield is very large, and the two inguinal plates, which are separate in the female, are fused with its front corners.

Capitulum more quadrate. Sexual differences are noticeable in the chelicerae, the free chela has only one tooth, and a sinuate process of uniform

breadth springs from its base and extends well beyond the apex of the segment, fixed chela armed with two teeth.

*Distribution.*—Germany (under fallen leaves, Kramer).

*Seiulus minutus* sp. nov. (Pl. VIII, fig. 31.)

The following is a short description of a *Seiulus* found amongst sphagnum moss from Croaghmore Mountain, Clare Island, during the month of August. It is apparently an undescribed species, remarkable for its small size and peculiar shape, and the distinct puncturation which greatly resembles that of one of the Oribatidae, *Nothrus monodactylus*, also found in sphagnum. Owing to the small size and delicate structure of the single specimen it did not seem advisable to risk the dissection of the mouth parts, so that the structure of the jaws and the epistome are not included in the description.

FEMALE. —The length is about 286 $\mu$ , breadth 165 $\mu$ . Colour faint yellow, translucent. The body is rounded in front, side margins sub-parallel, end margin truncated. Dorsum with distinct light-refracting punctures, and irregularly shaped markings towards the front and sides; there are two double rows of short hairs on the back, and a somewhat stronger marginal row springing from rather widely separated serrations on the sides of the body.

Sternum and genital plate of the usual laelaptid shape, the latter is long and narrow; anal plate of moderate size, broadly trapezoidal, lying close to the end of the body with about eight pairs of neighbouring hairs which are stronger than those of the upper surface. Peritreme well developed, stigmal expansion large, extremity partly enclosing the last pair of coxae, strengthened on its outer side by a narrow chitinous plate.

Capitulum large and cup-shaped, maxillary plate with three pairs of hairs, one pair placed close to the small maxillary lobes. Palps comparatively large, armature normal. Legs, especially the last three pairs, very robust, with strong hairs; upper lobe of the ambulacra hood-like, with uninterrupted margin, immediately over the small ambulacra of the first pair of legs is a long hair with a distinctly lanceolate extremity.

*Seiulus levis* Oudms. et Voigts. (Pl. VI, fig. 21).

Lough Fenagh and Delphi, ♀ ♀ in moss, September; Croaghpatrick, ♀ amongst sphagnum, October.

A preliminary description of this species appeared in the "Zoologischer Anzeiger" for 1904, and a fuller account with figures appeared in a later paper (75, p. 232). *S. levis* is remarkable for its oval shape, comparatively

smooth surface, which is but faintly sculptured with scale-like markings, and the hair vestiture is very scanty. The ventro-anal shield is large and rounded posteriorly, and on the anterior margin there is a wide emargination which receives the hinder margin of the genital plate.

*Distribution*.—Germany (Bremen).

*Seiulus hirsutus* (C. L. Koch).

Found amongst moss at Portmarnock, County Dublin, in January.

*Seiulus muricatus* (C. L. Koch).

I have a single specimen of this species, found at Glendalough, County Wicklow, in November.

**Euphis ostrinus** (C. L. Koch).

Achill Island in moss and under decayed fir cones lying on the ground, September; Knappagh Wood near Westport, in moss, August.

This little species is conspicuous in the field on account of its bright red colouring and polished surface.

*Distribution*.—Widespread in Europe.

**Paraseius Trägardh.**

Epistome trispinuous. Sternal, genital and ventro-anal plates of the usual laelaptid type. The peritrematic and outer pedal plates are very highly developed, and are fused together. Legs long, tarsi of the last pair attenuated. Ambulacra consisting of a lanceolate upper lobe, a pair of narrow membranous lobes, and a pair of bristle-like lateral blades; there are also two long tarso-ambulacral hairs.

**Paraseius italicus** (Berl.). (Pl. VI, fig. 22a-b.)

A single ovigerous example of this species occurred amongst moss gathered from partly submerged stones in a stream on the slopes of Croaghpatrick in July.

Berlese gives but a short description (9, p. 234) of this acarid, two figures of the upper and under surface were published in a later reference (10).

The length of the Irish specimen is  $561\mu$ , breadth  $385\mu$ . The dorsal plate is distinctly reticulated. The fused extremities of the pedal and peritrematic plates project in a triangular shape a little beyond the hinder margin of the genital shield. Anal plate very large. The legs measure approximately  $572\mu$ ,  $451\mu$ ,  $440\mu$ , and  $572\mu$ .

*Distribution*.—Northern Italy (found under dead leaves on a marsh, Berlese).

*Paraseius serratus* sp. nov. (Pl. VI, fig. 23a-d.)

As far as one can judge from a short description this species is allied to a Norwegian form *Ameroseius borealis*, Berlese (6, p. 259). It is a narrow, straw-coloured mite, which would appear to possess characteristics in its small size, the sculpturing of the dorsal shield, the form of the pedal plates, and in other details.

FEMALE (fig. 23a).—Length 440 $\mu$ , breadth 286 $\mu$ . Shape a long oval; dorsal shield large, surface transversely wrinkled in front with angular marking at the shoulders and towards the sides, which are distinctly serrated. Central hair armature weak, becoming stronger towards the margins of the shield where the hairs are adpressed; frontal bristles strong. Sternal plate wide in front, hinder corners rounded. There are two small metasternal plates, each carrying a hair. Ventro-anal plate comparatively large, almost circular, with three pairs of marginal hairs. The united pedal and peritrematic plates are produced in a broadly rounded extremity well beyond the last acetabula; peritreme sinuate with a post-stigmal continuation bordering, and apparently fused with, the outer margin of the pedal plates.

Capitulum transverse, hinder margin rounded, hairs normal; epistome (fig. 23d) trispinous, lateral spines with bifurcated tips; maxillary lobes lanceolate and well separated. Basal segment of palp swollen, armed with two hairs, the inner one long and undulate. The tritosternum is remarkable, instead of the usual narrow base and long filaments, the latter are welded together, terminal part ciliated at the sides, with a brush of long bristles at the extremity.

The legs are comparatively shorter and stouter than in *A. italicus*, the lengths are about 528 $\mu$ , 418 $\mu$ , 319 $\mu$ , and 396 $\mu$ . Ambulacra (fig. 23c) with the upper lobe more acute, and the tarso-ambulacral hairs are much shorter. The fixed chela has a group of at least five distinct teeth, while the free chela has only one strong tooth.

*Locality*.—Found commonly in sphagnum, gathered on the slopes of Croaghpatrick at an elevation of about 600 feet, during the month of October.

*Paraseius tenuipes* sp. nov. (Pl. VI, fig. 24a-c.)

The chief points in which the species differs from *P. italicus* are, the larger size, the form of the pedal plates, the smaller anal shield.

FEMALE (fig. 24a).—Shape a broad oval, length 742 $\mu$ , breadth 490 $\mu$ . Dorsal shield reticulated, with rather strong marginal hairs; there is a circular prominence not far from its hinder margin. The sternum is very

wide, not quite reaching the middle of the third coxa, outline of the side margins interrupted at the middle, hinder margin notched. Genital plate rather broad, end margin lying a little beyond the extremities of the pedal plates; ventro-anal shield semicircular, smaller than in *P. italicus*, and further removed from the genital plate, lying between the two, are three pairs of very small chitinous plates. Pedal plates large, just beyond the last acetabula they turn inwards, forming a truncated posterior margin. The peritreme is very wide, sinuate, with a post-stigmal continuation reaching the end margin of the pedal plates. Tritosternum (fig. 24*b*) with a long fused basal part, filaments short and distinctly spinous. Chelicerae moderately long and slender, free chela with two very feeble teeth close to the apex, fixed chela without distinct teeth (fig. 24*c*). Maxillary plate with four pairs of hairs, lobes straight and slender. Legs very long, the respective length about 737 $\mu$ , 561 $\mu$ , 550 $\mu$ , and 780 $\mu$ , tarsi of last pair much attenuated. Ambulacra very like those of *P. italicus*.

*Locality.*—One example found amongst moss on a stone in a mountain stream at Glencree, Co. Dublin, May.

#### Family CELAENOPSIDAE.

##### *Celaenopsis cuspidata* (Kram.).

Last September I found a single example of this remarkable species under decayed bark at Finglas, in County Dublin.

#### Family ZERCONIDAE.

##### *Zercon triangularis* C. L. Koch.

Common amongst moss from Knappagh Wood, near Westport; Croaghmore, Clare Island; and on Achill Island.

The Irish specimens are a little more ovate than those figured by Berlese, resembling in this respect a Scandinavian form recently described by Dr. Trägårdh under the name *Z. curiosus*, of which he remarks: "Ahnlich wie *Z. triangularis* K. geformt, aber verhältnismässig breiter mit mehr abgerundeten hinter Ecken" (88, p. 441). Some of the specimens have the two median hairs on the hinder margin of the last dorsal plate longer and stouter than in the ordinary form, approaching the variety *caudatus* Berlese, described by him as of frequent occurrence in moss on high mountains (15, p. 246).

*Distribution.*—Recorded from Germany and Italy, and doubtless a common species in western Europe, though it does not figure in Oudemans's Dutch list.

*Zercon trigonus* Berlese (Pl. VI, fig. 25).

A single example of this beautifully formed mite occurred amongst moss sent from Birr, in King's County, during November. It may be distinguished from the preceding species by the circular pits on the dorsum, and by the crenulate hinder margin of the body. Berlese found it amongst mosses in Italy (6). A sketch of the dorsal surface is given in the present paper.

*Epicrius geometricus* Can. et Fanzago.

Found amongst moss from Knappagh Wood, near Westport, in August.

*Distribution.*—A widespread European species, has been recorded from Germany, Holland, Italy, and Britain (Lincolnshire, Dr. George).

*Asca affinis* Oudemans.

Nymphae, apparently referable to this form occurred abundantly in a sand-pit used for macerating bones, Dublin.

Family THINOZERCONIDAE, *n. fam.*

On the coasts of Mayo and Dublin I have found between tide-marks both sexes of an acarid, which does not appear to have been previously observed. This interesting form clearly belongs to the Gamasoidea; yet its structural characters are such that it is not possible to refer it to any one of the described genera, and I believe it should also be regarded as the type of a new family allied to the Uropodidae and the Zerconidae. Affinities with the last-named family are apparent in the arrangement of the sternal and ventro-anal shields in the male, in the position of the male genital foramen it resembles both of these families.

The presence of two paired, sternal shields in the female is possibly the most remarkable characteristic of the present genus. Berlese has described an exotic form, *Heterozercon*, in the female of which there are two small sternal plates, however, the two forms are otherwise quite distinct. The dorsal position of the peritreme is also very remarkable. As a matter of fact there is scarcely room for the peritreme on the ventral surface of the body owing to the wide sternal area, the unusually large size of the acetabula, and the presence of outer pedal plates. The spine armature of the legs is remarkably varied.

In order to indicate the position of the family Thinozerconidae I have prepared a synoptical table of the known European families which is necessarily based on Berlese's "Conspectus familiarum" (2, p. 15) in which he recognizes two main divisions of the Gamasoidea differing in the position of the male genital foramen.

Dr. Oudemans has described two additional European families, the



Metaparasitidae and the very interesting Rhodacaridae<sup>1</sup> in which the male genital foramen is placed in the sternal shield at a little distance from its anterior margin, thus forming a link between Berlese's two main groups of the Gamasoidea. There would appear, however, to be some doubt that this is true of the first-mentioned family, as Berlese considers *Metaparasitus* to be identical with *Gamasolaelaps*, and the male foramen is in the usual frontal position in that genus. On this account, the family Metaparasitidae is omitted from the following table, which now numbers ten families:—

- |   |                                |
|---|--------------------------------|
| 1. Male genital foramen placed in the sternal shield, . . . . .   | 2                              |
| — Male genital foramen on the anterior margin of the sternal shield . . . . .   | 5                              |
| 2. Female genital foramen large, protected by a chitinous plate enclosed in the sternal shield. <sup>2</sup> Leg pits ( <i>fossulae pedales</i> ) present in many genera, . . . . . | <i>Uropodidae.</i>             |
| — Female genital foramen a transverse incision between the sternal and genital plates. Leg pits absent. Parasitic on arthropods.  | <i>Antennophoridae.</i>        |
| 3. Sternal shield entire, two dorsal plates present in both sexes, peritreme ventral, . . . . .   | <i>Zerconidae.</i>             |
| — Female with two, paired, sternal shields (fused in male), and three dorsal plates, peritreme dorsal, . . . . .  | <i>Thinozerconidae</i> n. fam. |
| 4. "Body divided into two distinct regions: a true thorax and a true abdomen" (Oudemans), male genital foramen in the sternal shield near its anterior margin, . . . . .            | <i>Rhodacaridae.</i>           |
| 5. Female genital shield entire ( <i>Laelaps</i> ), or, only partly divided in the middle line ( <i>Gamasus</i> ) . . . . .   | 6                              |
| — Female <i>area genitalis</i> formed of two hinged lateral plates, . . . . .   | 10                             |
| 6. Male with second legs much thicker than in the female; femur, patella, and tibia more or less armed with processes, . . . . .  | <i>Gamasidae.</i>              |
| — Second leg not, or but little, thickened in the male, . . . . .   | 7                              |
| 7. Adults well chitinized and free living (a few species of <i>Laelaps</i> are parasitic on rats, mice, and voles), . . . . .   | <i>Laelaptidae.</i>            |
| — Adults less chitinized, entirely parasitic on vertebrates, . . . . .  | 8                              |
| 8. Stigma dorsal, . . . . .   | <i>Pteroptidae.</i>            |
| 9. Stigma ventral, . . . . .  | <i>Dermanyssidae.</i>          |
| 10. A post-anal plate is present, . . . . .   | <i>Celaenopsidae.</i>          |

<sup>1</sup> The type species, *Rhodacarus roseus* Oudemans, occurs in Ireland. I have found the adult female under stones, amongst dead leaves, in the Tolka Valley, near Dublin, during the month of February. As far as I am aware this is the first record of its occurrence since Oudemans described it from the Netherlands (74, p. 42).

<sup>2</sup> In a few forms of the Uropodidae belonging to the genera *Uroseius*, *Trachytes*, *Celeano*, and *Polyaspis* the female genital foramen is not enclosed in the sternal shield.

**Thinozercon** n. gen.

The dorsum is protected by three dorsal plates (more or less fused in the male). There are two, paired, sternal plates in the female (fused in male), a fused ventro-anal shield and two inguinal plates. Pedal plates well developed, uniting behind the fourth acetabula. Peritreme placed on the dorsal margin of the body. Epistome unispinous, with strong lateral teeth. Legs incrassate, ambulacra present on all pairs. Male genital foramen in the centre of the sternal shield, the latter is entire, not joined to the ventro-anal plate, which is large, and includes the fused inguinal shields. Second legs of male without special armature. Type species *Thinozercon Michaeli* sp. nov.

**Thinozercon Michaeli** sp. nov. (Pl. VII, fig. 26a-m.)

MALE (fig. 26a).—Length  $1075\mu$ , breadth  $568\mu$ ; colour, golden-brown; shape, long oval, sinuate in front of the shoulders; the latter are low and rounded, anterior extremity produced in a small prominence, carrying two broad serrated bristles. Dorsal surface protected by one fused shield, in which can be traced the outlines of three plates which are separate in the female; moderately convex, with three pairs of circular pits. The dorsal plate folds over and protects the anterior ventral margin. Epidermis finely punctured, and closely areolated. There is a double row of short spines in the middle line, and a row of sub-marginal spines, end of the body set with adpressed bristles, some are feathered. Sternal plate large, fused with the first and second endopodial plates, front margin wide, undulate; the side margins send sharp processes between the last three pairs of legs; the end of the sternum tapers to an obtuse extremity between the fourth acetabula. There are five pairs of very short hairs on the sternum. The pedal plates form a continuous line on the outer side of the leg bases, curving inwards behind the last acetabula, where they form a pair of plate-like expansions fused with the last pair of inner pedal plates. A large ventro-anal shield occupies the hinder part of the body, leaving a very narrow margin between it and the dorsal shield, surface punctured and reticulated. The anal aperture is on a raised cribrum. The peritreme is of remarkable structure, originating on the front of the body, it follows the upper margin to a point opposite the interval between the third and fourth legs, it then curves round on itself, so that the stigmal extremity resembles an inverted interrogation mark. Base of tritosternum wide, stem stout, dividing to form a pair of long pectinated filaments. On the inner side of these, at the base, there is a short pointed process. The genital foramen is a small circular aperture between the third

legs; it is protected by two minute semicircular plates with thickened outer margins; the first of these carries a pair of stout bristles (fig. 26*b*).

Capitulum transverse; maxillary plate with three pairs of long bristles; close to the base is a series of raised semicircular ridges, armed with minute denticles running obliquely from the middle line of the plate; maxillary lobes of the usual triangular shape; on the inner side of these there are two long bristle-like processes, and between these is a pair of long maxillary processes which are spinous at their extremities. The epistome (fig. 26*c*) ends in a stout central spine, with a few lateral teeth, the side margins also carry strong spines. Chelicerae (fig. 26*d*), fingers comparatively straight, fixed chela with three teeth, one peg-like, free chela with two or three, more or less, obsolete teeth and a minute *pilus dentarius*. Palps stout and of average length; ventral face of first segment, with a distal prominence, carrying a stout spine, and near the base a bristle, both minutely pectinated; second segment, three dorsal hairs, a long inner spine, and a ventral bristle; third segment, three or four dorsal hairs, and two stout inner bristles; fourth segment, six or seven dorsal hairs, and there is a distal row of long ventral hairs; fifth segment, numerous bristles, a double claw-like spine.

Legs comparatively long; last three pairs incrassate, armed with simple and modified hairs; these consist of adpressed hairs, broad spines, with toothed extremities, and stout peg-like teeth, the last two kinds often arising from distinct peduncles (fig. 26*e-h*).

The ends of the tarsi (except first pair) carry three pairs of long pectinated hairs. The peduncle of the ambulacrum (fig. 26*i*) is broad, and opens out, dorsally, into a pair of sharply pointed flaps. On the ventral extremity are two lanceolate bristles which project beyond the two upper membranous lobes; the latter vary *inter se* in breadth and in the depth of the median incision. The ambulacra of the first pair of legs resemble those of the other pairs, except that they are reduced in size, especially the peduncle, and the pectinated tarsal hairs are absent.

FEMALE (fig. 26*g*).—Larger than the male; length, 1280 $\mu$  to 1332 $\mu$ ; breadth 768 $\mu$ . Shape and sculpturing as in male; there are three separate dorsal shields. The large central shield covers most of the dorsum; it is separated from the narrow anterior marginal plate by a fissure of thinner chitin which runs obliquely on each side of the body to a point just beyond the stigma. Immediately behind the large dorsal shield is a small crescentic plate, on the posterior margin of which are three pairs of pectinated bristles springing from tubercles. Ventral surface, sternal area (fig. 26*k*), with two paired plates, slightly separated, in the middle line of the body, each narrowing into a bluntly pointed extremity which does not reach the hinder

margin of the second coxae. The thickened front margin of each of these plates is very wide, and carries a single hair. The pedal shields are fused *inter se*, enclosing the three last pairs of legs. The *area genitalis* is trapezoidal, and lies opposite the third and fourth coxae. The anterior margin is rounded, anterior part protected by a triangular shield, the pointed apex of which reaches to about the middle of the genital area; the side margins are strengthened by narrow plates, hinder margin not chitinized. Ventro-anal plate much smaller than in the male, long oval, narrowed in front, densely areolated and punctured, armed with about four pairs of small bristles, and there are two pairs of strong pectinated hairs on the hinder margin. On each side of the ventro-anal shield is an oval inguinal shield. Peritreme (fig. 26*l*) as in male, tritosterum with a hatchet-shaped base, much larger than in the male, filaments long and finely pectinated.

Capitulum cup-shaped, maxillary plate with three pairs of long, widely separated hairs. Epistome, palps, and mandibles closely resembling those of the male. The legs are longer and less incrassate, their respective lengths are 814 $\mu$ , 748 $\mu$ , 737 $\mu$ , and 902 $\mu$ .

NYPH (fig. 26*m*).—An immature example, representing an early nymphal stage, of the female was found at Westport in July. It measures 998 $\mu$  in length, by 614 $\mu$  in breadth. The general structure greatly resembles that of the adult, except in the plate armature of the body.

The dorsal surface is protected by *five* plates arranged as follows:—two narrow marginal plates running from the chitinized frontal extremity to the point where the peritreme turns inwards on the dorsum; a large anterior shield, which is somewhat cone-shaped, containing the first two pairs of dorsal pits; at a little distance from this is a smaller semicircular plate, emarginate in front, enclosing the third pair of dorsal pits, and immediately behind this a small terminal plate similar to that of the adult. There are indications that in the still younger nymph there may possibly be three pairs of these central shields. Two sternal plates are present; they seem, however, to be fused on a chitinous base which reaches beyond them, and is deeply excavated on its hinder margin, so that the nymph differs in this respect from the adult female. There is a long ventro-anal shield, and on each side of this two circular inguinal shields. The legs and ambulacra are like those of the adult.

*Localities.*—Found in some numbers under stones on the sea-shore at Westport, County Mayo, in July ( $\sigma$ ,  $\text{♀}$ , and nymph). I have also found both sexes in a similar habitat, between tide-marks on the south shore of Howth, County Dublin, in the month of April.

## Family UROPODIDAE.

**Cilliba cassidea** (Herm.).

Clare Island, in moss, March; Achill Island ♂ and ♀ in moss and under bark, September and November; Westport district, adults and nymphs in August.

Berlese describes two forms of this species which he separates as follows:—

“Dorsum glaberrimum, scutum genitale foeminae, nitidum 750 $\mu$ . long... *Discopoma cassidea* G. et R. Can. (Herm.).

“Dorsum setosum, scutum genitale foeminae punctulatum. Ad 460 $\mu$ . long. *D. cassidea* var. *minor* Berl.” (2)

An examination of numerous Irish specimens shows the presence of hairs on the dorsum, and the female genital shield is distinctly punctulate. In the matter of size, however, they agree with the typical form, measuring from 744 $\mu$  to 921 $\mu$  in length. Both sexes vary equally in size. Possibly these specimens may be referable to a large form of the species.

A few of the *nymphae homeomorphae* were also found. In these the broad marginal part of the body is imperfectly chitinized on the ventral side, forming three pairs of plates. The second segment of the first pair of legs is without the distal spur which is always present in the adult.

*Distribution*.—Germany (Koch); Italy (Berlese); Holland (Oudemans, who records both the type form and the variety *minor* Berl.).

There is a difference of opinion amongst acarologists concerning the use of the generic names *Cilliba*, von Heyden and *Discopoma*, Canestrini for the preceding species (*cassidea* Herm.), a question concerning the validity of von Heyden's genera. Mr. Michael has dealt with the subject at length (49, p. 295) giving his reasons for the revival of certain of von Heyden's genera including *Cilliba*. Until the appearance of his valuable paper “Acari Mirmecofili,” Berlese had consistently used *Discopoma* to include *cassidea* Herm. In that paper, however, he states that there is sufficient reason for the revival of *Cilliba*, with *cassidea* as the type, as indicated by von Heyden, thus agreeing with Michael's use of this name, while Kramer's “*Uropoda splendida*” is selected as the type of *Discopoma*. Berlese remarks “il genere *Discopoma* di G. et R. Canestrini, sembra avere realmente per tipo la *D. splendida*, almeno questa è la prima specie (sotto il nome *D. clypeata*), che i detti Autori illustrano.” It is fortunate if, for this reason, both of these generic names can be preserved.

**Cilliba vegetans** (Duges).

Westport, found attached to a large Dor Beetle (*Geotrupes stercorarius*) in July.

This specimen is in the *nympha homeomorpha* stage, and agrees closely with the figure given by Oudemans of this form (73, pl. viii, fig. 35).

*Distribution*.—A widespread European species.

**Discopoma integra** Berl.

Clare Island, ♀ and *nympha homeomorpha* in sphagnum, July; Achill Island, females under bark, in decayed wood and in moss, September.

Not uncommon in these localities. The *nympha homeomorpha* is smaller (length 407 $\mu$ , breadth 330 $\mu$ ) and less elliptical in shape than the adult female, an Irish example of which measures 440 $\mu$  by 340 $\mu$ . I have also found the female on decayed wood at Glendalough, Co. Wicklow. The male is unknown.

There is an error in the original description of this species (15, p. 244) which should be corrected. Berlese refers to the marginal plates of the dorsum as follows:—"Scutum dorsi marginale integrum, totum aequae chitineum, transverse striatum." An examination of the Irish specimens shows that the marginal plates are not entire, and indeed Berlese's excellent figures of the species, published subsequently (11, pl. ii, fig. 18), make this point quite clear. These plates taper to a point a short distance from each other, leaving uncovered a small part of the posterior end of the body.

*Distribution*.—Italy (in moss at Vallombrosa, Palermo, Roma. Berlese).

*Discopoma pulcherrima* Berlese.

A single specimen of this handsome species occurred in a nest of the ant *Formica fusca* in a decayed birch stump at Glendalough, Co. Wicklow, last September, in company with *Uroobovella notabilis* Berl. It does not seem to have been recorded from the British Isles. Berlese found it in rotten wood, and also in ants' nests, though he does not mention the species of ant (5, p. 247).

*Phaulocylliba Berlesii* sp. nov. (Pl. VII, fig. 27a-d)

This genus was described by Berlese from Norwegian and Italian specimens in 1903 (6, p. 270), and *P. ventricosa* was indicated as the type species. The genus is briefly characterized as follows:—"Characteres generis *Discopoma*, sed scutum marginale dorsi omnino nullum. Scutum dorsuale medium ovale, sat a marginibus discretum. Metapodia ut in Uropodis. Fossulae pedales subevanidae."

The most interesting feature about this genus is the absence of marginal plates. On the Dublin coast I have found an undoubted species of *Phaulocylliba*, which from its much smaller size and peculiar habitat evidently represents an undescribed species.

**MALE** (fig. 27*a*).—A small yellowish brown, oval-shaped species; the measurements are—length about 670 $\mu$ , breadth 486 $\mu$ . The dorsal shield is large, very finely punctured, and also with larger punctures. There is a double row of short adpressed hairs on the middle of the dorsum, and a few scattered hairs towards the sides. Marginal plates absent, so that the body margin from behind the shoulders is unprotected (fig. 27*b*) with seven or eight pairs of short spines, two pairs of these, at the end of the body, are longer than the others.

The ventral plate is large, and leaves uncovered a narrow body margin behind the last pair of legs. The *fossulae pedales* of the fourth legs are not strongly marked; their outlines run obliquely from the last acetabula and curve round to within a short distance of the body margin, remaining *fossulae evanescent*.

The peritreme starts a little in front of the second legs; curving outwards it lies along the margin of the body, and thence turns obliquely inwards reaching a point near the acetabula of the third legs. Genital foramen (fig. 27*c*, between the fourth acetabula, oblong, slightly flattened at each end; a pair of strong hairs spring from near its hinder margin. Camerostoma small. Base of tritosternum semicircular, end of filament three-branched.

Capitulum nearly square, maxillary plate with three pairs of short hairs along the middle line, and a pair of very long hairs on its front margin; outer lobes small. The under side of the first palp segment is swollen into a large rounded prominence which carries at its apex a two segmented process; the end segment is bilobed, and its inner lobe terminates in four or five curved bristles (fig. 27*d*), otherwise the palps are of normal structure. The chelicerae are withdrawn into the body cavity. Armature of legs much as in *Cylliba*; there is a small branched hair on the underside of the patella and tibia of the last three pairs of legs.

*Locality*.—Found under stones between tide-marks in Howth Harbour, Co. Dublin, towards the end of November.

#### **Haluropoda** n. gen.

In salt marshes both on the east and west coasts of Ireland there occur two species of the Uropodidae which would appear to be referable to an undescribed genus, intermediate in character between the genera

Discopoma and Uropoda, Auct. The generic characters are briefly as follows :—

Dorsal plates consisting of the usual large shield and two marginal plates which do not cover the posterior margin of the body, resembling the genus Discopoma in this respect. Ambulacra present on all legs, those of the first pair obvious, though smaller than the others. The *fossulae pedales* are sufficiently well developed, last pair without a separate groove for the reception of the tarsal segments (such as is found in Urodiscella and other genera). Metapodial line present, evanescent towards the middle of the body. Type species, *Haluropoda interrupta* sp. nov.

In order to indicate the position of this new genus I have prepared a table based on the characters of the dorsal plates and on the presence, or otherwise, of ambulacra on the first pair of legs. Mr. Michael has published a synoptical table of the then known genera in his "Notes on the Uropodinae" (49, p. 298), and more recently Berlese compiled a very useful table of the uropodid genera (12, p. 324). With regard to the ambulacra, Michael does not agree that their presence on, or absence from, the first pair of legs is a good method of dividing these genera, though "it may be preserved to differentiate smaller groups," yet it is undoubtedly a useful character, and cannot, in my opinion, be overlooked in the grouping of the genera.

First pair of legs without ambulacra—

- |   |       |   |
|---|-------|---|
| Marginal shield entire, fused with the central dorsal shield,   | . . . | <i>Cilliba</i> ( <i>Cillibano</i> ) von Heyd. |
| Marginal shield interrupted, not covering the end of the dorsum | . . . | <i>Discopoma</i> G. et R. Canestrini.         |
| Marginal shields absent,  |       | <i>Phaulocylliba</i> Berl.                    |

First pair of legs furnished with ambulacra—

- |                              |       |                                   |
|------------------------------|-------|-----------------------------------|
| Marginal shield interrupted, | . . . | <i>Haluropoda</i> n. gen.         |
| Marginal shield entire,      | . . . | <sup>1</sup> <i>Uropoda</i> Auct. |

**Haluropoda interrupta** sp. nov. (Pl. VII, fig. 28a-c.)

MALE (fig. 28a).—Length 866 $\mu$  to 921 $\mu$ , breadth 716 $\mu$ . Colour light chestnut, shape sub-discoidal, produced to form the narrow anterior margin. Dorsal shield large, very finely punctured with small scattered hairs. The marginal plates are indistinctly punctured, and taper to a point at a little beyond the

<sup>1</sup>For the distinctive characters of the genera allied to the Uropoda of Auct., see Berlese's table (12 p. 325). They are *Uropitella* Berl., *Urodiscella* Berl., *Uroobovella* Berl., *Urodinychus* Berl., and the myrmeophilous genera, *Urotachytes* Berl., and *Trachyuropoda* Berl.



third quarter of the body; in the cuticle of the uncovered part of the dorsum are about six pairs of hair-bearing pores; there are also a few fine hairs on the posterior margin. Ventral surface (fig. 28*b*) highly chitinized; in the epigastric region the metapodial line runs inwards from the margin of the body, immediately behind the last pair of leg pits, becoming evanescent towards the anal region. Leg pits well developed, consisting of single depressions in the integument. The genital foramen lies between the coxae of the third legs, oval, occupied by two small crescentic plates, aperture pear-shaped. In the sternal plate on each side are three hair-bearing pores. Peritreme short, rising on the side margin of the body it runs along the mesopleural ridge, it then turns downwards for a short distance into the leg pit of the third leg. Tritosternum hidden by the first coxae, basal piece rudimentary, stem with a small branch on each side beyond the middle, apex very finely branched. Legs, first pair unarmed, coxae with inner basal prominence and outer incised lamellar plates. Femur of second pair carrying the usual spur, as in Uropoda, and also a smaller spine beyond the middle, the patella has a small distal spine, and the tibia is unarmed. Femora of the third and fourth legs with the pointed lamellae usual in the Uropodidae. Ambulacra of first pair of legs reduced, thin at the base, strongly thickened at the apex, in which the small, stout claws are deeply imbedded, ambulacra of the three posterior pairs, much as in *Cilliba* (fig. 28*c*).

The capitulum is broad and strongly convex below; maxillary plate, one pair of long bristles in front and three pairs of short ones in the middle. Maxillary lobes small; central processes consisting of two adjacent rods, bifurcated at their extremities. Epistome long and narrow, base with a few strong spines, densely pectinate at the middle, and the apex appears to be forked. Chelicerae drawn deeply into the body cavity, small; fixed chela with rounded terminal hood, there is a small prominence on the middle of the blade; free chela much shorter with a tooth-like process half way between the middle and the terminal tooth, or there may be scarcely any trace of armature.

**FEMALE.**—Length  $896\mu$ . Apart from the genitalia, the armature of the second legs, and a few other points the female strongly resembles the male. The genital plate is large ( $176\mu \times 132\mu$ ), widely rounded in front and truncated at its hinder margin, coarsely granulated in front, and near the hinder margin there is a pair of minute hairs. The tritosternum differs from that of the male in having a large crown-shaped basal piece with strong lateral angles and a bluntly pointed central process. The ventral shield of the capitulum is less convex, with a pair of long hairs near the base of the maxillary lobes and three pairs of short hairs, arranged more or less in a line, behind these.

*Localities.*—Occurs commonly under stones on the sea-shore at and a little below high-tide mark, and also in salt-marshes. - Westport, ♂, and ♀ with eggs July; Mulranny, ♂ ♀ and nymphs, September. I have found it in county Dublin at Howth and at Dollymount salt-marsh in November.

**Haluropoda minor** sp. nov. (Pl. VII, fig. 29a-d.)

**MALE** (fig. 29a).—Length 614 $\mu$ , breadth 460 $\mu$ . Colour reddish-brown, shape oval. Dorsal armature consisting of a long oval central plate, and two marginal plates, which leave a small part of the end of the body uncovered. Central plate with exceedingly fine punctures and also with very coarse punctures; there are at least three double rows of piliferous pores as well as some scattered hairs. Marginal plates long, coarsely granulated, tapering to obtuse extremities which almost reach the end of the central shield, on the outer margin there is a row of hairs. Uncovered end of the body with a few hair-bearing pores. Imbedded in the side margins of the body are a number of modified hairs very similar to the T-shaped hairs found in the genus *Trachyuropoda*.

All the ventral plates are fused. Peritreme and leg pits very similar to those of the preceding species, hinder margin of last pair widely rounded. Genital area opposite the coxae of the third pair of legs, ovate, narrowed, and somewhat truncated in front (fig. 29b). Coxae of first pair of legs rather short, and strongly angled on the inner side, femur armed with a papilla, placed distally. The femur of the second pair carries a curved spur and in front of it two small round lamellae; there is a smaller spur on the patella. The third and fourth pairs, and the ambulacra, are of the usual uropodid type. Tritosternum, base small, main stem with a distinct branch near the middle on each side, extremity also branched.

Capitulum short and very broad, there are three pairs of small spines on the ventral surface, the middle pair, placed slightly in front of the palp acetabula, are stout and spur-like, and two very long bristles stand close to the bases of the maxillary lobes. Epistome and chelicerae similar to those of the preceding species. Palps short and stout, ventral surface of first segment with a distal prominence and two bristles, one long and extremely finely spinous; second segment with about four stout spines; the third segment fig. 29c, is armed on its inner surface with a sharply pointed spur, and behind this spur there is a long sabre-like bristle, dorsal surface with two long spines. On the fourth segment there are six or seven dorsal spines, two of these spring from large pores, and on the ventral surface one very long bristle.

**FEMALE** (fig. 29d).—Length 627 $\mu$ , breadth 462 $\mu$ , closely resembling the

male in general structure. Genital plate very large, of a regular oval shape, except at the truncated hinder margin, surface coarsely punctured. Tritosternum with crown-shaped basal piece, stem with a branch on each side, close to the base, extremity branched. The hairs of the maxillary plate are more slender. Palps as in the male except for the absence of the peculiar armature on the inner side of the third segment, in place of which there is a single small spine.

The chief points in which the present species differs from the preceding, apart from size, are the longer marginal plates, the coarse puncturing of the epidermis, the presence of modified hairs on the side margins of the body, and, especially in the male armature of the third palp segment.

*Localities.*—Westport, under stones on the sea-shore, nymphs and adults in July, and in a similar habitat at Mulranny, Co. Mayo, in September. Nymphs and adult males were also obtained from debris collected from old nests of Black-backed Gulls, and Puffins, on The Bills Rocks in June. I have also found it in company with the preceding species on the coast of county Dublin at Dollymount and Howth.

*Uropoda obscura* (C. L. Koch) Berl.

I have found the immature (nymphal) stage of this mite amongst moss at Tibbradden, Dublin mountains, in the month of June.

*Uropoda tecta* Kramer.

Occurs in fungi in woods at Glendalough, county Wicklow, September.

*Uroobovella notabilis* Berl.

Found commonly in a nest of the ant *Formica fusca* in a decayed birch log at Glendalough in September; also at the Scalp and Powerscourt in county Wicklow.

The specimens are a little shorter and broader than those described by Berlese (12, p. 338), the largest measures about  $717\mu$  in length, by  $588\mu$  in breadth. This species does not appear in Mr. Donisthorpe's records of British myrmecophilous mites.

*Urodinychus ovalis* (C. L. Koch), var. *Thorianus* Berl.

Adult males and females of this fine species were found under bark in the Westport demesne in July. They are of a reddish-brown colour; one of the examples measures  $896\mu$  in length, therefore a shade smaller than the type. It is possible that the large specimens ( $950\mu$ ), recorded from Holland by Oudemans (74, p. 46), may be referable to this variety.

*Distribution.*—Described by Berlese (6, p. 271) from specimens collected in Norway by Dr. Thor,

**Urodinychus punctatissimus** sp. nov. (Pl. VII, fig. 30a-b.)

This species is allied to *Urodinychus ovalis* (Koch) with which it agrees closely in form, size, and in general structure.

Female (fig. 30a) Length 614 $\mu$ , breadth 486 $\mu$ , shape oval, dorsum slightly convex. The entire surface of the body is exceedingly closely and minutely punctured, so that a fairly high magnification is necessary in order to make clear the individual punctures, and without a trace of the stronger puncturation present in *U. ovalis*. The dorsal shield is crowded with short hairs. Marginal shield very narrow, entire, with a row of widely separated hairs, inner edge weakly crenulate, there are no cross striations.

Camerostoma small. Genital area (fig. 30b) as in *U. ovalis*, pointed in front, surface of plate very minutely punctured. Ventro-anal plates completely fused, studded with hairs, but not so thickly as the upper surface of the body. *Fossulae pedales* and metapodia like those of *U. ovalis*, as figured by Berlese (1, Fasc. xli, No. 9). Peritreme with two loops, stigmal extremity directed inwards, with a post-stigmal continuation in the fossulae of the third legs.

*Locality*.—Achill Island, a single specimen in moss, November.

**Urodinychus campomolendina** Berl.

Under bark in the Westport district, July.

I have found this species commonly under bark of decayed tree trunks in the Dublin and Wicklow districts.

*Distribution*.—A widespread European species.

**Urodiscella philoctena** (Trouess.).

1902. *Uropoda philoctena* Trouessart 96, p. 36. 1904. Berlese 12, p. 342.

A single male example occurred in a nest of the small yellow ant *Lasius flavus*, in company with the following species, at Westport, Co. Mayo.

M. Janet was the first to use the specific name "*philoctena*," accompanying his reference to the mite is a sketch of a male *Urodiscella* attached to the strigil of an ant (*Lasius mixtus*). However, as he gave no description of the animal, the name remained a *nomen nudum* until Trouessart subsequently described the species. Janet's figure gives a very good idea of the under side of the male, except that the peritreme is not included.

I have also found the male and female of this species in nests of *Lasius flavus* at Glendalough, and can state that the peritreme is similar in both sexes. It is shaped almost exactly like a note of interrogation, differing, in

this respect, from the figure of the female in Berlese's "Acari Mirmecofili" (12, pl. viii, f. 20). The measurements of the male are  $495\mu \times 407\mu$ , and of the female  $517\mu \times 429\mu$ .

*Distribution.*—Italy (Portici, Silvestri); France (Beauvais, Janet, in nest of *Lasius mixtus*); England (Weybridge, in nests of *Lasius umbratus*, Donisthorpe).

***Urotachytes formicarius* (Lubbock).**

This beautiful species is the only one of the large, red, ants' nest mites found in the district. It is common both on Clare Island and at Westport in nests of the yellow ant *Lasius flavus*.

The male occurred in some of the nests. It is slightly smaller than the female, the length varying from  $844\mu$  to  $947\mu$ . The circular genital aperture is situated, in most specimens, opposite the third and fourth coxae, in others it is exactly opposite the third pair. Each chela of the mandibles is armed with a single strong tooth. Immature examples in the second nymphal stage were also found. This stage measures  $768\mu$  in length, and very closely resembles that of *Trachyuropoda laminosa*, figured by Berlese (12, pl. xi, fig. 63), with a raised central ridge and three pairs of large depressions on the dorsum. The ventral surface is also very similar in the two species.

*Distribution.*—France (Luxemburg, Wasmann); England (Cornwall, Michael; Isle of Wight, Boxhill, Bradgate Park, Forth Bridge, and other localities, Donisthorpe in "Entom. Record," xxii, xxiii). Berlese remarks that he has not found this species in Italy.

*Trachyuropoda coccinea* (Michael).

This species occurs commonly in nests of the ant *Formica fusca* in the eastern parts of Ireland, as at Scalp, Powerscourt, Glendalough, and Howth, yet I could find no trace of it in the Clare Island district.

The variety *sinuata* Berlese, lives in nest of the same ant at Glendalough, and no doubt in many other localities.

*Trachyuropoda lamellosa* (Can. et Berl.).

1877. *Trachynotus troguloides* Can. et Fanzago 25, p. 62. 1884. *Uropoda laminosa* Can. et Berl. "Atti. Soc. Ven. Trent," ix, p. 6. 1884. *Uropoda lamellosa* Berl. 1, Fasc. xiii, n. 1. 1894. *Glyphopsis lamellosa* Michael 49, p. 309. 1904. *T. laminosa* Berl. 12, p. 360. *T. celtica* Halbt. 31.

Tallaght, County Dublin, many females and a few males found in nest of the ant *Lasius niger* on the bank of the Dodder in April; has also occurred with *Lasius flavus*, on Lambay Island.

The ants' nest mite, described and figured as this species by Canestrini and Berlese in the references **1, 12, 25**, does not altogether agree in the sculpturing of the dorsum with the mite recorded from the above-mentioned localities. However, Mr. Michael has taken a similar species in England, and he informs me that his specimens were referred to the present species by Canestrini, so that we must accept this identification of the British form, unless the latter represents a local variety of the species.

Has been found in Luxemburg, France, Bohemia, Italy and Britain.

#### *Dinychus tetraphyllus* Berl.

A single specimen occurred amongst moss in the Westport district in July.

Quite a short description of this curiously formed mite was published by Berlese (**5**, p. 247). More recently Trägårdh has given a very full account of the species with some good drawings of the nymph, male, and female (**88**, p. 450; it is a rich brown oval-shaped creature, and may be recognized by the four blade-like hairs placed on a narrow transverse plate close to the hinder margin of the body, a little in front of these is another row of four longer and more slender spines.

*Distribution*.—Sweden (Sarekgebirge, Trägårdh; Italy (under rotten wood and also, though more rarely, in moss, Berlese).

#### Family LABIDOSTOMMATIDAE.

##### *Labidostomma cornuta* (Can. et Fanzago).

1877. *Nicoletia cornuta*. Canestrini et Fanzago **25**.

Achill and Westport districts, not uncommon in moss on trees, and under bark, during September. I have also found it in pine woods in counties Dublin and Wicklow where it was noticeable enough on account of its bright orange colour.

There are two recorded European species of this curious genus which, as regards its systematic position, has long been a trouble to acarologists. Descriptions and figures of both of these species may be found in Berlese's work on Italian Mites (**1**). *L. cornuta* is said to differ from *L. lutea*, Kramer, in being larger, and the front corners of the fore body are produced into sharp points. Canestrini and Fanzago's figure of *L. cornuta* (Tav. III, fig. 2) shows these very clearly. The Irish specimens that I have seen agree well with *L. cornuta* except in the matter of size, the length being about 700 $\mu$ . In the original description the length is given as 1000 $\mu$ , and according to

Berlese it may reach a length of 1200 $\mu$ . *I. lutea* has been recorded as a British species (47A and 28C), but the figures accompanying the records resemble the present form.

*Distribution*.—Probably widespread in Europe (Germany; Hungary, 33; Italy; Britain).

Sub-Order **IXODOIDEA**.

Family IXODIDAE.

*Ixodes ricinus* (Linn.).

The common tick is abundant throughout the district, especially so amongst grass and heather in wooded districts. One example occurred on a young rat. I have noticed that in the south and west of Ireland this species is more abundant and is much more liable to attack man than it is in the eastern parts of the country.

*Distribution*.—Europe; Asia; N. Africa; N. America; &c. (Neuman 54).

*Eschatocephalus vespertilionis* (C. L. Koch).

A female of this species found on a bat in the Edenvale Caves in County Clare has been identified by Professor Nuttall. I am informed by Dr. Scharff that the host was the Lesser Horse-Shoe Bat (*Rhinolophus hipposideros*), a local species of which a number were found hanging from the roof of one of the inner caves during the month of April.

*Argas vespertilionis* (Latr.).

I have seen specimens of this tick obtained off the Pipestrelle Bat in County Longford, and it has also occurred at Blarney in County Cork.

Sub-Order **ORIBATOIDEA**.

Family ORIBATIDAE.

*Pelops acromias* (Herm.).

Clare Island, Achill and Westport district. Not uncommon in moss and rotten wood, also swept off furze bushes and pine trees.

*Distribution*.—Throughout Europe.

*Pelops fuliginosus* C. L. Koch (*P. laevigatus* Nicolet).

Delphi in moss; the Bill Rocks off Clare Island in debris from nests of sea birds; June.

*Distribution*.—A widespread European species.

***Pelops phaenotus* C. L. Koch.**

Slopes of Croaghpatrick in sphagnum, October.

*Distribution.*—Germany; England; Italy.

***Oribata sphagni* Michael.**

Local. Croaghpatrick, amongst moss on stones in a small stream on the lower slopes of the mountain, July; also a few specimens amongst wet sphagnum, at about 600 feet, in the same locality in October.

The Croaghpatrick specimens measure about  $330\mu$  in average length. Mr. Michael points out that the pseudostigmatic organs are hidden in this species occasionally, however, these organs are extended. They are small with a very slender stalk and large globular head. There are two fine, widely separated, interlamellar hairs. On the abdomen there is a marginal row of fine hairs and a few pairs are present on the dorsum of the animal.

*Distribution.*—Germany (Sellnick); England (on sphagnum, Michael); Scotland (Evans).

***Oribata gracilis* Michael (var. *major* Berlese).**

The Bill Rocks, in debris from old nests of gulls and puffins, June; Achill, under bark, September; Delphi, in moss; Mulranny, on the sea-shore, in September.

Berlese has described and figured, from Irish specimens, a variety of this species (var. *major*) which is larger than the typical form measuring  $520\mu$ – $640\mu$  in length, and the pseudostigmatic organ is “longe fusiformibus, subplumosus” (7, p. 29). The above recorded specimens are possibly to be referred to this variety. They measure from about  $520\mu$  to  $539\mu$  in the length of the body, the pseudostigmatic organs are long and fusiform, somewhat bent at the base and their extremities are finely spinous.

*Distribution.*—Italy; Holland (in decaying leaves, Oudemans); England (in moss on trees, Michael); Scotland (Evans).

***Oribata mollicoma* C. L. Koch.**

A few specimens found in moss on Croaghmore mountain, Clare Island, also on Achill Island, and in the Westport district (Croaghpatrick, &c., in sphagnum).

*Distribution.*—Finland (Nordenskiöld); Swedish Lapland (Sarekgebirge, Trägarth); Germany; England; Scotland.



**Oribata alpina** sp. nov. (Pl. VIII, fig. 32*a, b*).

The following short description refers to an apparently undescribed species of *Oribata* which is common enough in the mountain districts of the County Mayo. It is unknown to Mr. Michael, to whom specimens were sent, and it does not appear to agree with any of the European species of this genus described since the publication of the "Tierreich" volume treating of the Oribatidae.

The species may be compared with *Oribata mollicoma* C. L. Koch, to which it is allied in general structure. It is, however, much larger and of more robust build and the hairs of the notogaster are shorter, other differences are also noticeable.

The measurements are: length 716 $\mu$ , breadth 512 $\mu$ . Colour pitchy black with a lighter patch on the front of the body. The texture of the epidermis is dull, due to the extremely fine and close punctuation of the surface of the body. Cephalothorax rather narrow, rounded at the extremity. Lamellae a pair of broad blades ending in stout bluntly pointed cusps, which are bent downwards, and are separated by a cup-shaped hollow. The translamella is a narrow band. As in the case of *O. mollicoma* the end of the lamellar region reaches far forwards so that the frons is very short. The prostigmatic organ is moderately long with a stout stem and weakly clavate extremity, directed upwards. Interlamellar hairs widely separated, long, and finely setose. Notogaster globular with a double row of marginal hairs and there are also three or four pairs on the back of the animal, these hairs are rather stout, finely setose, and are much shorter than in *O. mollicoma*. Front margin of the progaster gently rounded, sloping backwards towards the side margins. Pteromorphae normal, not produced in front. Legs long and rather stout. Mouth parts of the usual type.

This species may be easily separated from *Oribata Edwardsi* by the much greater length of the lamellae.

*Localities*.—Clare Island, in moss on Croaghmore mountain, August; Lough Fenagh, in sphagnum, October; Delphi, in moss, August.

**Oribata Edwardsi** Nicolet.

Clare Island, Achill, and the Westport district. Rather a common species in moss and under bark from March to October, and doubtless throughout the year. Also on the Dublin mountains and apparently widespread in Ireland.

*Distribution*.—Finland; Sweden; Germany; France; Italy; and Britain.

**Oribata lapidaria** H. Lucas.

Westport, common under stones on the shore of Clew Bay, and swept off plants; Castlebar under stones on the lake-shore.

*Distribution.*—Finland to Africa (Algeria).

**Oribata globula** Nicolet.

Not uncommon. Clare Island, in moss; Achill, in rotten wood and on decayed fir cones; Mulranny, under stones on the sea-shore.

*Distribution.*—A widespread species ranging from Finland to Algeria.

**Oribata orbicularis** C. L. Koch.

A few specimens of an *Oribata* apparently referable to this species, or perhaps to a variety of it, were found under stones on the sea-shore at Mulranny, County Mayo.

The shape is broader and stouter than in typical *O. orbicularis*. In this respect it agrees very closely with a mite described from Swedish Lapland under the name of *O. monticola* (88). In that species, however, the lamellar and interlamellar bristles have very distinct secondary hairs, while in the Mulranny form these are minutely setose. As the species is a somewhat critical one it seems best to record these specimens as above.

*Distribution.*—Finland to Italy.

**Oribata piriformis** Nicolet.

A few specimens in moss from Knappagh Wood near Westport, August.

*Distribution.*—Europe.

**Oribata fuscipes** C. L. Koch.

Westport, one specimen in sphagnum at Coolbareen Lough, July; and a few under stones on the shore of Clew Bay.

*Distribution.*—Finland (Nordenskiöld); Germany; ?North America (Michael); England (Epping Forest, Michael); Scotland (Forth Area, Evans).

**Oribata setosa** C. L. Koch.

Achill Island, swept off conifers; Mulranny sandhills; Westport, common on furze, and in sphagnum.

The Irish specimens vary considerably in size and in the shape of the lamellae. The cusps of the latter are produced at the outer angle, but not so markedly as in the form figured in "British Oribatidae" (plate vii, fig 3), which doubtless represents an extreme form of the species. The prostigmatic organs vary in structure, in a number of specimens, obtained off furze,

they are shorter with compactly clubbed extremities, in other specimens these organs are more drawn out. In addition to the marginal hairs there are five or six pairs of hairs on the dorsum of the animal.

*Distribution.*—A widespread European species ranging into the Arctic Circle (Franze-Joseph Archipelago, Spitzbergen, Michael).

**Oribata quadricornuta** Michael.

Evidently a local species in the district. Westport, on furze, July; Mulranny, under stones on the sea-shore in September.

*Distribution.*—Finland; Germany; Holland; Algeria; Britain.

**Oribata ovalis** C. L. Koch. •

Abundant in moss. Clare Island, Achill, and Westport district.

*Distribution.*—Common and widely distributed in Europe.

**Oribata dorsalis** (C. L. Koch).

Mulranny, under stones on the sea-shore, and on the banks of stream flowing from the Curraun lakes, September; var. *longiplumus* Berlese, common under bark in the Westport demesne, July.

The specimens are referable to two recognizable forms. In one of these the pseudostigmatic organs are shorter, closely resembling *O. alata* var. *integer* Berlese in this respect. I cannot say, however, that the specimens are identical with this variety as they do not seem to agree in the other characters mentioned by Berlese. The second form is a little larger, and the pseudostigmatic organs are very long and strongly recurved, hair-like and exceedingly finely setose at their extremities. This form is probably the same as Berlese's *O. eliminatus* var. *longiplumus*, which is described and figured in the same paper (7, p. 30, pl. 1, figs. 21, 22). In none of the Irish specimens that I have seen are the pseudostigmatic organs sufficiently short and clavate to enable one to refer them to typical *O. alata* (Herm.) as this is figured by Berlese (1, Fasc. lxxviii, N. 9) and other acarologists.<sup>1</sup>

*Distribution.*—This species has an extremely wide European range.

<sup>1</sup> Since these notes were written I have received from Dr. Berlese a paper dealing with the *alata* group of the genus *Oribata*. (*Acari Nuovi*, Manipulus ix, Redia, x, 1914.) A re-examination of the Mayo specimens confirms me in the belief that the form with long recurved, pseudostigmatic organs is *O. longiplumus*, now established as a species by Berlese. The only difference is that the transverse line dividing the cephalothorax from the abdomen is wanting in the Irish specimens, but Berlese figures a variety (*myrmophilus*) of this species in which this line is evanescent. The form with shorter and more clavate pseudostigmatic organs is not *integer* but *O. nervosus*, Berl. recorded from Norway, North America, and South Africa. Specimens of this form, found on the sea-shore at Mulranny, measure about 653  $\mu$  in length by 486  $\mu$  in breadth.

**Oribata cuspidata** Michael.

Clare Island, Achill, and the Westport district. This small and variable species is abundant in the district especially amongst sphagnum on the mountains (Croaghmore and Croaghpatrick). On Achill Island it was found amongst fallen pine needles in September.

*Distribution.*—Finland; Germany; Sweden; Italy.

**Oribata Lucasi** Nicolet.

Achill, one specimen found under bark of a fir tree, September.

This specimen is very small measuring only  $374\ \mu$  in length. Michael gives the average length of this species as  $600\ \mu$ . A second Irish example which I found on Lambay measures  $550\ \mu$ .

*Distribution.*—Finland (Nordenskiöld); Germany (Sellnick); Holland, (Oudemans); France; Algeria; Britain.

**Oribata fusigera** Michael.

Achill, on furze, September; Croaghpatrick, on sphagnum, October; Westport, at Coolbareen Lough, on sphagnum.

*Distribution.*—England (in moss, Michael. Common amongst sphagnum at Gibside, Hull); Scotland (Evans). There is an unrecorded example of this species in the museum collection found some years ago on Lambay off the Dublin coast.

**Oribata parmeliae** Michael.

Common under lichens growing on granite rocks on the sea-shore at Howth, county Dublin. Recorded by Michael from an exactly similar habitat in Cornwall.

**Scutovertex sculptus** Michael.

The Bill Rocks, 9 miles off Clare Island, in old nests of gulls and puffins, June; Mulranny, abundant under stones on the sandhills in September.

*Distribution.*—Germany (Sellnick); England and Algeria (Michael); Scotland (Evans).

**Scutovertex bilineatus** Michael.

Westport, under stones on the sea-shore a little above high-water mark in July.

*Distribution.*—Russia ("in subsaline algae," Oudemans); England ("aquatic, on fresh-water algae," Michael).

**Scutovertex corrugatus** Michael.

Mulranny, common under stones on the sea-shore at high-water mark in September.

*Distribution.*—According to Trägårdh this interesting species is identical with *Eremaeus lineatus* Thorell (83). It has therefore an extremely wide range in north-western Europe i.e. Siberia, Novaya Zemlya, Spitzbergen, Bären Insel, Sweden, and Sellnick records it from the Faröes. In Britain it was first discovered by Mr. Bostock at Puffin Island, North Wales, "crawling on fresh-water algae (*Prasiola stipitata* and *Cladophora fracta*), where the fresh water was dripping over the rocks close to the sea, but not where the sea would come" (48). At Mulranny it was most abundant under stones where a small stream flows into the sea at the head of Ballacragher Bay, but it was by no means confined to the fresh water.

*Scutovertex maculatus* Michael.

Has been found on the shore of Lambay off the Dublin coast (31).

**Cepheus bifidus** Nicolet.

Westport district, a few specimens found amongst moss at Knappagh Wood in August.

*Distribution.*—Finland (Helsingfors, in damp pine forests, Nordenskiöld); Holland, in decaying leaves (Oudemans); France; Britain.

**Cepheus tegeocranus** (Herm.).

Clare Island, Achill, and Westport district, in moss.

*Distribution.*—Finland to Algeria.

**Tegeocranus latus** (C. L. Koch).

Achill Island, abundant under bark of decayed fir trees in company with its curiously formed nymph, September.

*Distribution.*—Similar to that of the last species.

**Carabodes elongatus** (Michael).

Clare Island, Achill, and Westport district. Frequent in moss.

*Distribution.*—There are few records of this species, it is widespread, however, having been recorded from Italy, Algeria and Britain. Trägårdh has described a variety, *subarctica*, from Swedish Lapland (88).

*Tegeocranus marginatus* Michael.

Abundant amongst lichens on the Portmarnock sandhills. January.

*Tegeocranus labyrinthicus* Michael.

Under lichens growing on rocks by the sea-shore at Howth, Co. Dublin. This species must be recorded with reserve as the specimens found in this locality are not quite typical.

*Liacarus coracinus* (C. L. Koch).

Clare Island, in moss, March. Has also been found under bark at Bray Head, Co. Wicklow, in May.

*Distribution.*—Finland to Algeria.

*Liacarus ovatus* (C. L. Koch).

Clare Island, Achill, and Westport district.

The Achill specimens occurred in rotten wood and amongst pine needles, September.

*Distribution.*—Germany; Holland; France; Italy; Britain.

*Notaspis bipilis* Herm.

Clare Island, Achill, and Westport district.

*Distribution.*—A common and widely distributed species ranging from Novaya Zemlya to the extreme south of Europe; Siberia.

*Notaspis exilis* Michael.

Clare Island, Achill, and Westport district.

*Distribution.*—Probably equally widely distributed as the preceding species.

*Notaspis venustus* (Berlese). (Pl. VIII, fig. 33 *a-b*.)

There is little doubt that a *Notaspis* found commonly on the sea-coast at Mullranny is to be referred to this species, originally described from Norway by Dr. Berlese under the name of *Oribatula venusta*. The extremely short description is as follows:—"Testacea. Facies *O. calypterae* Berl., sed multo maior abdomineque magis rotundato. Organa pseudostigm. bene clavata. Pteromorparum rudimenta ut in *O. calyptera*. Ad 600  $\mu$  long.; 400  $\mu$  lat." (14, p. 8). A figure of the dorsal aspect of the animal appears in a subsequent paper (10, p. 229, Taf. xx, fig. 70). The species differs from allied forms in the shape of the body, the lamellae, and the pseudostigmatic organs.

The Irish examples vary but little in size and shape (fig. 33*a*), the length is about 539  $\mu$ , and the breadth 341  $\mu$ , therefore slightly smaller than the Norwegian specimens. The form is broadly ovate, shoulder flaps very pronounced, a little more so than in *N. similis*, the end of the body is slightly

pointed in most specimens, and there are four pairs of small markings, rather like gland openings, near the margin of the abdomen. Hair armature short and sparse.

Cephalothorax broad and bluntly pointed, lamellae long and rather broad, widest at the distal extremity, their hairs are strong and finely spinous, and spring from the outer angle of the lamellae; translamella absent, or extremely faintly marked; interlamellar hairs widely separated. The prostigmatic organs are rather short, with distinctly clubbed, and finely setose, extremities (fig. 33*b*). Front tibia armed with a prominence and tactile hair.

*Locality*.—Mulranny, common on the sandhills and under stones on the sea-shore near high-water mark in September.

**Notaspis similis** Michael.

Clare Island, The Bill Rocks, Achill, Delphi and the Westport district, common in moss.

*Distribution*.—Finland; Holland; Britain.

**Notaspis lucorum** (C. L. Koch).

Common in moss. Clare Island, Achill, and Westport district.

*Distribution*.—Spitzbergen to Italy.

**Notaspis oblonga** (C. L. Koch).

Achill Island, in moss and amongst fallen pine-needles, September; Westport (Knappagh Wood, in moss).

*Distribution*.—A widespread species, Finland to Italy.

**Notaspis lacustris** Michael.

Mulranny, in sphagnum pools, September; Delphi; Croaghpatrick at about 600 feet, in sphagnum, October.

*Distribution*.—Finland; Germany; Holland; Italy; Britain.

**Dameosoma lanceolata** (Michael).

Clare Island; Achill; Westport (Croaghpatrick, 600 feet, in sphagnum, October).

*Distribution*.—Holland (Oudemans); England (in moss, Michael); Scotland (Forth area, Evans). I have also found this species in Dollymount saltmarsh, Co. Dublin, in October.

**Dameosoma splendens** (C. L. Koch).

Achill, several specimens in moss, September.

*Distribution.*—Scandinavia (Trägardh) to Italy.

**Dameosoma clavipectinata** (Michael).

Achill Island, in moss, September.

*Distribution.*—Not known. Finland (Nordenskiöld); Lapland (Trägardh); England (Michael); Scotland (Evans).

**Suctobelba trigona** (Michael).

Westport (Croaghpatrick, 600 feet, in sphagnum, October).

*Distribution.*—Italy (frequent in moss, Paoli, 76); England (Michael); Scotland (Evans).

**Damaeus clavipes** (Herm.).

Clare Island, Achill, and Westport district.

Evidently a fairly common mite in moss throughout the district, which seems poor in the species of this genus.

*Distribution.*—Finland to North Africa (Algeria).

**Damaeus geniculatus** (L.) C. L. Koch.

This common species occurs at Lambay and other localities in the Dublin and Wicklow districts.

**Damaeus vertilicipes** Nicolet.

Westport (Knappagh Wood, several in moss, August).

*Distribution.*—Finland; Germany; Holland; France; Britain.

**Hermannia convexa** (C. L. Koch).

Clare Island, Achill and Westport district. Common in moss and under bark.

*Distribution.*—Sweden; Germany; Holland; France; Britain.

**Hermannia scabra** (L. Koch). (*H. nodosa* Michael.)

The Bills Rocks, in old nests of sea-birds, June; Mulranny, abundant under stones on the sea-shore just above high-water mark, September; Westport, on shore, July.

*Distribution.*—Finland (under wood on the sea-shore, Nordenskiöld); Siberia and Novaya Zemlya (L. Koch); Germany (Sellnick); Sweden; England (Michael); Scotland (Evans).



**Hermannia reticulata** Thor.

Clare Island, Achill, and Westport district.

*Distribution.*—Evidently a widespread species in northern latitudes, Novaya Zemlya; Spitzbergen; Baring Island; East Greenland; Holland; Britain.

**Hermannia bistriata** (Nicolet).

Clare Island, Achill, and Westport district. Common in moss.

*Distribution.*—A widespread European species. The specimens recorded as *H. carinata* Kramer, from Lambay (31) are to be referred here.

**Hermannia nanus** (Nicolet).

Clare Island, Achill, and Westport district.

The commonest species of the genus, occurring in moss in all parts of the district.

*Distribution.*—Finland to Italy.

**Nothrus sylvestris** Nicolet.

Clare Island, Achill, and Westport district.

*Distribution.*—Finland (Nordenskiöld) to Algeria (Michael).

**Nothrus palustris** C. L. Koch.

Clare Island, in moss, October; Achill, adults in moss and nymph under bark, September; Westport (Knappagh Wood, a few in moss, August).

*Distribution.*—Widespread. Finland to Italy.

**Nothrus spinifer** C. L. Koch.

Clare Island, a few specimens in moss gathered on Croaghmore mountain, July. I have also found this species on Lambay and under bark of decayed fir trees at Glendalough, Co. Wicklow.

*Distribution.*—Germany; France; Italy; Algeria; Britain.

**Nothrus bicarinatus** C. L. Koch.

Achill Island, under bark and amongst fallen pine needles, September.

*Distribution.*—Germany; Holland; France; Italy; Britain.

**Nothrus segnis** (Herm.).

Clare Island, in moss, adult in March, nymph in July; Achill, in moss; Mulranny, in moss, and off conifers, September.

*Distribution.*—Widespread. Finland to Italy.

*Nothrus invenustus* Michael.

Not uncommon under lichens growing on large boulders on the south shore of Howth, near the Baily lighthouse, county Dublin.

*Nothrus horridus* (Herm.).

The nymphal form has been found on Lambay, county Dublin.

*Nothrus teleproctus* (Herm.).

Abundant under stones amongst heather on Lambay and also at Howth, county Dublin.

***Malacoethrus glaber*** (Michael).

Westport, common on the slopes of Croaghpatrick in wet sphagnum, October.

The statement that the cuticle of this species is "smooth, but not shining, without any reticulations" (48, p. 525) must be understood in a comparative sense. In a note received from Mr. Michael he remarks "the word smooth in my description (British Oribatidae) must be taken only as compared with reticulated. I give 'not reticulated' in a bracket as the equivalent and explanation of 'smooth.' When there is an entire absence of all punctures and granulations I use the word 'polished.'" It seems worth emphasizing this point as in one or two recent descriptions of allied continental species it seems to have been misunderstood. As a matter of fact in the present species both the cephalothorax and the abdomen are exceedingly finely punctured, and there are also numerous light-refracting punctures.

*Malacoethrus* was introduced as a new sub-genus by Berlese with *M. egregia* as the type species, it would really seem to be worthy of generic rank on account of the structure of the legs, and also of the pseudostigmatic area. Berlese gives a very short diagnosis which is as follows "Organa pseudostigmatica setula nulla vel inconspicua aucta. Pedes curti, crassiusculi, tarsi apice spinis validis armatis" (7).

*Distribution.*—England (amphibious, in moss and sphagnum, Michael); Scotland (Evans). An allied species *M. sphagnicola*, Trägårdh, has been recorded from Swedish Lapland (88).

***Malacoethrus tardus*** (Michael).

Clare Island (Croaghmore), and on Croaghpatrick. Evidently rather a common species in sphagnum in both of these localities.

In these specimens the anterior side corners of the abdomen are almost square and do not form rounded projections. This refers, however, to dead specimens, and Mr. Michael remarks *in lit.* that in these the appearance of

projecting rounded anterior corners to the abdomen is lost. The notogaster of this species is finely punctured and interspersed with larger punctures, and there is a marginal row of six hairs.

*Distribution.*—England (Cornwall, on lichen growing on granite rocks, Michael).

***Malacoonthrus monodactylus* (Michael).**

Clare Island in sphagnum, August; Westport, common amongst sphagnum on Croaghpatrick, October.

The cephalothorax of this curious species is distinctly granular, and the abdomen is finely punctured with numerous larger punctures. The hinder margin is rather more acuminate than it is figured in "British Oribatidae" (48).

*Distribution.*—England (on moss and sphagnum, Michael); Scotland (Evans). An allied, if not identical, species *M. globiger* Trägårdh has been described from Swedish Lapland (88).

*Lohmannia insignis* Berl.

Found associated with Springtails (*Lipura ambulans*) attacking the roots of Kidney Beans in a Dublin garden during the month of June (Carpenter 27).

***Hypoethonius rufulus* C. L. Koch.**

Common in moss on Clare Island and Achill, and in the Westport district.

*Distribution.*—Finland to Italy.

***Brachychthonius brevis* (Michael).**

A few examples of this minute species were found amongst sphagnum moss on the slopes of Croaghpatrick in October.

This genus was recently described (10, p. 219) by Berlese with *Hypoethonius brevis* as the type. In the same reference three new varieties of the species are briefly described. The Croaghpatrick specimens agree with the typical form as described by Michael (48, p. 539). The pseudostigmatic organs have the extremities strongly fusiform and setose. In addition to the rostral hairs there are two other pairs of hairs on the cephalothorax of this species. An anterior pair in a position which corresponds to that of the lamellar hairs of the typical oribatid and the other pairs springs from a prominence immediately in front of the pseudostigmata. The Irish specimens measure from about  $200\mu$  to  $210\mu$  in length, by  $135\mu$  in breadth.

*Distribution* —Italy (Berlese); England (Michael); Scotland (Evans); Lapland (Sarekgebirge, var. *lapponica* Trägårdh).

**Hoploderma magnum** (Nicolet).

Clare Island, Achill, and Westport district. Abundant in moss, amongst fallen pine needles, and under bark.

*Distribution*.—Germany; Holland; France; Britain.

**Hoploderma dasypus** (Ant. Duges).

Clare Island, Achill, and Westport district. Common

*Distribution*.—Finland to North Africa (Algeria).

**Phthiracarus arduus** (C. L. Koch).

Clare Island, in sphagnum and under bark.

*Distribution*.—Finland; Germany; Holland; Britain.

Sub-order **SARCOPTOIDEA**.Family **HYADESIDAE**.**Hyadesia fusca** (Lohm.).

1894. *Lentungula fusca* Lohmann **43**, p. 86. 1899. *L. fusca* Canestrini and Kramer **26**, p. 136. 1901. *L. fusca* Michael **51**, p. 196 (reference). 1907. *H. fusca* Lohmann **45**, p. 368.

A number of specimens were found amongst coralline seaweeds in rock-pools on the coast of Clare Island in July, with sea mites of the genus *Rhombognathus*.

This would appear to be the first recorded occurrence of this marine species on the coasts of Britain. It is closely allied to *H. algivorans*, described by Michael (**51**) from brackish water on the coast of Cornwall. Lohmann separates the two northern<sup>1</sup> species as follows:—

Stalked claw of the first leg very small, much shorter than the strong end claw of the fifth leg segment; claw of the first pair of legs much shorter than that of the second pair; claw of the last pair of legs without adjacent tooth at the base. Length of female 380 $\mu$ , . . . *H. algivorans* (Mich.).

Stalked claw of the front legs only a little shorter than the strong end claw of the fifth leg segment; claw of the first two pairs of legs of about equal length. Length of female 530 $\mu$ , . . . *H. fusca* Lohm.

Apart from its larger size *H. fusca* may also be known by the presence of a narrow chitinous plate on the front margin of the body, and the palpus has only two free segments. The Clare Island specimens agree in every respect with *H. fusca* except that they are a shade smaller.

<sup>1</sup> Two other species are found in the southern ocean, i.e., *H. uncinifer* Mégnin at Tierra del Fuego (**47**), and *H. kerguelensis* Lohmann amongst algae on the coast of Kerguelen (**45**).

There seems to be no doubt that the genus *Lentungula* is synonymous with the previously described genus *Hyadesia* notwithstanding the fact that the latter was described from an immature form. The general structure, and especially of the peculiar claw armature, puts this fact beyond doubt. Consequently as *H. uncinifer* Mégnin is the type species the name of the family (or sub-family if preferred) must be changed accordingly.

*Distribution.*—*H. fusca* has been recorded from the coasts of the North Sea (Heligoland), and the Baltic (Rügen, Kiel).

Family TYROGLYPHIDAE.

**Glycyphagus domesticus** de Geer.

**Tyroglyphus siro** (Linn) Gervais.

**Tyroglyphus longior** Gervais.

Specimens of these three common and widely distributed species were found in the Westport district.

**Tyroglyphus Wasmanni** Moniez.

A few specimens, in the hypopial nymph stage, were found on ants in a nest of *Formica fusca* at Mulranny, Co. Mayo, in the month of September.

As far as I can ascertain this is the first definite record of this ants' nest mite from the British Isles. The specimens agree closely with Mr. Michael's excellent description and figures of the hypopus of this species, except that the shape is more regularly oval and the end of the body is not truncated; however, the slightest pressure would cause a change in the shape of this delicately organized creature. There is also a pair of small suckers on the first pair of epimera.

With regard to the occurrence of this interesting species in Britain Mr. Michael remarks: "I am not quite sure that it is found in Britain—I have a strong impression that it is so" (51). As long ago as 1881 Mr. Parfit found the early stages of an acarus on the abdomen and antennae of ants in a nest near Exeter, in all probability this was referable to the present species, which was not described until 1892 (*Entom. Mo. Mag.* xviii, p. 43).

*Distribution.*—In natural nests of *Lasius fuliginosus* in Holland, and in artificial nests at Prague (Wasmann).

Four additional species of Tyroglyphidae have been found in Ireland. They are—

*Histiostoma rostro-serratum* Mégnin. A few specimens found in company with other tyroglyphid mites attacking decayed bulbs, Dublin, January.

*Histiogaster corticalis* (Michael), in a bulb of *Hippeastrum* (Carpenter, Inj. Insects, Econ. Proc. R. Dublin Soc. i, p. 603).

*Carpoglyphus anonymus* (Haller). Specimens of this mite were found feeding on jam, Dublin, June.

*Rhizoglyphus echinopus* (Fumouze et Robin), a common and destructive species, occurring in various kinds of bulbs, and in decayed potatoes.

Sub-Order **THROMBIDOIDEA.**

Family **EUPODIDAE.**

**Eupodes variegatus** C. L. Koch.

The Bills Rocks off Clare Island, in refuse from old nesting sites of sea-birds, June.

*Distribution.*—Germany; Italy; and Britain.

**Rhagidia terricola** (C. L. Koch).

Common under stones on the Mulranny sand-hills in September.

*Distribution.*—Europe (Berlese).

**Rhagidia halophila** (Lab.).

There is referred to this species a rather large *Rhagidia*, which was found under stones partly embedded in sandy mud, &c., and also running with great speed on rocks, between tide-marks, on the shore at Mulranny in September.

It was recorded by Moniez in his paper on marine mites and insects under the name of *Norneria halophila* Lab. His remarks concerning its habits apply excellently to its occurrence on the Irish coast, and are worth repeating: "Nous avons assez souvent trouvé sous les fucus ou sur les pierres que recouvre la marée, un Acarien d'un beau rouge que nous avons aussi rencontré hors de la portée des eaux de la mer, sur la falaise, ou même à l'intérieur des terres, dans des stations variées, toujours un peu humides. Il est remarquable par son extraordinaire agilité et par les mouvements circulaires qu'il décrit volontiers; il est de nature fort délicate et on l'endommage facilement en le voulant prendre" (52).

As the species has not been satisfactorily described the following notes on its structure may prove useful. The Irish specimens (female) measure as much as  $1280\mu$  in length; breadth  $640\mu$ . Colour during life, orange. The length of the mandible from its base to the tip of the fixed chela is about  $352\mu$ ,

breadth  $154\mu$ ; length of free chela  $143\mu$ . Body of the mandible with an evenly rounded base, not truncated; both chelae are without teeth, but under a high magnification the edge of the free chela is seen to be very minutely serrated. Palps rather large, length about  $363\mu$ ; dorsal surface of the segments armed with long bristles as follows:—Second segment, two widely separated bristles; third, three bristles, middle one the longest; fourth, with nine long setose bristles.

*Distribution*.—Coast of France (Moniez).

**Penthaleus ovatus** C. L. Koch.

Mulranny under stones on the sea-shore, September.

Identified from a single specimen of which the colour during life was not noted. It agrees, however, with Berlese's description and figures of this mite (1, Fasc. lx, n. 2), except in size. The Italian specimens are recorded as measuring  $400\mu$ , while the Mulranny example is  $640\mu$  in length, not including the rostrum.

*Distribution*.—Germany; Italy; Britain.

**Halotydeus hydrodromus** (Berl. et Trouess.) var. **albolineatus** nov.

The genus *Halotydeus* was founded by Berlese in his work on Italian mites (1, Fasc. lx, n. 10). The type species is *H. hydrodromus*, one of the littoral mites discovered by Trouessart on the coast of France and recorded in a joint paper with Berlese in 1889 (17). The genus may be readily distinguished from *Notophallus* by the six segmented legs, and the terminal position of the anal foramen.

The form here recorded is in all probability a variety of the type species from which it differs noticeably in colour.

Berlese describes, and figures, the colouring of *H. hydrodromus* as follows:—“Color corporis nigro olivaceus, macula dorsi media rufescenti, pedibus rostroque cinnabarino roseis. Oculi albo micantes.” In the Irish specimens the ground-colour of the body is black with a *longitudinal white stripe* along the middle of the back, this line widens out a little at each end and extends on to the cephalothorax. The legs and mouth organs are bright red. The following is a short description of this variety:—

Length about  $800\mu$ ; shape and general structure as in the type. Cephalothorax with three pairs of hairs. There is a shoulder bristle, a double row of a few hairs on the dorsum, and there are about five pairs of hairs grouped on the posterior third of the animal; all of these hairs are straight and finely spinous. Second palp segment stout, very strongly

arched, with two spinous hairs; third segment much smaller with three stout bristles; end segment short and conical with a terminal row of bristles consisting of a stout, strongly pectinated hair and immediately over this a row of four shorter flexed spines, which are pectinated only at their bases. Palps as figured for *H. hydrodromus* (1, Fasc. lx, n. 10) except that the movable claw is more strongly bent. Berlese figures three pairs of hairs on the lower face of the capitulum though he remarks: "Capitulum setis duabus simplicibus auctum." In the present form there are two, strongly pectinated, hairs in this position.

*Localities.*—Under stones between tide-marks on the sea-shore at Mulranny, Co. Mayo. On more than one occasion large colonies of adults and young forms were found under stones partly embedded in mud well below high-water mark. I have also observed this species running about on rocks exposed by the tide at Malahide on the Dublin coast in company with other littoral mites.

#### Family BDELLIDAE.

##### *Bdella capillata* Kramer.

1881. Kramer 37, p. 446. 1891. Berlese 1, Fasc. lix, n. 6 (var. *Berlesei* Trägårdh). 1902. Trägårdh 85, p. 17.

Clare Island in rock-crevices between tide-marks on the sea-shore; Mweelaun (a wave-swept rock); Louisburgh and Westport districts.

An interesting point concerning this species is whether the ordinary form found under stones, &c., is identical with the form occurring between tide-marks on the sea-shore. In his paper on the littoral species of *Bdella*, Trägårdh describes two shore-frequenting varieties of this species, *i.e.*, var. *pallipes* and var. *pallipediformis*. I have found examples of *B. capillata* in both habitats, and cannot say that they differ in any respect, although it is not unlikely that one or other of these littoral varieties may occur on the Irish coast. The following is a short description of the essential characters of the form here recorded; it applies equally to specimens found inland and on the sea-shore.

Length, including rostrum, from 2 to 2.50 mm. The measurements of the last four palp segments are about 473 $\mu$ , 99 $\mu$ , 187 $\mu$ , 473 $\mu$ . Grouped towards the end of the second palp segment are five bristles, four of these are arranged in pairs, the proximal half is without bristles, ventral side with only one bristle, which is placed near the base; third segment, one bristle; fourth with four bristles. In dorsal view the fifth palp segment carries about twelve bristles, and there is a group of three others on its extremity; they



are arranged much as in Trägårdh's figure of *B. littoralis* (85, pl. i, fig. 1). As Kramer points out in his description of *B. capillata*, the central one of these terminal hairs about equals half the length of the segment, and is a little longer than the others. Upper side of mandible with eleven or twelve pairs of hairs, and on the ventral side of rostrum there are four pairs.

*Distribution*.—Scandinavia; Germany; Italy; Britain.

***Bdella longirostris* (Herm.) Lam.**

Mulranny, Westport, Castlebar, and probably throughout the district.

This brightly coloured yellow, black, and red mite is well figured by Berlese (1, Fasc. xlv, n. 6). It was found commonly in a variety of situations, on sand-hills, under stones on the banks of mountain streams and on more than one occasion in sphagnum pools.

*Distribution*.—Germany; France; Italy; Britain.

***Bdella vulgaris* (Herm.) Koch.**

Common. Clare Island, in moss from Croaghmore; Mulranny; Croaghpatrick amongst sphagnum, October.

*Distribution*.—Scandinavia; Germany; France; Italy; Britain.

***Bdella decipiens* Thorell.**

1871. *B. decipiens* Thorell 81, p. 699. 1890. *B. vulgaris* var. *littoralis*. Moniez 52, p. 196. 1902. *B. decipiens* Trägårdh 85, p. 21.

Clare Island, in rock crevices between tide-marks; Mulranny, abundant under stones between tide-marks at Bellacragher Bay in September.

As a result of a careful comparison of the shore-frequenting *Bdellas* Dr. Trägårdh gives his reasons for believing that they are all to be referred to two species, of which one is the present species, and that it is probably a variety of *Bdella vulgaris* (85, p. 23).

*Distribution*.—Has been found on the Siberian coast; also in Sweden and Spitzbergen.

***Cyta latirostris* C. L. Koch.**

Mulranny, a few specimens found under stones on the sand-hills; The Bill Rocks, in sea-birds' nests; Westport district.

*Distribution*.—Apparently a common European species ranging from Finland to Italy.

## Family RAPHIGNATHIDAE.

**Cryptognathus lagena** Kramer.

1879. Kramer, "Arch. f. Naturgesch." Jahrg., xlv, p. 156. 1882. Haller  
30, p. 313. 1885. Berlese 1, Fasc. xxii, n. 9.

Westport, a single specimen found amongst moss from Knappagh Wood in July.

This is a beautiful and easily recognized species. It is a bright scarlet mite of long oval form, with a transparent chitinous collar which projects from the anterior end of the body and partly encloses the capitulum. The skin is finely punctured and is also distinctly reticulated. An excellent figure of the species is given by Berlese in the above reference.

*Distribution.*—Germany (Kramer and Haller); Italy (Florence and the Apennines, Berlese).

**Bryobia praetiosa** C. L. Koch.

Abundant under stones on the Mulranny sand-hills, and under refuse on the shore near Westport.

*Distribution.*—A common European species.

*Tetranychus telarius* (L.) Duges.

The common "red spider" is an abundant species in gardens in Dublin and elsewhere in Ireland. I have noticed it in swarms on violets during the month of October.

## Family ERYTHRAEIDAE.

**Actineda vitis** (Schrank) Berlese.

Clare Island and the Westport district; a common species on plants in woodland localities.

*Distribution.*—Widespread in Europe, also found in South America (Berlese).

## Family RHYNCHOLOPHIDAE.

**Rhyncholophus regalis** C. L. Koch.

Clare Island, under stones on hills, July; Westport district.

*Distribution.*—Widespread in Europe.

**Rhyncholophus nemorum** C. L. Koch.

Westport district; Mweelrea mountains, June to September.

*Distribution.*—Germany; Italy; Britain; &c.

**Rhyncholophus rubripes** Trouessart.

1889. *R. mineatus* var. *rubripes* Berl. et Trouessart 17; see also Trouessart 90, p. 754. 1889. Moniez 52, p. 196.

Westport and Mulranny, locally common on the sea-shore, July and September.

This brightly coloured mite is a denizen of the sea-shore where it may be found under stones and running actively on rocks exposed by the receding tides below high-water mark.

During life the body is red with darker markings on the back, the legs and mouth parts are of a bright red. The length of the Irish specimens ranges from about 1024 $\mu$  to 1434 $\mu$ , and the breadth is 870 $\mu$ . The shape varies, as a rule the shoulders are well marked, and the end of the body is more or less truncated. The abdomen is set with a comparatively dense covering of rod-like hairs, those of the fore-body are shorter and somewhat adpressed. The cephalothorax is bluntly pointed in front; form of the crista as is usual in the genus, median rod rather broad, frontal sensory area with eight or nine stout bristles (average length 50 $\mu$ ) in front of the two long sensory hairs. Palps long and very stout, last segment with a stout, club-shaped appendage which extends a little beyond the tip of the terminal claw, apex covered with strong curved bristles. The legs are long and robust, tarsus of the first pair not very strongly arched, its length is about 175 $\mu$ , breadth 90 $\mu$ .

*Distribution.*—Coasts of France and the British Isles. The mite described from the Scotch coast under the name of *Ritteria hirsutus* George ("The Naturalist," 1910, p. 182), is to be referred to the present species. At Malahide on the Dublin coast I have found it abundantly, in company with *Hydrogamasus Giardi*, on rocks studded with the small acorn-shell *Balanus balanoides* well below high-water mark. Trouessart observed it under similar conditions on the French coast, and remarks of the former species: "Ce Gamase vit en commensal sur *Balanus balanoides*."

**Rhyncholophus mineatus** (Herm.), Berl.

Found in the Westport district.

*Distribution.*—Widespread in Europe.

**Rhyncholophus norvegicus** Sig. Thor.

1900. *Ritteria norvegica* Sig. Thor., Norges Rhyncholophidae, Christiania Vid.-Selsk. Forhandl. No. 3.

I am inclined to refer to this species a *Rhyncholophus* which was found not uncommonly in the Westport district during April and May. It does not seem to agree with any one of the species described from Germany or Italy by acarologists.

It is a robustly built species ranging from  $2,200\mu$  to  $2,380\mu$  in length, and the breadth is about  $1,300\mu$ . The cephalothorax is sharply pointed in front and, in most specimens, there is but little demarcation from the abdomen. Thor describes the crista as follows:—"The crista lies in the centre of an oblong, thinnish, chitinized plate (something as in the case of *R. vertex* Kramer). The actual linear-shaped crista widens posteriorly in a diamond or circular shape with two hair pores and extends anteriorly into the prominent chitinized edge where there are from 7 to 9 smaller hairs and behind these at the edge of the crista the usual two large hair pores."

***Rhyncholophus tardus* sp. nov.** (Pl. VIII, fig. 34*a-d*).

The following is a short description of a slender-legged *Rhyncholophus* which was found under stones on the sea-shore at the head of Bellacragher Bay, near Mulranny, in September. It does not appear to have been previously described.

The shape of this mite (fig. 34*a*) is long oval, rounded at both extremities; the length, including apex of crista, is about  $1,638\mu$ , breadth  $844\mu$ . Colour orange red. There is only a sparse covering of hairs; on the anterior parts of the body these are short and curved, on the posterior margin they are more closely set, longer, and all are minutely spinous (fig. 34*b*). The cephalothorax is indistinctly marked off from the abdomen by a slightly convex groove. Eyes minute, consisting of a single lens on each side. The crista (fig. 34*c*) is a slender rod in the centre of a very thin chitinous plate; distal sensory area of the usual triangular shape, sharply pointed, with two long sensory hairs, and immediately in front of these is a *single*, forwardly directed hair which reaches a little beyond the anterior end of the body. Proximal sensory area as usual in the genus. The legs are slender and rather weakly developed; the first pair are considerably shorter than the body, with elongate tarsi (length  $195\mu$ , breadth  $65\mu$ ), which are but little swollen on their dorsal margin somewhat resembling *Thrombidium* in that respect; the lengths of the four pairs are approximately as follows:— $1078\mu$ ,  $594\mu$ ,  $650\mu$ ,  $891\mu$ . The shape of the rostrum and palps is shown in dorsal view (fig. 34*d*).

***Rhyncholophus sabulosus* sp. nov.** (Pl. VIII, fig. 35*a, b*)

The following are some comparative notes on a small species of *Rhyncholophus* which was found not uncommonly on the Mulranny sandhills, County Mayo, during the month of September. It is a noticeable species during life on account of its bright red colour.

The general structure closely resembles that of the preceding species (*R. tardus*). Shape oval, rather elongate (fig. 35*a*). Size smaller. Length,

including the apex of the crista, about  $960\mu$ , breadth  $506\mu$ . Hair armature sparse and slightly more setose than in *R. tardus*. The crista is of an exactly similar type, with only one hair in the front of the anterior sensory area, the latter is less acuminate, and the rod of the crista is decidedly shorter.

The leg measurements are approximately as follows:— $605\mu$ ,  $385\mu$ ,  $407\mu$ , and  $594\mu$ ; they are comparatively shorter and more robust than in *R. tardus*, and the tarsi (length  $140\mu$ , breadth  $65\mu$ ) of the first pair of legs are noticeably less elongate (fig. 35*b*).

***Smaris expalpis* (Herm.) Koch.**

*S. impressa* Koch, **34**, Fasc. xv, fig. 1. 1882. *S. impressa* Haller **30**, p. 314. 1887. *S. expalpis* Berlese **1**, Fasc. xxxix, n. 2.

Clare Island (Creggan Lough, June); Mulranny, September; Westport district (Belclare, June).

This interesting mite is of decidedly aquatic habits and seems to be especially fond of sphagnum pools, at least this is so in the Clare Island district. A few fully grown specimens were found during the month of June, and immature examples were met with in September. I have also collected this species from a pond on the bank of the River Corrib near Galway, as well as in other parts of Ireland.

*Distribution*.—Scandinavia; Germany; France; Italy; Britain (Dr. George records it from Lincolnshire, **28B**).

Family THROMBIDIDAE.

***Eothrombium siculum* Berl.**

A single specimen occurred amongst moss near Lough Fenagh in October.

The measurements of this specimen are smaller than those recorded for the species by Berlese (**16**, p. 40). The length of the body is about  $742\mu$ ; length of tarsus  $165\mu$  by  $66\mu$  (dorsal view); length of tibia  $110\mu$ . There is a rather sparse covering of somewhat adpressed spines ranging in length from about  $45\mu$  to  $60\mu$ .

Berlese separates this species from the allied *E. echinatum* chiefly on account of its smaller size and more slender legs. In all probability the Lough Fenagh specimen is an immature example of the present species.

*Distribution*.—Sicily (Palermo, in moss, Berlese).

***Podothrombium bicolor* (Herm.).**

A single specimen found in the Westport district in April.

Smaller than the type form as described by Berlese (**13**, p. 68), and possibly to be referred to a variety of the present species. The measurements are length of body  $1690\mu$ , breadth,  $972\mu$ ; length of tarsus  $385\mu$ ,

breadth of same  $132\mu$ , length of tibia  $330\mu$ . In the leg measurements it approaches nearer to Berlese's variety *ciscalpinum*, but the tarsi are longer.

*Distribution.*—Central Europe (Berlese 16).

**Podothrombium filipes** (Koch).

Mulranny, under stone on the sea-shore, September.

In all probability the single specimen found in the above locality is to be referred to a variety of the present species, though the record must be made with reserve until more specimens are found. According to Berlese's table of the species of *Podothrombium* it would appear to belong to the *macrocarpum* group, but the great length of the legs inclines me to believe that the specimen may be a variety of *P. filipes*. The size of the creature and the structure of the palps, &c., also agree with that species. The measurements are as follows:—length of the body about  $1460\mu$ ; the length of the first pair of legs is about  $2048\mu$ ; length of tarsus  $506\mu$ , breadth  $110\mu$ ; length of tibia  $516\mu$ .

*Distribution.*—Norway and Germany (Berlese 16).

**Microthrombidium valgum** George. (Pl. VIII, fig. 36.)

Slopes of Croaghpatrick in wet sphagnum, also in sphagnum pools at Mulranny and Louisburgh, July to October.

This species is allied to *M. pusillum* Herm., it was described under the name of *Otonia valga* a few years ago by Dr. George ("The Naturalist," 1909, p. 423) from a specimen found by Mr. Evans at Aberfoyle. The following is a short description of the Irish specimens:—

The length varies from  $717\mu$  to  $947\mu$ . The colour is red. Shoulders prominent, front margin concave, and the body is strongly narrowed posteriorly. Cephalothorax very small; crista a thick chitinous rod, widened in front to form a lobe-like extremity which projects slightly beyond the front margin of the animal. The eyes are placed immediately in front of the proximal sensory area and *quite close to the crista*. Hair vestiture rather dense, consisting of moderately long ( $25\mu$  to  $30\mu$ ) bristles, these are thickened at the middle, and sharply pointed, with strong secondary hairs. Palps stout, appendage of fourth segment short and very broad, rounded at its extremity with a number of long bristles, all of which are spinous, with the exception of one terminal hair; external spine absent; dorsal comb distinct, consisting of about eight bristles. Legs shorter than the body, tarsus of first pair, in side view, of an oblong shape, a little more than twice as long as broad ( $155\mu$  by  $70\mu$ ); length of tibia about  $90\mu$ .

I am indebted to Dr. George, and also to Mr. Sheppard of the Hull Museum, for a loan of the type specimens of this and the following species.

**Microthrombidium ramosum** (George) var. **similis** nov. (Pl. VIII fig. 37a.)

This well-marked form is allied to *M. sucidum* (C. L. Koch), but differs from it in the shape of the body papillae. A description, with figures, was published by Dr. George in "The Naturalist" for the year 1909.

Apparently the Irish form, of which a single specimen was found amongst moss on Clare Island (June), differs from the type in the shape of the body hairs, and in other details.

The measurements of this variety are as follows:—length of the body, including cephalothorax,  $1126\mu$ , and the breadth is about  $640\mu$ . General structure as in *Microthrombidium*. Crista normal. Eyes placed on the lateral outline of the cephalothorax. The hair armature is very peculiar. The shape of these hairs varies in different parts of the body, on the cephalothorax, and the humeral regions—they are, mostly, pointed bristles all very strongly spinous. Elsewhere on the animal the hairs have thickened extremities, reaching their greatest development, in this respect, on the hinder region of the body, where they are distinctly clavate with four, five, or six pointed lobes or teeth at their extremities. The average length of these hairs, especially on the hinder margin, is about  $40\mu$ . The palps are short, length about  $300\mu$ ; fourth segment wide at the base, and its appendage is large ( $45\mu$  by  $25\mu$ ), near its base is a strong "inferior spine." The legs are robust: length of first pair about  $716\mu$ ; tarsus sub-cylindrical widest near base, length  $250\mu$ , breadth (on side view)  $90\mu$ , length of tibia  $125\mu$ .

In this variety the tessellated hairs are less closely set than in the type; they are not quite so clavate, and the extremities are less deeply branched. The appendage of the last palp segment is shorter (in *M. ramosum* it measures  $60\mu$  by  $25\mu$ ).

**Microthrombidium spinosum** (Can.).

A specimen of this distinct species was found amongst moss on the north-east cliffs of Clare Island in September.

All the measurements of this specimen are a little smaller than those recorded by Berlese (16, p. 157), there is no doubt, however, that it is to be referred here. There are two kinds of body spines, one kind having distinct secondary hairs, and the other is plain and sword-like.

*Distribution*.—Norway; Italy; Britain.

**Microthrombidium simulans** Berl.

Found in the Westport district in April.

This species may be recognized by the strongly fusiform body hairs. There is only one stout external spine near the appendage of the last palp segment. Here again the Irish specimens are smaller than the Italian.

*Distribution.*—Norway, and a variety (*trispinum* Berl.) has been described from Germany (16).

**Microthrombidium calyceigerum** Berl.

Found in the same locality as the preceding species.

This species is remarkable for the peculiarly modified body hairs. These are very strongly clavate and finely setose, with a septate extremity, and though of similar type throughout, they vary considerably in length in different parts of the body. All of these hairs spring from beautifully formed stellate bases.

The form of the body of this species is rather elongate, the Irish specimens varying in length from  $1433\mu$  to about  $1800\mu$ , breadth about  $1000\mu$ . The length of the first tarsus is  $330\mu$ , breadth,  $115\mu$ , thus agreeing closely with the measurement given for this species by Dr. Berlese. On the last palp segment there are five stout spines arranged along the outer side close to the appendage.

*Distribution.*—Norway.

**Microthrombidium subrasum** Berl.

Clare Island, a single fully grown specimen found in June.

A species having an extremely dense covering of almost globular, papilla-like hairs. The measurements differ only slightly from those of the type form.

*Distribution.*—Germany; Italy; Britain.

**Sericothrombium holosericeum** (Linn.).

Clare Island, Achill Island, and the Westport district.

*Distribution.*—Found throughout Europe.

[*Thrombidium* (?) *fucicolum* Brady.

Under this name Brady has described an acarid which was “washed from among the roots of Algae gathered between tide-marks in Roundstone Bay” (19). In a later reference (20) he changes the name to *Thrombidium fuscum*, and remarks that it was subsequently found in fresh water. The Irish localities mentioned are “Bog-pools near Clifden (Connemara), ditches (slightly brackish) near Newport (Mayo), Kinny Lough (Donegal).” The description of this acarid is unsatisfactory and leaves many points in doubt so that the true identity of the creature does not appear to have been settled. The rough figure accompanying the original description somewhat suggests one of the sub-aquatic oribatid mites. It certainly does not belong to the genus *Thrombidium*.]



Family HALACARIDAE.

**Rhombognathus setosus** (Lohm.).

Clare Island, one specimen found amongst coralline seaweeds in July.

*Distribution*.—Recorded by Lohmann from the Baltic (strand and littoral regions to a depth of 19 mètres, 44).

**Rhombognathus notops** (Gosse).

Clare Island, a few examples amongst coralline seaweeds, July.

*Distribution*.—Atlantic (ranging as far north as Greenland, 44). Baltic.

**Rhombognathus pascens** (Lohm.).

Clare Island, common in coralline seaweeds and in Lithothamnion, July; Blacksod Bay, on shore during March (Irish Fisheries Station W. 189). Elsewhere on the Irish coast at counties Dublin and Cork.

*Distribution*.—Atlantic, North Sea, and Baltic. Littoral regions down to 46 mètres (44).

**Rhombognathus Seahami** (Hodge).

Clare Island, in coralline seaweeds and in Lithothamnion, July; Blacksod Bay, in Lithothamnion (Irish Fisheries Station W. 235). Has also been found on the east coast at Howth and Sandycove in February and March.

*Distribution*.—Similar to that of the preceding species.

With regard to the relative numbers in which the species of this genus occur I may mention that of 80 specimens obtained from a small quantity of coralline seaweeds, 66 are referable to *R. pascens*, 10 to *R. Seahami*, 3 to *R. notops*, and 1 to *R. setosus*.

**Halacarus (Halacarus) actenus** Trouess.

Clew Bay, nymph dredged in 24 fathoms in May (Irish Fisheries Station W. 84); Blacksod Bay, adult male in March, and nymphs in weed from the shore, September (Irish Fisheries Station W. 234). Has also occurred adult on a Holothurian at Portmarnock, on the Dublin coast, in February.

*Distribution*.—Atlantic, evidently a widespread species in both the northern and southern oceans, occurring as far south as Kerguelen. Littoral region down to 500 mètres.

**Halacarus (H.) ctenopus** Gosse.

Recorded as occurring on weeds between tide-marks at "Westport and Birterbury Bays" and at the "Isles of Aran (Galway Bay)." (Brady 19.)

*Distribution.*—Littoral region of north-western Europe down to 64 mètres (44), and as far west as the Bermudas (45).

**Halacarus (H.) Basteri** (Johnst.).*H. spinifer* Lohmann 40.

Clare Island, nymph amongst weed on the coast in August (Irish Fisheries Station W. 281); Blacksod Bay, female, with eggs, in March, and nymphs in September. Has also been found at Ardfry on the Galway coast in May (nymph), and on our eastern coast at Howth and Sandycove.

*Distribution.*—A widespread species, occurring in the Baltic, North Sea, English Channel, and the Atlantic, with a variety (*affinis*, Trouess.) in the Mediterranean.

**Halacarus (H.) Southerni** sp. nov. (Pl. VIII, figs. 38*a*, *b*).

This species belongs to the *balticus* group of *Halacarus*, and in some respects resembles *H. floridearum* Lohmann. It differs from the allied species in the small size, in the form of the body, the armature of the first pair of legs, &c. The inner spur of the third palp segment is very small.

FEMALE (fig. 38*a*).—Length about 385 $\mu$ , breadth 240 $\mu$ . Hyaline, with the eyes and a median spot, black. Form very broad, sub-ovate, fore-body produced in a broadly rounded extremity covering most of the capitulum. Side margins indented only at the origin of the third pair of legs, with one shoulder bristle. Dorsal plates rather weakly chitinized and finely punctured. Frontal plate rounded posteriorly; eye-plate oblong and bluntly pointed; hinder dorsal plate long and tongue-shaped; its front margin is truncated, and lies quite close to the frontal shield.

Capitulum (length, including rostrum, 165 $\mu$ , breadth 75 $\mu$ ), with the hinder margin somewhat truncated, and the sides are rounded; rostrum of a rather broad, triangular form, its apex does not reach the end of the second palp segment. The third palp segment is armed with a minute inner spur.

Legs moderately long and robust, first and second pairs of very similar structure. The length of the first leg (fig. 38*b*) is about 350 $\mu$ , dorsal surface of third segment strongly humped before middle, with a pair of distal hairs; fourth segment with one ventral and three dorsal hairs, and near the former is a strong spine; fifth segment with two long hairs in addition to the

terminal pair, ventral side armed with three pairs of hairs, of which the first is much shorter than the others; end segment stout, with a dorsal hair, two terminal hairs, and a short ventral spine.

*Locality.*—Two specimens were dredged in Clew Bay at a depth of 24 fathoms on a bottom of gravel and shelly sand, 25th May, 1909 (Irish Fisheries Station W. 84).

**Halacarus (H.) areolatus** sp. nov. (Pl. VIII, fig. 39*a, b*).

The present species is evidently allied to *H. floridearum* much more so than the preceding form. The much broader frontal plate and the differently sculptured genital area may be noted. The type specimen was unfortunately injured during preparation, so that I am unable to give exact measurements.

**MALE.**—A small species, shape rather long and narrow, and with a weakly chitinized armature. Front margin of the body broad and truncated. There is only one shoulder bristle. First dorsal shield very broad, rounded posteriorly, though in an immature specimen, which possibly belongs to this species, the hinder margin is slightly emarginate. Second dorsal shield tongue-shaped, with a broadly truncated front margin, separated from the first shield by a very narrow space, in which lie two small hair-bearing plates. The eye-plates are rather small and of an oblong shape.

Genito-anal plate large, its front margin reaches well in front of the last pair of leg acetabula; *area genitalis* semi-circular, with numerous hair pores, which are rather widely separated; at the sides of the porous area there is present a group of from twenty to twenty-four distinct areolations in the epidermis (fig. 39*a*).

Capitulum large, basal part very broad and finely punctured; rostrum moderately long, apex not quite reaching the end of the second palp segment. Third palp segment with a strong inner spine. Legs long and slender, and of fairly uniform thickness; the following hair armature applies to the first pair:—third segment, 2 dorsal and 3 ventral hairs; fourth segment, 2 dorsal and 2 ventral hairs; fifth segment, 6 ventral hairs, of which the proximal pair are spur-like, and 4 dorsal hairs; end segment, 1 dorsal and 1 ventral hair, the latter is short and spine-like (fig. 39*b*).

*Locality.*—Found amongst seaweeds on the shore of Blacksod Bay in September (Irish Fisheries Station W. 234).

**Halacarus (Copidognathus) gracilipes** Trouess.

Blacksod Bay, ♀ slightly immature, March; in the same locality both adults and nymphs were found in weed on the shore (Irish Fisheries Station

W. 233), and adults were dredged in four fathoms during the month of September (Irish Fisheries Station W. 232).

This beautifully sculptured species is evidently not uncommon in Blacksod Bay, the only Irish locality in which it has been found. Two varieties have been described by Trouessart; apparently the Irish specimens belong to the typical form.

*Distribution.*—Littoral and abysmal regions, to a depth of 1410 mètres, Trouessart (95). North Sea (44, Atlantic; Mediterranean (92). Trouessart has recorded it from the English coast. “Côtes d’Angleterre, îles Silly (sur une préparation communiquée par M. Brady, confondue avec *Halacarus ctenopus*)” (91).

***Halacarus (C.) gibbus* Trouess.**

Clew Bay, adults dredged in 24 fathoms on gravel and shelly sand, May (Irish Fisheries Station W. 84).

A variable species, of which no fewer than five distinct forms have been described by Trouessart (92, &c.). The Irish specimens were all dredged in the one locality, and in spite of their small size they appear to me to belong to the type form. At least they possess the *sharp* frontal process of the dorsal shield, the longer legs, strong lamellae, and the capitulum is distinctly swollen at the sides. The measurements are about  $400\mu$  in length, by  $242\mu$  in breadth.

*Distribution.*—Has been recorded from the North Atlantic (French coast, and the Azores 91, 44), with varieties in the English Channel, Mediterranean, South Pacific, and in the Indian Ocean (45).

***Halacarus (C.) oculatus* Hodge.**

Blacksod Bay, dredged in four fathoms, September (Irish Fisheries Station W. 232). Has also been found in Malahide Inlet on the Dublin coast, July, and in Kinsale Harbour in from two to five fathoms, May (Irish Fisheries Station R. 45).

*Distribution.*—Apparently a widespread species. Baltic; North Sea; Atlantic (coasts of Britain, and as far south as Kerguelen in the South Atlantic, Lohmann, 45). Trouessart records it from a depth of 1410 mètres (95).

***Halacarus (C.) rhodostigma* Gosse.**

Blacksod Bay, adult dredged in three fathoms, March (Irish Fisheries Station W. 181). Additional localities on the Irish coast are—Valencia

Harbour in from seven to nine fathoms, August (Irish Fisheries Station W. 196), and Kinsale Harbour, two to five fathoms, in weeds during May (Irish Fisheries Station R. 45).

*Distribution.*—North Sea; English Channel; Atlantic. Littoral region down to 58 mètres (44).

*Halacarus (C.) tabellio* Trouess.

Has been found in rock-pools at Malahide and Howth on the Dublin coast.

**Halacarus (C.) lamellosus** var. **septentrionalis** nov. (Pl. VIII, figs. 40*a*, *b*).

There seems no doubt that two examples of a *Halacarus* dredged in Clew Bay are to be referred to a variety of *H. lamellosus*, Lohmann, and in all probability represent a northern form of this species.

**MALE** (fig. 40*a*). Compared with the typical form as described and figured by Lohmann (41) the present variety is much larger (length  $396\mu$ – $410\mu$ , breadth about  $242\mu$ ). The marginal lamellae of the third segment of the first pair of legs are greatly reduced, or are absent. This segment is also relatively longer, about equalling the fifth segment in length. There is only a faint trace of a lamella on the corresponding segment of the second pair of legs. The lateral extremities of the leg segments are strongly produced, as in the type form. Length of first leg (fig. 40*b*) about  $330\mu$ ; there are two short spines and a fine hair on the under surface of the fifth segment.

The extremity of the last palp segment is about on a level with the end of the fourth segment of the first pair of legs, in the typical form it evidently overreaches it considerably. The second dorsal shield is narrower and of more uniform breadth throughout; it is very long, truncated in front, and almost touches the posterior margin of the first dorsal shield.

*Locality.*—Clew Bay, County Mayo, dredged in 24 fathoms on a bottom of gravel and shelly sand, 25th May, 1909 (Irish Fisheries Station W. 84).

*H. lamellosus* has been recorded by Lohmann (44) from the Atlantic littoral (Bermudas, mouth of the Amazons), and from the Pacific Ocean (Sydney). Trouessart has also recorded it as having been dredged on *Lithothamnion coralloides* in the English Channel (Saint-Vaast-la-Hougue). The specimens from the last-mentioned locality are without leg lamellae and possibly belong to the present variety (94).

**Halacarus (C.) Fabricii** (Lohm.)

Blacksod Bay, the nymph and adults were found amongst weeds on the shore during September (Irish Fisheries Station W. 234). Elsewhere on the

Irish coast it has occurred at Ardfry in Co. Galway, in from one to three fathoms during May (Irish Fisheries Station A. 134); and also at Malahide and Howth on the Dublin coast in February and June.

*Distribution*.—Littoral region down to 318 mètres (44). Atlantic (widespread); Baltic.

*Scaptognathus Trouessarti* sp. nov. (Pl. VIII, fig. 41a, b.)

For the single example of this interesting species I am indebted to Mr. R. Southern, who found it amongst material dredged in from 19 to 20 fathoms in Dingle Bay on a bottom of fine gravel during the month of August (Irish Fisheries Station W. 260). The habitat probably corresponds with the very similar ground in Clew Bay (gravel and shelly sand, 24 fathoms) where *H. actenus*, *H. Southerni*, *H. gibbus*, and *H. lamellosus* were found. The species is undescribed, and I have much pleasure in naming it in honour of Dr. Trouessart who has kindly compared my drawings of the creature with his types of *S. tridens* and *S. Hallezi*. It is evidently intermediate between these two species, the only hitherto known representatives of this peculiar genus.

The following characters will serve to distinguish the three species of *Scaptognathus*.

Size larger, total length exceeding 700  $\mu$ .

Capitulum very large, more than half the breadth of the body; end of the second palp segment terminating on its under side in a long, slender spine,<sup>1</sup> which is bent sharply downwards; the extremities of the two strong apical teeth are widely separated. Total length of the animal 750 $\mu$ . . . . *S. tridens* Trouess.

Capitulum much smaller, slightly less than half the breadth of the body; apex of the second palp segment (in dorsal view) ending in a small bluntly pointed lobe, armed with a long fine hair; a long setiform bristle springs from the underside of the segment; both of these hairs are directed inwards; the extremities of the strong apical teeth lie almost in the same plane. Total length about 716 $\mu$ . . . . *S. Trouessarti* sp. nov.

Size smaller, total length 450 $\mu$ .

Capitulum much as in *S. Trouessarti*, but its sides are more evenly rounded; end of the second palp segment without a long inwardly directed hair, instead of which there is a short hair on its outer extremity; ends of the two strong teeth separated.

*S. Hallezi* Trouess.

<sup>1</sup> Corresponding with the "apophyse olécranienne" of Dr. Trouessart's paper on this genus (92).

Apart from the smaller size of the capitulum the present species is apparently more closely allied to *S. tridens* than to *S. Hallezi*. It resembles the former species in size, and in the sculpturing of the dorsal and ventral plates, especially of the first and second epimera. The front margin of the body is very distinctly truncated, and the genito-anal plate is vase-shaped, with pronounced anterior corners; in the latter character it would appear to differ from both of these species.

In the size and shape of the capitulum (length  $286\mu$ , breadth  $138\mu$ ), it closely resembles *S. Hallezi*, but the side margins are rather distinctly angled immediately in front of the basal constriction. The second palp segment is armed as indicated in the preceding table, but there is also on its underside, close to the apex, a stout ventrally directed process, which is not visible when the animal is seen from above.

**Trouessartiella falcata** (Hodge).

Blacksod Bay, nymph and adult in September.

*Distribution*.—Littoral and abysmal regions (44), Baltic, North Sea, and Atlantic, ranging into the Antarctic Ocean (to a depth of 385 mètres, 45).

**Simognathus sculptus** (Brady).

Clare Island, the larva, nymph, and adult occurred commonly on *Lithophyllum incrustans* on the shore during the month of July. The adult has also been found in rock pools at Portstewart in October.

The six-legged larval form of this remarkable species measures about  $330\mu$  in length, including the capitulum and rostrum. It has a comparatively large frontal shield shaped much as in the adult, and there is a small oval plate at the end of the body. Apparently the frontal plate does not alter much during the development of the creature, as the plate armature of the first nymphal stage (length  $614\mu$ , breadth  $307\mu$ ) is practically the same as in the larva.

NOTE.—The type specimens of the new species and varieties described in this paper are preserved in the National Museum, Dublin.

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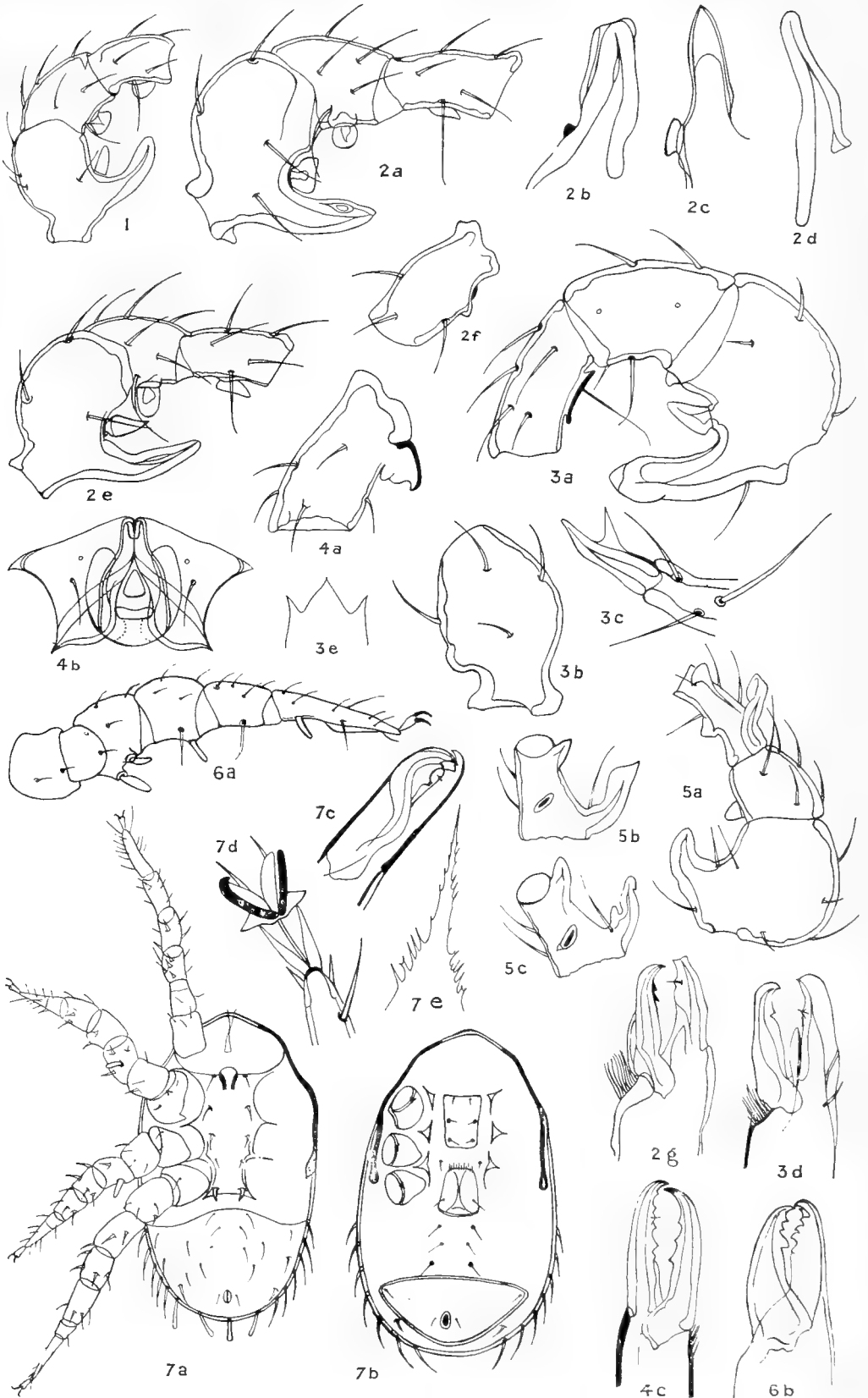
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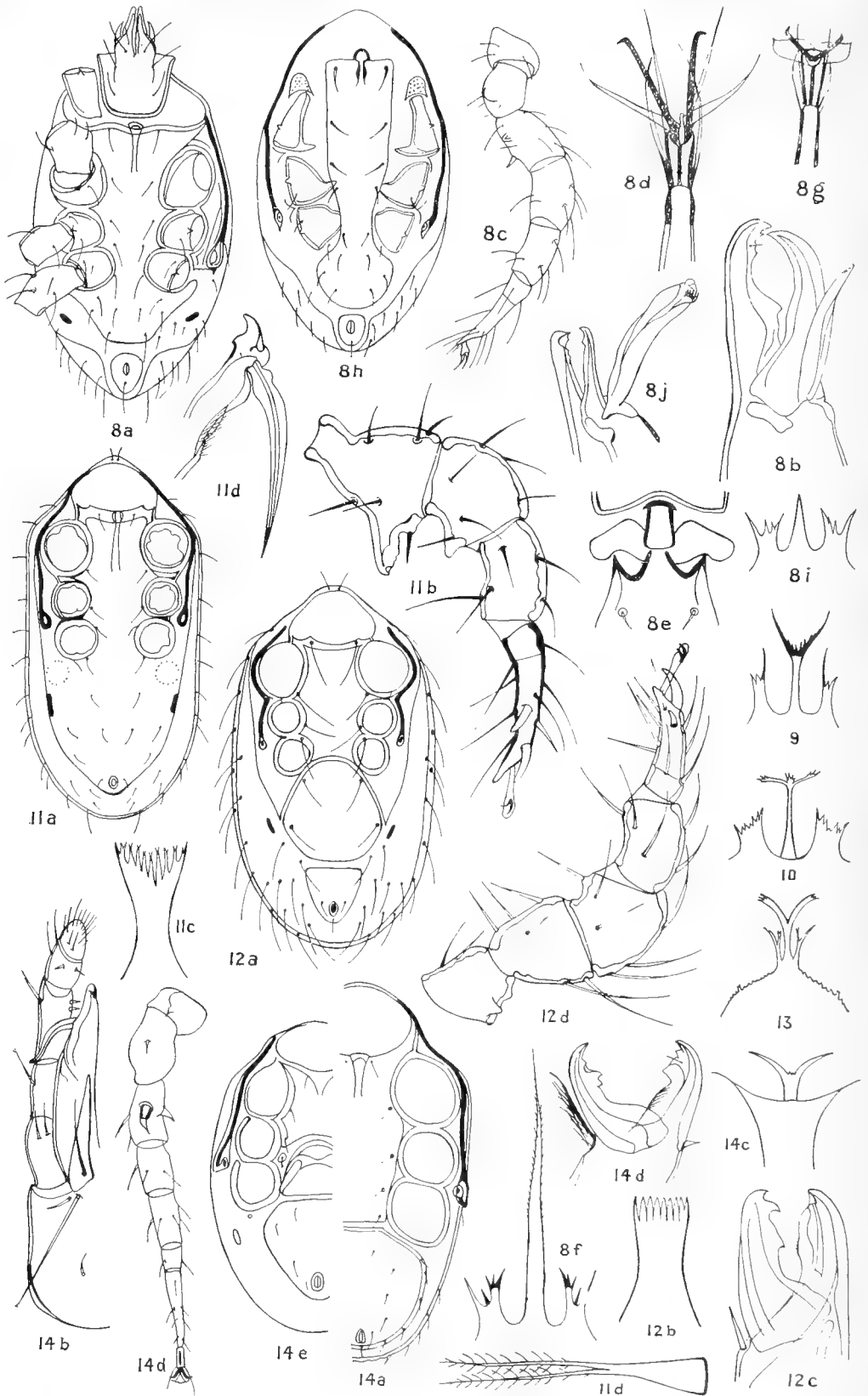
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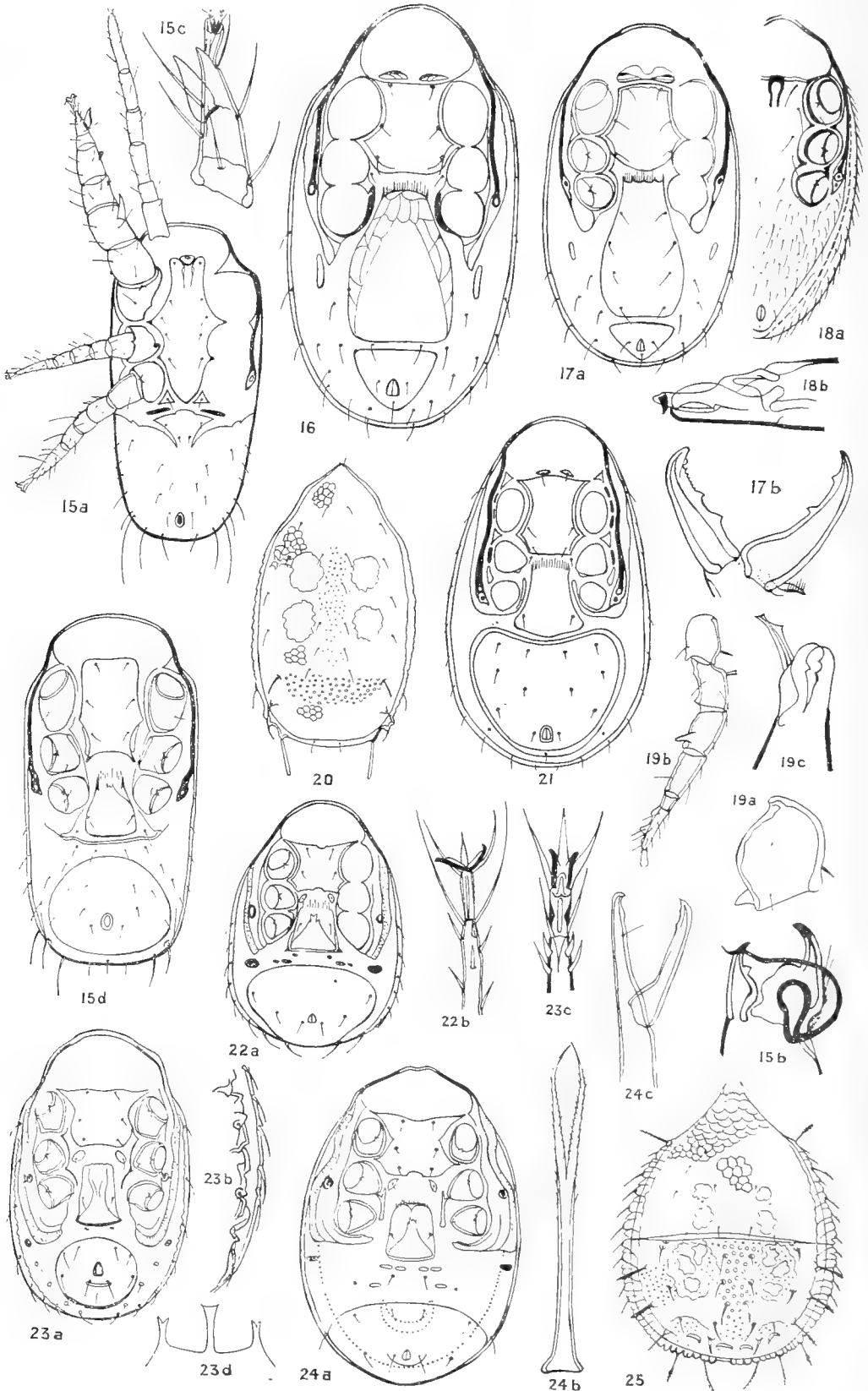




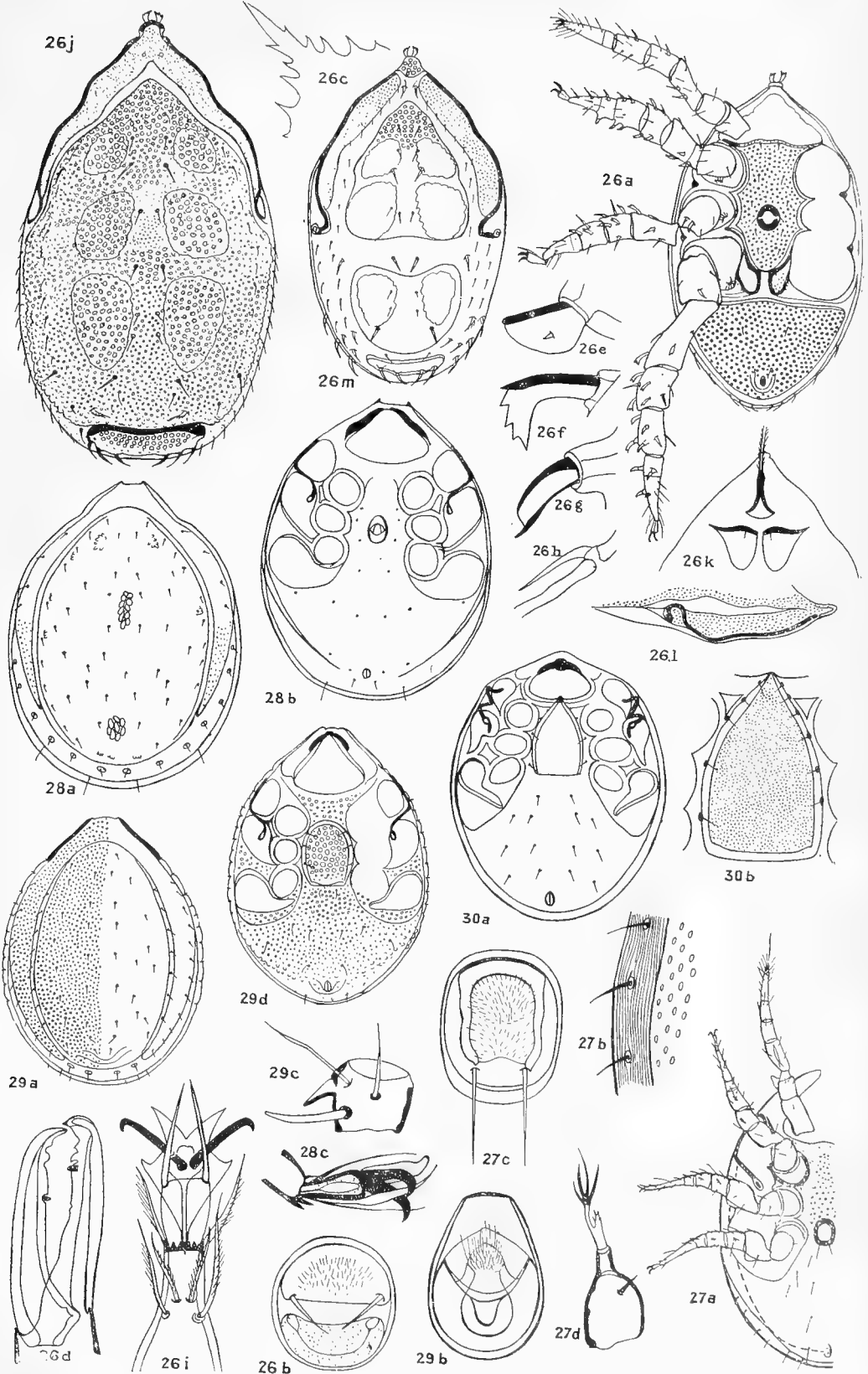






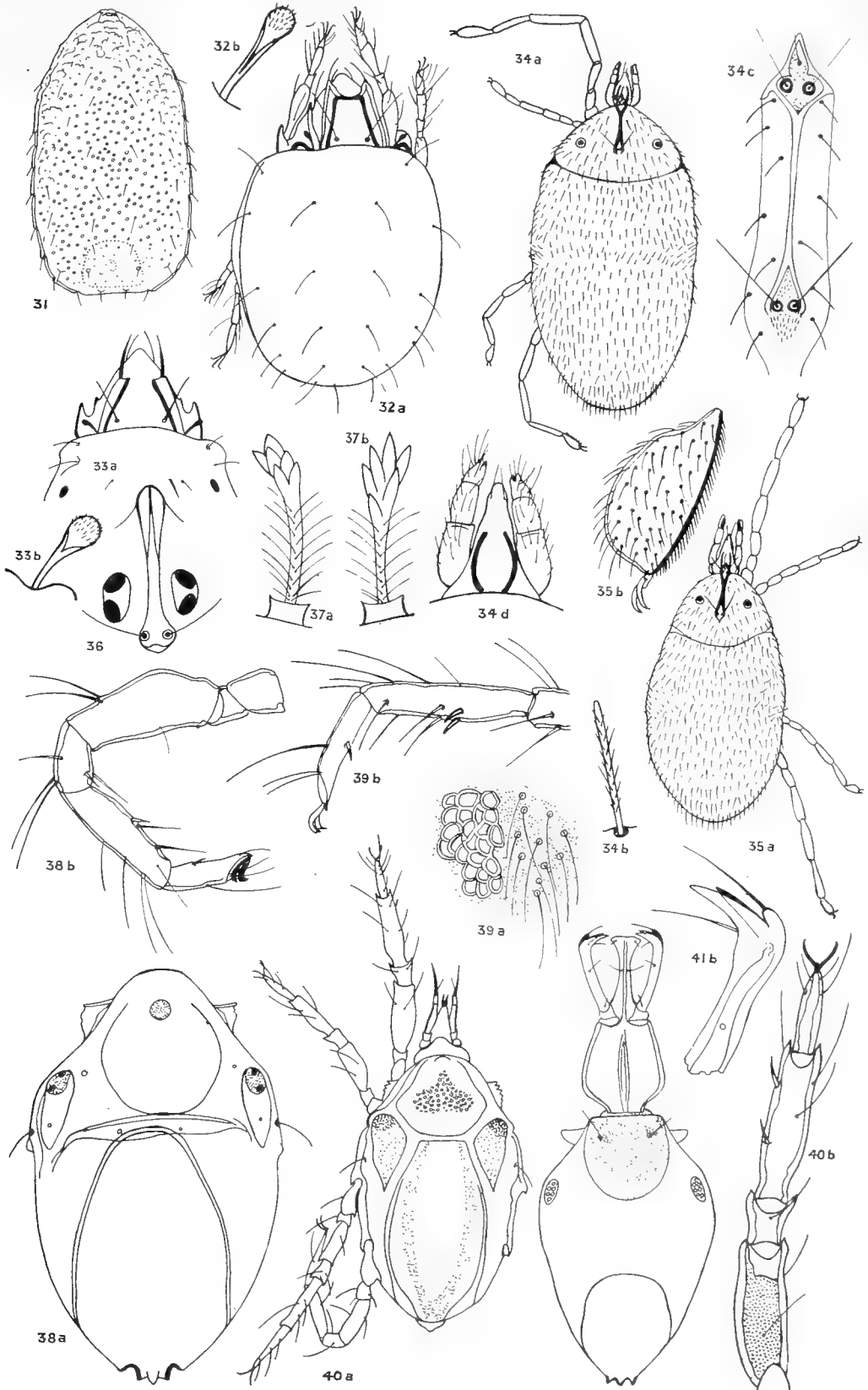














DECAPODA.

BY G. P. FARRAN, B.A.

Read APRIL 22. Published JUNE 4, 1912.

THIS list of Clare Island and Clew Bay Decapoda is based on collections made by Mr. W. Rankin on Clare Island itself and the islands and shores of Clew Bay, mainly near Belclare, and on material dredged and trawled by the Fisheries cruiser "Helga" in Clew Bay and the neighbourhood in up to about 20 fathoms of water. Most of the captures made by the s.s. "Helga" were identified by Mr. S. W. Kemp, now of the Indian Museum, Calcutta, and are indicated by his initials.

The list has been supplemented by the inclusion, in square brackets, of species occurring in Blacksod Bay to the northward and Ballynakill Harbour to the south, which may reasonably be expected to be present in Clew Bay. Even with these additions, the list falls far short of the total number of species of Decapoda which have been taken in shallow water on the west coast of Ireland; but as the missing species are either very scarce or else are difficult of capture, as, for instance, the burrowing forms, it is probable that continuous work in the district would not add much to the total.

The distribution of each species, both in the British Isles and elsewhere, is briefly given; and it will be seen that, in the light of our present knowledge, they may be divided into two very unequal groups. The first consists of six species—*Pandalus montagui*, *Eupagurus bernhardus*, *Eupagurus pubescens*, *Carcinus maenas*, *Hyas araneus*, and *Hyas coarctatus*, which are found in N. E. America and within the Arctic Circle, and stretch southwards for various distances along the west coast of Europe, two of them, *Carcinus maenas* and *Eupagurus bernhardus*, reaching as far south as the Mediterranean. The second group contains forty-six species, almost 90 per cent. of the total, which are found in the Mediterranean, and extend northwards along the west coast of Europe. Fourteen of these species fall short of Norway, only reaching to the British Isles or the southern North Sea; twenty-five reach the south or west coasts of Norway, and thirteen extend along the west coast of Norway to within the Arctic Circle, several of them having been found on the East Finmark coast.

Intermediate between these two groups are three species, absent from the Mediterranean, *Anapagurus hyndmanni*, *Philocheras echinulatus*, and *Philocheras bispinosus*, of which the distribution seems at present to be centred in the British Isles.

The large excess of southern over northern forms is, perhaps, to be expected, when it is realized that the west coast of Ireland lies in the track of a current of warm Atlantic water, reinforced by an outflow from the Mediterranean, which sets northwards along the west coast of Europe, and produces a marked effect as far north as the mouth of the White Sea. Such a current would prove a formidable obstacle to the southern extension of northern forms, both on account of its climatic effect and also by reason of the mechanical obstacle which it opposes to the drift of floating larvae.

It is, perhaps, worth noting that, of the forty-eight species which extend their range into the Mediterranean, at least thirty-two are found in the Adriatic, an area the fauna of which seems in many ways to resemble that of the west coast of Europe.

The majority of the species recorded are widely distributed forms, as is to be expected; perhaps the most interesting record in the list is that of *Eupagurus pubescens*, a northern species not found hitherto on the west coast of Ireland, though known from the north coast.

#### LIST OF SPECIES.

##### Sub-order DECAPODA NATANTIA.

**Pandalus montagui** Leach.—Clare I. harbour, one (W. R.). Scarce outside the islands, Clew Bay; Inishgowla, common (S. W. K.).

*Distribution*.—From the extreme north of Norway to the English Channel, N. E. America, Greenland, Iceland. Common round the British and Irish coasts.

**Pandalina brevirostris** (Rathke).—Inishlyre, two; Inishgowla, few (S. W. K.).

*Distribution*.—From the extreme north of Norway to the Mediterranean, the Adriatic. Common round the British and Irish coasts.

**Hippolyte varians** (Leach).—Clew Bay, moderately common (W. R.), Inishgowla, abundant (S. W. K.).

*Distribution*.—From the extreme north of Norway to the Mediterranean, the Adriatic. Abundant round the British and Irish coasts.

[**Hippolyte prideauxiana** Leach.]—Not yet recorded from Clew Bay, but probably occurs. It has been taken in *Zostera* beds in shallow water at Ballynakill and Blacksod.

*Distribution*.—Mediterranean, Bay of Biscay, Shetlands. West coasts of Scotland and Ireland, English Channel.

**Spirontocaris cranchi**, Leach.—Off Mulranny, Inishlyre, Inishgowla, moderately common.

*Distribution*.—West and south Norway to the Mediterranean, the Adriatic. All coasts of the British Isles in shallow water. It is very common on the west coast of Ireland, but, apparently, exceedingly scarce on the east, where its place is taken by the more northern form *S. pusiola*.

**Athanas nitescens** (Montagu).—Not yet recorded from Clew Bay, but occurs at Ballynakill and Blacksod.

*Distribution*.—West coast of Norway to the Mediterranean, Adriatic, Black Sea, Madeira, Cape Verde Is. West coast of Ireland and English Channel.

[**Processa canaliculata**, Leach.]—Not yet recorded from Clew Bay, but occurs at Ballynakill and Blacksod.

*Distribution*.—West coast of Norway to the Mediterranean, Adriatic, Madeira. Coasts of the British Isles.

**Leander serratus** (Pennant).—Clew Bay, 6–12 fms.; Ooghnamaddy and Clare I. harbour (W. R.).

*Distribution*.—Denmark to the Mediterranean. English (and Scottish?) coasts, east, west, and south coasts of Ireland.

**Leander squilla** (Linn.).—Ooghnamaddy, Clare I., in rock-pools; Clew Bay, 6–12 fms.; Clew Bay islands, 4½ fms. (W. R.).

*Distribution*.—West Norway to the Mediterranean, Adriatic, Black Sea, Azores, Canary Is. English and Scottish coasts, common all round Ireland.

**Palaemonetes varians** (Leach).—Bog-hole on Annagh I. (W. R.).

*Distribution*.—Sweden to the Mediterranean. English coasts and Firth of Forth, Irish coasts; a brackish-water species.

**Crangon vulgaris** Linn.—A common species, chiefly on sand; Clare I. harbour; Mulranny (W. R.). Inishgowla; Inishlyre (S. W. K.).

*Distribution*.—White Sea to the Mediterranean, Adriatic, Iceland. All coasts of the British Isles.

**Philocheras echinulatus** (M. Sars).—North-east of Clare I., 16–19 fms., three (S. W. K.).

*Distribution*.—West coast of Norway, North Sea, north side of Bay of Biscay. West coast of Scotland, east and west coasts of Ireland.

**Philocheras trispinosus** (Hailstone).—East of Clare I., 20 fms., one (S. W. K.).

*Distribution*.—Bay of Biscay, Mediterranean, Azores. Coasts of British Isles.

*Philocheras bispinosus* (Hailstone and Westwood).—Very common throughout Clew Bay (S. W. K.).

*Distribution*.—Lofoden to the Azores. All British and Irish coasts.

*Pontophilus spinosus* (Leach).—East of Clare I., 20 fms., one; S.E. of Clare I., 13-16 fms., two (S. W. K.).

*Distribution*.—West coast of Norway to the Mediterranean, Adriatic. All British and Irish coasts.

#### Sub-order DECAPODA REPTANTIA.

*Jaxea nocturna* Chiereghin.—The adult has not been found, but the free-swimming larval stage (Trachelifer), which, as Scott<sup>1</sup> has pointed out, is referable to this species, was occasionally taken at Inishbofin in 1900 and 1901, and more recently, in May, 1909, in a surface tow-net in Killary Harbour (three specimens) and in a bottom tow-net off Crump Island, two specimens).

*Palinurus vulgaris* Latreille.—The larval form (Phyllosoma) was taken in a bottom tow-net off Clare I. in May, 1909, at a depth of 29 fms. The adult has been taken at Ballynakill.

*Distribution*.—British Isles to the Mediterranean, Adriatic. West coasts of Ireland and Scotland, English Channel.

*Homarus gammarus* (L.).—South and east of Clare I., common (W. R.). It is fished for regularly by the islanders.

*Distribution*.—S. W. Norway to the Mediterranean, Adriatic. Coasts of the British Isles. Replaced by a closely allied species in N. E. America.

[*Galathea strigosa* (Linn.).]—Not yet recorded from Clew Bay, but occurs at Ballynakill and Blacksod.

*Distribution*.—Extreme north of Norway to the Mediterranean, Adriatic, Canaries, Azores. Coasts of British Isles, Shetlands to the English Channel.

*Galathea squamifera* Leach.—Annagh I., two (W. R.). Probably would be found to be common if looked for in spring, at which season it visits the shore, between tide-marks, in large numbers.

*Distribution*.—North-west Norway to the Mediterranean, Adriatic. All the British and Irish coasts.

<sup>1</sup> 18th Ann. Rep. Scotch Fishery Board, p. 405.

- Galathea dispersa**, Bate.—North-east of Clare I., 18 fms., one (S. W. K.).  
*Distribution*.—South and west coasts of Norway, France, Mediterranean. British and Irish coasts, Shetlands to the English Channel.
- Galathea intermedia**, Lilljeborg.—Clew Bay, common (S. W. K.).  
*Distribution*.—From the extreme north of Norway to the Mediterranean, Madeira, Azores. All British and Irish coasts.
- Porcellana longicornis** (Linn.).—Abundant in Clew Bay (S. W. K.). Annagh I. common at low water (W. R.). This species occurs from between tide-marks to about 20 fms.  
*Distribution*.—S. W. Norway to the Mediterranean, Adriatic, Black Sea, Canaries. All coasts of British Isles.
- Porcellana platycheles** (Pennant).—East shore of Clare I., common (S. W. K., W. R.). Annagh I., common (W. R.). Occurs almost exclusively between tide-marks.  
*Distribution*.—Southern North Sea to the Mediterranean, Adriatic, Canaries. British and Irish coasts, Shetlands to the English Channel.
- Eupagurus bernhardus** (Linn.).—Common in Clew Bay (S. W. K.), N., E., and W. shores of Clare I.; Old Head (W. R.).  
*Distribution*.—Extreme north of Norway to the Mediterranean; N.E. America. All coasts of the British Isles.
- Eupagurus prideauxi** (Leach).—East of Clare I., 16 fms., one (S. W. K.). East of Clare I., 21 fms., one (G. P. F.).  
*Distribution*.—N.W. Norway to the Mediterranean, Adriatic. Irish Sea, west coasts of Scotland and Ireland, Shetlands, English Channel.
- Eupagurus cuanensis** (Thomp.).—Inishlyre, on coral sand, common (S. W. K.). Mulranny, 10 fms.; Clew Bay, 8 fms. (W. R.). Off Inishgort, 7–10 fms. (S. W. K.).  
*Distribution*.—S.W. Norway to the Mediterranean. Coasts of British Isles, Shetlands to the English Channel.
- Eupagurus pubescens** (Krøyer).—Clew Bay, 10 fms., two (W. R.). This record is of interest as being the first from the west coast of Ireland of this distinctly northern species.  
*Distribution*.—N.E. America, Greenland, Iceland, Norway. Scotland, north coast of Ireland, N.E. coast of England.
- Anapagurus laevis** (W. Thomps.).— $\frac{3}{4}$  mile north of Clare I. lighthouse, 21 fms., two (G. P. F.). Frequents much deeper water than *A. Hyndmanni*.  
*Distribution*.—West Norway to the Mediterranean. All British and Irish coasts.

**Anapagurus hyndmanni** (W. Thomps.).—Clew Bay, 10 fms., two (W. R.).  
Small specimens not uncommon throughout Clew Bay; Inishlyre, 4 fms.  
(S. W. K.). Usually found from low-water mark to about 12 fms.

*Distribution*.—Southern North Sea. All British and Irish coasts.

**Ebalia tumefacta** (Montagu).—Off Inishlyre, one (N. Colgan). Three miles  
E. of Clare I., one; N.E. of Clare I., 18 fms., one; 2 miles N.W. of  
Inishgort, 8 fms., one; Inishlyre Roads, one (G. P. F.).

*Distribution*.—N.W. Norway to the Mediterranean, Adriatic. English  
Channel, Irish Sea, west coast of Ireland, Shetlands.

**Ebalia cranchi** Leach.—2 miles E. of Clare I., 18 fms., two; south of  
Mulranny, 5-11 fms., one (G. P. F.).

*Distribution*.—S.W. Norway to the Mediterranean, Adriatic. English  
and Irish coasts, east coast of Scotland.

**Corystes cassivelaunus** (Pennant).—Off Clare I. lighthouse, 25½ fms., two  
young; N.E. of Clare I., 13-16 fms., one young; off Mulranny, 13 fms.,  
one young (S. W. K.).

*Distribution*.—Southern North Sea to the Mediterranean, Adriatic.  
Coasts of England and Ireland, east coast of Scotland.

**Carcinus maenas** (Pennant).—South and east coasts of Clare I., common;  
islands in Clew Bay, moderately common (W. R.).

*Distribution*.—N. E. America, extreme north of Norway to the Medi-  
terranean, Adriatic. All British and Irish coasts.

**Portunus puber** (Linn.).—North and east coasts of Clare I., moderately  
common; Annagh I. (W. R.). Usually found between tide-marks.

*Distribution*.—Southern North Sea to the Mediterranean. British and  
Irish coasts.

**Portunus depurator** (Linn.).—Clew Bay, common (S. W. K.). Islands in Clew  
Bay, frequent; Mulranny, 6 fms. (W. R.).

*Distribution*.—N.W. Norway to the Mediterranean, Adriatic. All  
coasts of British Isles.

**Portunus corrugatus** (Pennant).—Inishlyre, 4-5 fms., two (S. W. K.).

*Distribution*.—Southern North Sea to the Mediterranean, Adriatic  
Canaries. Irish coasts, south and east coasts of England.

**Portunus arcuatus** Leach.—Generally distributed and very common.

*Distribution*.—S.W. Norway to the Mediterranean, Adriatic. English  
Channel, Irish Sea, east coast of Scotland.

**Portunus pusillus** Leach.—Clew Bay, 5 fms., two (W. R.). N.E. of Clare I.,  
13-16 fms.; east of Clare I., 17 fms.; Inishlyre, 4 fms. (S. W. K.)

*Distribution*.—S.W. Norway to the Mediterranean, Adriatic. All  
British and Irish coasts.



**Portunus holsatus** (Fabr.).—Mulranny, 10 fms., two (W. R.). Only found on a sandy bottom.

*Distribution.*—S.W. Norway to the Mediterranean, Canaries. British and Irish coasts, Shetlands to the English Channel.

**Cancer pagurus** Linn.—Clew Bay, frequent (S. W. K.). S. and E. of Clare I., common, taken in lobster pots; Annagh I. at low water (W. R.).

*Distribution.*—Extreme north of Norway to the Mediterranean, Adriatic. All British and Irish coasts.

**Pirimela denticulata** (Montagu).—Off Mulranny, 7 fms., two (S. W. K.).

*Distribution.*—Extreme north of Norway to the Mediterranean, Adriatic. English Channel, east coast of England, Irish coasts.

**Xantho incisus** (Leach). (*X. floridus* (Montagu)).—S. and E. shores of Clare I., common (W. R.).

*Distribution.*—British Isles to the Mediterranean, Adriatic. English Channel, west coast of Ireland.

**Xantho hydrophilus** (Herbst.) (*X. rivulosus* Risso).—Rock-pool Ooghamaddy, Clare I., three (W. R.).

*Distribution.*—S.W. Norway to the Mediterranean, Adriatic. English Channel, west coast of England, west coast of Ireland, Shetlands.

**Pilumnus hirtellus** (Linn.).—Islands in Clew Bay, five (W. R.). Off Mulranny, two (S. W. K.).

*Distribution.*—Southern North Sea to the Mediterranean, Adriatic. English Channel, Irish Sea, west coast of Ireland.

[**Gonoplax angulatus** (Pennant).]—Not yet recorded from Clew Bay, but occurs at Ballynakill.

*Distribution.*—Southern North Sea to the Mediterranean, English Channel, Irish Sea, west coast of Ireland.

**Pinnotheres pisum** (Linn.).—"A living specimen [of *Mytilus Modiolus*] dredged in about 2 fms. off Annagh Island contained a living egg-bearing female of the Pea Crab (*Pinnotheres Pisum*) with a carapace measuring 7.5 mm." Colgan: Marine Mollusca, Clare Island Survey, p. 26.

*Distribution.*—Southern Norway to the Mediterranean. Coasts of British Isles.

**Inachus dorynchus** Leach.—Taken a few times N.E. and S.E. of Clare I., 13–20 fms. (S. W. K.); Clew Bay, 12 fms.; off Old Head, 16 fms. (W. R.).

*Distribution.*—S.W. Norway to the Mediterranean, Adriatic, Canaries. Coasts of British Isles, Shetlands to the English Channel.

**Inachus dorsettensis** (Pennant).—In small numbers throughout Clew Bay, 7–20 fms.

*Distribution.*—West Norway to the Mediterranean.

**Macropodia rostrata** (Linn.).—Common throughout Clew Bay (S. W. K.). Islands in Clew Bay,  $4\frac{1}{2}$  fms. ; off Clare I., 13 fms. ; common (W. R.).

*Distribution.*—Extreme north of Norway to the Mediterranean, Adriatic, Azores, Madeira, Senegambia. All British and Irish coasts.

[**Maia squinado** (Herbst.).]—Not yet recorded from Clew Bay, but has frequently been taken at Ballynakill.

*Distribution.*—Southern North Sea to the Mediterranean, Adriatic, Canaries, English Channel, west coast of Ireland.

[**Pisa tetradon** (Pennant).]—Scarce at Ballynakill and Blacksod ; not yet taken in Clew Bay.

*Distribution.*—British Isles to the Mediterranean, Adriatic, Canaries, English Channel, west coast of Ireland.

**Eurynome aspera** (Pennant).—Small specimens often taken in crevices of bored limestone between Clare I. and Mulranny, 6–16 fms. (S. W. K.).

*Distribution.*—S. W. Norway to the Mediterranean, Adriatic. All British and Irish coasts.

**Hyas araneus** (Linn.).—Clew Bay, frequent ; Annagh I. (W. R.).

*Distribution.*—N. E. America, extreme north of Norway to the English Channel. All British and Irish coasts.

**Hyas coarctatus** Leach.—Mulranny, 12 fms., two ; off Belclare,  $3\frac{1}{2}$  fms. (W. R.). Off Inishgort, 8–10 fms., few (G. P. F.). Much rarer on the west than on the east coast of Ireland.

*Distribution.*—Alaska, N. E. America, extreme north of Norway to the English Channel. All British and Irish coasts.

NEBALIACEA, CUMACEA, SCHIZOPODA, AND  
STOMATOPODA.

BY W. M. TATTERSALL, D.Sc.

Read APRIL 22. Published JUNE 4, 1912.

THE Clare Island marine area, as understood in this report, extends from Blacksod Bay in the north to Slyne Head in the south. Seawards it may be considered to extend to the fifty-fathom line.

Up to about a dozen years ago no collecting appears to have been done in this area. At least I can find no records pertaining to the orders of Crustacea here dealt with.

In 1899 the Fisheries Branch of the Department of Agriculture and Technical Instruction for Ireland established a marine station at Inishbofin and Ballynakill, and commenced a series of observations which have gone very far to elucidate the marine fauna of the southern part of the area.

The Clare Island Survey, commenced some three years ago, has more particularly dealt with the northern part of the district. In the preparation of this report I have supplemented the results obtained by the latter survey by including the species obtained by the former series of investigations, so that the present report includes all the species of the Crustacea concerned which have up till now been found in the area. The list of the Cumacea here given is partly derived from Calman's paper,<sup>1</sup> and partly from the collections made during the survey; while the list of Schizopoda has been largely supplemented by extracts from a larger paper on the littoral Schizopoda of Ireland, which I have in preparation.

The Crustacea here considered are creatures of normally bottom-haunting habits, living either in rock-pools on the shore, or among the littoral seaweeds, or buried in sand. But they have the additional peculiarity that they frequently become true pelagic forms during the hours of darkness, and may be captured in enormous numbers at such times. Whereas, therefore, the usual method of collecting such forms is by using a dredge or attaching

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<sup>1</sup> Fisheries, Ireland, Sci. Invest., 1904, I. (1905).

fine-meshed nets to trawls worked over the ground, the use of a tow-net at night, especially in the shallow bays and harbours, not only facilitates the collection of species, but gives a better and more correct idea of the abundance or scarcity of the different species collected. In the Cumacea it is usually the males only which become free-swimming at night, but among the Mysidae both sexes appear to be equally represented in night gatherings.

The Stomatopoda are represented so far only by larval forms caught in the tow-nets. These belong to two distinct genera; but the species cannot yet be definitely settled pending the capture of adult specimens.

The present report includes one species of Cumacea and one of Mysidae new to Ireland and one species of the former and eight of the latter not hitherto recorded from the district.

#### SYNCARIDA.

***Nebalia bipes*** (Fabricius).—*Nebalia bipes* is abundant throughout the district.

It is to be found at low water at spring tides, under stones on the shores, and seems to prefer the neighbourhood of black, evil-smelling mud. It is likewise frequently captured at night in tow-nettings taken in harbours and sheltered bays. On one occasion a lobster, which had died in the lobster-pot, was found to be covered literally with thousands of this Crustacean.

#### CUMACEA.

***Bodotria scorpioides*** (Montagu).—Taken in nineteen gatherings from Bofin Harbour, three from Fahy Bay, Ballynakill Harbour, and one from just north of Cleggan Bay. It never occurred in very large numbers, and was most abundant in the tow-nettings at night. Clew Bay, once.

***B. pulchella*** (G. O. Sars).—Fahy Bay, Ballynakill Harbour, twice; north entrance to Ballinakill Harbour, once; Cleggan Bay, once; Blacksod Bay, twice.

***Cumopsis goodsiri*** (van Beneden).—Feorinyeeo Bay, Blacksod Bay, two males and two females. New to Ireland.

***Iphinoë trispinosa*** (Goodsir).—One of the most abundant species in the area in harbours and sheltered bays. Abundant in tow-nettings taken at night in Ballynakill and Bofin Harbours; Clew Bay, 5–11 fms., common; Blacksod Bay, 2–9fms., common.

***Vauntomponia cristata***, Spence Bate.—Occurs in considerable numbers in Ballynakill Harbour. Common in night tow-nettings, but only male specimens are captured in this way. Elly Bay, Blacksod Bay, 1–4 fms., three specimens.

- Eudorella truncatula** (Spence Bate).—Taken three times in Bofin Harbour and three times in Fahy Bay, Ballynakill Harbour. Clew Bay, 1–5 fms., common. Blacksod Bay, 5 fms., two specimens.
- Cumella pygmaea**, G. O. Sars.—Generally distributed throughout the area, both in the harbours and sheltered bays, and in the open seas down to 45 fms.
- Nannastacus unguiculatus**, Spence Bate.—Very abundant in the sheltered bays and harbours of the district, but also found in the open seas round Clare Island and Inishturk. Blacksod Bay, one specimen.
- N. brevicaudatus**, Calman.—The types and only known specimens were found in Ballynakill Harbour.
- Pseudocuma longicornis** (Spence Bate).—The most abundant species of Cumacea in the area, and generally distributed. Often taken in large numbers in tow-nettings made at night.
- P. similis**, G. O. Sars.—Bofin Harbour, one specimen.  $1\frac{1}{2}$  miles N.W. by W. of Inishturk, one specimen. Between Clare I. and Achillbeg, one specimen.
- Diastylis rugosa**, G. O. Sars.—From Ballynakill Harbour, on five occasions. Blacksod Bay, one specimen.
- D. rostrata** (Goodsir).—Twice taken in Ballynakill Harbour. Clew Bay, 5–10 fms., two specimens. Blacksod Bay, 3–9 fms., common. 5 mi. S.S.E. of Clare I. light, 17 fms., four specimens.
- D. spinosa**, Norman.— $2\frac{1}{2}$  miles S.E. of Clare I. light, 18 fms., one male.  $3\frac{1}{2}$  miles S.S.W. of Mulranny pier, Clew Bay, 15 fms., one female. Blacksod Bay, 9 fms., two males. New to the district.

## EUPHAUSIACEA.

- Meganyctiphanes norvegica** (M. Sars).—*M. norvegica* is very frequently taken in tow-nettings in the open seas of the Clare Island marine area, but is seldom found in any of the harbours in that area. It may, however, be driven in during gales, and even cast up on the beach. It forms the main food of mackerel, herring, salmon, and trout in the springtime, and, judging from the contents of the stomachs of these fishes examined at that period of the year, this Euphausian must be enormously abundant at certain seasons. The contents of the stomach of a whale captured at Inishkea in the spring of 1900 were found to consist entirely of this species.
- Nyctiphanes couchi** (Bell).—A smaller form than *M. norvegica*, *N. couchi* is usually found associated with this species in the open seas round Clare Island and district, and appears to be equally abundant. Considered

broadly, however, *N. couchi* is a more distinctly shallow-water species than *M. norvegica*. Like the latter, it is a favourite food of pelagic fishes.

**Thysanoëssa inermis** (Kröyer).—This species has a distribution in the district under review entirely coincident with that of *M. norvegica* and *N. couchi* and is usually found associated with them. Under this species I include records formerly listed under the name *Borcophausia inermis* (Kröyer), and *Thysanoëssa neglecta* (Kröyer), since, according to Hansen, these two supposedly distinct species are merely dimorphic forms of one species, which must bear the earlier name here given to it.

#### MYSIDACEA.

**Siriella armata** (Milne-Edwards).—Near Portlea, Clare Island, 5–6 fms. Inishgowla Harbour, Clew Bay, 1–4 fms. South side of Feorinyeeo Bay, Blacksod Bay, shore. Feorinyeeo Bay, 2–5 fms. Elly Bay, Blacksod Bay, 1–3 fms. Carrigeenmore, Blacksod Bay, in tow-net through weeds, close to shore. Entrance to Blacksod Bay, 7 fms. Bofin Harbour, very common. Ballynakill Harbour, common. Cleggan Bay, 17 fms.

A very common and abundant species in the district, generally found living among *Laminaria* and other seaweeds, or in rock-pools, and frequently captured free-swimming at night, by means of tow-nets.

**S. clausii**, G. O. Sars.—Inishgowla Harbour, Clew Bay, 1–4 fms. South side of Feorinyeeo Bay, Blacksod Bay, rock-pools on the shore. Entrance to Blacksod Bay, 7 fms. Cleggan Bay, 17 fms.  $2\frac{1}{2}$  miles S.W. by W. of Shark Head, Inishark, surface. Half mile N. of Cleggan Head, surface. Bofin Harbour, very abundant. Ballynakill Harbour, very abundant.

A very common species, especially abundant at night in the harbours and shallow bays of the area.

**S. jaltensis**, Czerniavsky.—Carrigeenmore, Blacksod Bay, shore. South side of Feorinyeeo Bay, Blacksod Bay, shore. Elly Bay, Blacksod Bay, shore. Barranagh, Blacksod Bay, 2–3 fms. Portlea, Clare Island, in tow-net.  $2\frac{1}{2}$  miles S.W. by W. of Shark Head, Inishark, surface. 2 miles W. by S. of Inishturk, surface.  $\frac{1}{2}$  mile N. of Cleggan Head, surface. Bofin Harbour, very abundant. Ballynakill Harbour, very common.

A species of similar habitats and abundance to *S. clausii*, and usually found associated with it. It has not been previously recorded from the area under review, though known to me for several years from the collections of the Fisheries Branch of the Department of Agriculture for Ireland.

**Gastrosaccus spinifer** (Goës).—Entrance to Blacksod Bay, 7 fms. Between Inishturk and Inishark, surface. Between Innishinny and the Gun Rock, Inishbofin, surface. Fahy Bay, Ballynakill, 2 fms. Found also on one occasion in the stomach of a mackerel caught off Cleggan Head.

A free-swimming form usually found in the open sea and rarely taken in the harbours and bays of the area.

**G. sanctus** (van Beneden).—Bofin Harbour, very abundant, especially at night. Ballynakill Harbour, taken on six occasions, and only very young specimens.

The specimens from Bofin Harbour depart from the typical forms in being without lobes on the posterior margin of the carapace.

**G. normani**, G. O. Sars.—One mile outside Bofin Harbour, one specimen. Between Bofin and Carrickmahoga Rocks, one specimen.  $2\frac{1}{2}$  miles S.W. by W. of Shark Head, one specimen. 2 miles S.S.W. of Shark Head, two specimens. Between Inishturk and Inishark, one specimen.

An open-sea species, never taken in harbours or sheltered bays. All the west of Ireland specimens have upturned lobes on the posterior margin of the carapace, and differ in this respect from Mediterranean specimens, in which the lobes are absent. All the specimens were captured at the surface.

**Anchialus agilis**, G. O. Sars.—Taken on about a dozen occasions in the open seas round Inishbofin, Inishark, Inishturk, and Clare Island, but never taken in the harbours or enclosed bays of the district. It is usually captured at the surface of the sea. Not previously recorded from the area.

**Heteromysis formosa**, S. I. Smith.—Bofin Harbour,  $2\frac{1}{2}$  fms., three young specimens. Not previously recorded from the area.

**Erythrops elegans**, G. O. Sars.—Fahy Bay, Ballynakill, 2 fms., one specimen. Not previously recorded from Ireland.

**Mysidopsis angusta**, G. O. Sars.—North entrance to Ballynakill Harbour, 7 fms., one specimen. New to the district.

**M. gibbosa**, G. O. Sars.—Bofin Harbour, rarely. Ballynakill Harbour not infrequently.

**Leptomysis lingvura**, G. O. Sars.—Bofin Harbour, three specimens on three separate occasions. New to the district.

**Hemimysis lamornae** (Couch).—Entrance to Blacksod Bay, 7 fms., two specimens. Off Portlea, Clare Island, in tow-net.

**Macropsis slabberi** (van Beneden).—Ballinakill Harbour, surface, one specimen. Bofin Harbour, on three separate occasions, at the surface at night.

- Macromysis flexuosa** (Müller).—A very common species, enormously abundant in the bays and harbours of the area, usually found among *Laminaria* and other seaweeds and in rock-pools.
- M. inermis** (Rathke).—Inishgowla Harbour, Clew Bay, 1–4 fms. Carrigeenmore, Blacksod Bay, in tow-net through weeds close to shore, abundant. Off Portlea, Clare Island, in tow-net, 5–6 fms., abundant. Ballynakill Harbour, on two occasions. Bofin Harbour, common.
- A moderately abundant species in the area, but never found along the shores or in rock-pools like *M. flexuosa*. It usually occurs in about 5 fms. of water.
- Schistomysis ornata** (G. O. Sars).—Entrance to Blacksod Bay, 7 fms., abundant. Feorinyeeo Bay, Blacksod Bay, 5 fms., one specimen.
- S. arenosa** (G. O. Sars).—Off the white strand, Ship Sound, Bofin Harbour, 3 fms., in sand, very abundant. Carrigeenmore, Blacksod Bay, in tow-net through weeds, close to shore.
- Neomysis integer** (Leach).—Lough Leam, Mullet, abundant. Lough Leam is a brackish-water lough, cut off from the sea, and only entered by the tide at spring-tides. New to the district.

#### STOMATOPODA.

In 1905 I recorded the fact that Stomatopod larvae, belonging to two distinct genera of adult Stomatopoda, occurred regularly in tow-nettings taken in the late autumn off Inishbofin and Ballynakill Harbour. Since the publication of that note further specimens have come to hand; and I now wish to correct an error in the identification of one of the types of larvae. I referred the two kinds of larvae to the larval genera *Alima* and *Gonerichthus*, the young forms of *Squilla* and *Gonodactylus* respectively. The latter larvae in reality belongs to the genus *Lysiosquilla*. I was able to correct my earlier determination by the discovery of a single specimen, 16 mm. in length, in the first adult stage, in which the raptorial claw bears nine teeth, including the large terminal one. It suffices for the present to include the genera *Squilla* and *Lysiosquilla* in the fauna of the Clare Island marine area. No adult specimens have yet been found; but the larvae in all stages of development occur free-swimming in the shallow seas of the district every year in the late summer and early autumn.



TABLE INDICATING THE KNOWN GEOGRAPHICAL DISTRIBUTION OF NEBALIACEA, CUMACEA, AND SCHIZOPODA.

	A	B	C	D
	Species known from Norway.	Species known from British Area.	Species known from the Atlantic Coasts of Europe S. of the British Area.	Species known from the Mediterranean.
SYNCARIDA.				
<i>Nebalia bipes</i> , . . . . .	×	×	×	×
CUMACEA.				
<i>Bodotria scorpioides</i> , . . . . .	×	×	×	×
<i>Bodotria pulchella</i> , . . . . .		×	×	×
<i>Cumopsis goodsiri</i> , . . . . .		×		×
<i>Iphinoë trispinosa</i> , . . . . .	×	×	×	×
<i>Vauntomponia cristata</i> , . . . . .		×	×	×
<i>Eudorella truncatula</i> , . . . . .		×	×	×
<i>Cumella pygmaea</i> , . . . . .	×	×		×
<i>Nannastacus unguiculatus</i> , . . . . .		×		×
<i>Nannastacus brevicaudatus</i> , . . . . .		×		
<i>Pseudocuma longicornis</i> , . . . . .	×	×	×	×
<i>Pseudocuma similis</i> , . . . . .	×	+	+	
<i>Diastylis rugosa</i> , . . . . .	×	×	×	×
<i>Diastylis rostrata</i> , . . . . .	×	×		
<i>Diastylis spinosa</i> , . . . . .		×		
EUPHAUSIACEA.				
<i>Meganyctiphanes norvegica</i> , . . . . .	×	×	×	×
<i>Nyctiphanes couchi</i> , . . . . .		×	×	×
<i>Thysanoëssa inermis</i> , . . . . .	×	×		
MYSIDACEA.				
<i>Siriella armata</i> , . . . . .		×	×	×
<i>Siriella clausii</i> , . . . . .		×		×
<i>Siriella jaltensis</i> , . . . . .		×		×
<i>Gastrosaccus spinifer</i> , . . . . .	×	×	×	
<i>Gastrosaccus sanctus</i> , . . . . .		×	×	×
<i>Gastrosaccus normani</i> , . . . . .		×	×	×
<i>Anchialus agilis</i> , . . . . .		×	×	×
<i>Heteromysis formosa</i> , . . . . .	×	×		
<i>Erythrops elegans</i> , . . . . .	×	×		
<i>Mysidopsis angusta</i> , . . . . .	×	×		×
<i>Mysidopsis gibbosa</i> , . . . . .	×	×		×
<i>Leptomysis lingvura</i> , . . . . .	×	×	×	×
<i>Hemimysis lamornae</i> , . . . . .	×	×		×
<i>Macropsis slabberi</i> , . . . . .		×	×	×
<i>Macromysis flexuosa</i> , . . . . .	×	×	×	
<i>Macromysis inermis</i> , . . . . .	×	×		
<i>Schistomysis ornata</i> , . . . . .	×	×	×	
<i>Schistomysis arenosa</i> , . . . . .		×		×
<i>Neomysis integer</i> , . . . . .	×	×	×	

## GEOGRAPHICAL DISTRIBUTION OF THE SPECIES NOTED ABOVE.

The preceding table indicates broadly the known geographical range of the species recorded above. A study of this table reveals the interesting fact that the marine fauna of the west of Ireland, as far as these orders of Crustacea are concerned, is a blending of northern forms with southern species from the Mediterranean, the latter element somewhat preponderating. The single species of *Nebalia*, *N. bipes*, extends from Norway to the Mediterranean. Among the Cumacea we find seven species have been recorded from Norway and ten from the Mediterranean, while five are common to Norway, the British area, and the Mediterranean. Five species, *Nannastacus unguiculatus*, *Eudorella truncatula*, *Bodotria pulchella*, *Cumopsis goodsiri* and *Vauntomponia cristata*, have the northern limit of their geographical range in the British area, while two forms, *Pseudocuma similis* and *Diastylis rostrata*, have yet to be met with south of the British area. One species, *Nannastacus brevicaudatus*, is peculiar to the Clare Island marine area, *Diastylis spinosa* has so far only been found in the British area, and none of the species extend to the American coasts.

Of the three species of Euphausiacea, one, *Meganyctiphanes norvegica*, extends from Norway to the Mediterranean; the second, *Nyctiphanes couchi*, is known from the Mediterranean, but not from Norway; while the third, *Thysanoëssa inermis*, is not certainly known to the south of Britain. *M. norvegica* is also found off the North American coast. Here again, therefore, we get a blending of northern and Mediterranean species.

Of the nineteen species of Mysidae here recorded, thirteen extend to the Mediterranean and eleven to Norway, but only five from Norway to the Mediterranean. Six of them have the southern limit of their known geographical range in the British area, while eight of them have not yet been recorded south of the English Channel. There are no species peculiar to the British area, and only one species, *Heteromysis formosa*, extends to the American coasts. No Stomatopoda are known from Norway, so that the Stomatopod element in the fauna of the West of Ireland is of southern origin.

Summing up the known geographical range of all the species here recorded we get the result set forth in the following table:—

	Norway.	British Area.	Mediterranean.	Common to all three.
<i>Nebalia</i> , . . . .	1	1	1	1
Cumacea, <sup>1</sup> . . . .	7	14	10	5
Euphausiacea, <sup>2</sup> . . . .	2	3	2	1
Mysidacea, <sup>2</sup> . . . .	11	19	13	5
Total, . . . .	21	37	26	12

This table brings out well the fact that the shallow-water marine fauna of the west coast of Ireland is a blending of a northern and southern fauna, the latter element preponderating slightly as a whole and in each separate order.

Concerning the horizontal and bathymetric distribution of the species here noted definite information is difficult to obtain, owing to the peculiarity of habit already noted for the majority of forms of becoming free-swimming at night. *Nebalia bipes* is a purely littoral species, not extending below the ten-fathom line. Of the Cumacea, the following species appear to be true littoral forms confined to the ten-fathom limit of the shore:—

- Bodotria pulchella*. *Diastylis rugosa*.
- Iphinoë trispinosa*. — *Cumopsis goodsiri*.
- Nannastacus brevicaudatus*.

The seaward limit of the remaining species, as far as at present known, is as follows:—

- Cumella pygmaea*, 67 fms. *Pseudocuma longicornis*, 58 fms.
- Bodotria scorpioides*, 15 fms. *Pseudocuma similis*, 28 fms.
- Vauntomponia cristata*, 50 fms. *Diastylis rostrata*, 1063 fms.
- Nannastacus unguiculatus*, 64 fms. *Diastylis spinosa*, 183 fms.
- Eudorella truncatula*, 1443 fms.

The three Euphausians are pelagic Crustacea, often extending far out to sea and in water of considerable depth, which reach the maximum of abundance in the adult stage at about the 100-fathom line, and in the young and half-grown stages in considerably shallower water. They are at

<sup>1</sup> Two species peculiar to the British Area.

<sup>2</sup> One species extends to America.

all times creatures of the open shallow seas, and are rarely found in harbour and bays unless driven there under stress of weather.

The following species of Mysidae may be regarded as purely littoral species :—

- |                      |                       |
|----------------------|-----------------------|
| Siriella armata.     | Macropsis slabberi.   |
| S. jaltensis.        | Macromysis flexuosa.  |
| S. clausii.          | Schistomysis arenosa. |
| Heteromysis formosa. | Neomysis integer.     |
| Leptomysis lingvura. |                       |

The species of *Gastrosaccus* and *Anchialus* are more purely pelagic than the other Mysidae, but only *G. normani* extends seawards for any distance. It has been recorded from a depth of 180 fathoms.

The remaining species are bottom-living forms which range from all depths down to about fifty fathoms.

AMPHIPODA.

By W. M. TATTERSALL, D.Sc.

Read JUNE 28. Published AUGUST 18, 1913.

INTRODUCTION.

THE area covered by this report is the same as that given by me in the reports on the Schizopoda and Isopoda, namely, from Blacksod Bay in the north to Slyne Head in the south, and seaward to the 50-fathom line. The material on which the report is based is derived from the following sources:—(1) the collections made by the Fisheries Branch of the Department of Agriculture and Technical Instruction for Ireland during their survey of the harbours of Ballinakill and Bofin and the neighbouring fishing-grounds; the full results as regards the Amphipoda have not yet been published, but I have abstracted such records from my notes as concern the area now under review; (2) the collections made by the same Department during the survey of Blacksod Bay; (3) the collections made specially for this Survey by the Department's cruiser "Helga" and by other naturalists engaged in the Survey, among whom should be mentioned Mr. Nevin H. Foster and Mr. Robert Welch, who made collections of the semi-terrestrial Amphipoda in the Westport district and on Clare Island. The result is that an enormous quantity of material is available for the purposes of this report; and the total of ninety-five species here recorded must be considered a fairly exhaustive list of the Amphipoda of the district.

Very little systematic collecting has been done in the area previous to the making of the collections here dealt with. In 1868 Messrs. Brady and Robertson spent a week dredging the bays round Clifden, and recorded twenty-two species of Amphipoda. Isolated records have been noted by Walker, Norman, Calman, Spence Bate, and others from time to time, so that up till now a total of forty-one species of Amphipoda is known from the Clare Island marine area.

The present report adds a further fifty-four species, nineteen of which are now added to the fauna of Ireland, the remaining thirty-five species being new to the district.

I have seen all the species previously recorded except *Phorocephalus holbolli* recorded from Ardbear Bay by Brady and Robertson, and *Gammarus campylops* noted from Newport, Co. Mayo, by Norman. The former I suspect to be either *Metaphorus fultoni* or *M. pectinatus*, both comparatively common in the district; and the latter, as pointed out by Walker, will probably prove to be only a form of *Gammarus locusta*. The Amphipoda are normally creatures of bottom-haunting habits, and a large part of the material has been captured by means of a dredge or by shore-collecting. But tow-netting in the harbours and shallow waters of the district at the surface at night has yielded excellent results. A great number of Amphipoda become pelagic during the hours of darkness, and can then be caught in immense numbers. In this way a better idea can be obtained of the relative abundance of the various species in the district than would be got by a considerable amount of shore-collecting and dredging.

I have already published a paper on the pelagic Amphipoda of Ireland, and have abstracted from it the records which concern the area under review. In the course of the examination of the collections of the Amphipoda I have come across a few additional Isopoda. No species of the latter occurred that had not been previously recorded; but the following species were noted from new localities within the area, and may, perhaps, be fittingly placed on record here:—

*Paratanais batei*, G. O. Sars.— $2\frac{1}{4}$  miles E. of Clare Island light, 22 fathoms, one.

*Gnathia conyurata* (Lilljeborg).—Inishgowla Harbour, Clew Bay, 4 fathoms, one.

*Munna krøyeri*, Boeck.—Inishlyre Roads, 4 fathoms, one.

The arrangement and nomenclature of the Gammaridea here followed are those of Stebbing, "Das Tierreich."

#### SYSTEMATIC LIST.

### AMPHIPODA GAMMARIDEA.

#### Family LYSIANASSIDAE.

#### *Nannonyx goëssii* Boeck).

Elly Bay, Blacksod Bay, shore, one; 2 faths., one.

New to Ireland.

*Distribution*:—Arctic Ocean, N. Atlantic from Norway to the English Channel, West Norway.

**Lysianassa ceratinus** (Walker).

Blacksod Bay and inlets, taken on nine occasions, shore to 5 faths. Inishlyre Harbour, 5 faths., and surface, two. Off Clare Island, 7–17 faths., two. Bofin, common. Ballinakill Harbour, common.

*Previous Irish Records* :—Strangford Lough, Clew Bay, Valentia.

*Distribution* :—Atlantic coasts of Great Britain, Ireland and France.

I have accepted Chevreux's decision, that this species is distinct from *L. longicornis* Lucas, with which it has been united by Stebbing. I have seen over one hundred specimens of this species, and they all, without exception, have the hind margin of the third segment of the metasome rounded. None of them shows any approach to the spiniform condition seen in *L. plumosa* Boeck. It is quite the most abundant Lysianassid in shallow water on the West of Ireland.

**Perrierella audouiniana** (Bate).

Blacksod Bay, 5 faths., two. Inishlyre Harbour, 5 faths., two. Fahy Bay, Ballinakill Harbour, 3 faths., sixteen.

New to Ireland.

*Distribution* :—North Atlantic and North Sea from Norway to France, Mediterranean.

**Orchomene batei** G. O. Sars.

Blacksod Bay, 1–8 faths., common. Outer Harbour, Bofin Island, one.

Not certainly recorded from Ireland before, though it is probable that Thompson's records of *Anonyx elegans* from Bangor, Co. Down, and Kinahan's of *Anonyx minutus* from Belfast Lough refer to this species.

*Distribution* :—North Atlantic and North Sea from Norway to France, Mediterranean.

**Ichnopus spinicornis** Boeck.

Off High Island, Co. Galway, surface, one.

New to the district.

*Previous Irish Record* :—Off Valentia (Porcupine). The present record is only the second one for the British Isles.

*Distribution* :—Arctic Ocean, North Atlantic and North Sea, Mediterranean and Java Sea.

**Socarnes erythrophthalmus** Robertson.

1½ miles E.N.E. of Clare Island light, 21 faths., eleven.

*Previous Irish Records* :—Valentia (Walker); Ardbear Bay, Co. Galway (Norman).

*Distribution* :—Atlantic coasts of Great Britain, Ireland, and France.

**Tryphosa sarsii** (Bonnier).

Blacksod Bay, N. of Ardely Pt., 2-5 faths., two. Inishgowla Harbour, Clew Bay, 1-4 faths., one. Fahy Bay, Ballinakill Harbour, 1-3 faths., twelve.

*Previous Irish Record*:—Clew Bay (Norman).

*Distribution*:—Atlantic coasts of South and West Norway, Great Britain, and Ireland.

**Tmetonyx cicada** (Fabricius).

Blacksod Bay, one young specimen.

*Previous Irish Records*:—Kenmare River (Walker); several records from deep water off the west coast of Ireland, 90-630 faths. (Walker and Norman).

*Distribution*:—Arctic Ocean, North Atlantic and North Sea from Norway to France.

**Orchomenella nanus** (Kröyer).

Inishlyre Harbour, 5 faths., one. Bofin Harbour, 1-4 faths., on three occasions. Fahy Bay, Ballinakill Harbour, 1-3 faths., two.

New to the district.

*Previous Irish Records*:—Valentia and district, off Galley Head, Co. Cork (Walker); deep water off the West of Ireland, 40 faths. (Porcupine).

*Distribution*:—North Atlantic and North Sea from Norway to France.

**Lepidepcreum longicorne** (Bate and Westwood).

1 mile outside Bofin Harbour, 17 faths., one. 5 miles N.W. by N. of Inishturk, 48 faths., one at surface. 2 miles S. of Shark Head, 42 faths., one at surface.

*Previous Irish Records*:—Off Galley Head, Co. Cork, and off Teelin Head, Co. Galway, 33-37 faths. (Walker).

*Distribution*:—North Atlantic and North Sea from South Norway to France, Mediterranean.

Family **AMPELISCIDAE**.**Ampelisca brevicornis** (A. Costa).

Blacksod Bay, common in sand. Ballinakill Harbour, Coastguard Bay, in sand, two.  $\frac{3}{4}$  mile S. of Mulranny Pier, 5-11 faths., thirty.

New to the district.

*Previous Irish Records*:—Valentia Harbour, Dunbeacon Harbour (Walker); Belfast Lough (Kinahan).

*Distribution*:—Arctic Ocean, North Atlantic and North Sea from Norway to France, Mediterranean.



**Ampelisca spinipes** Boeck.

Blacksod Bay, 7–9 faths., common.  $1\frac{1}{2}$  mile N.W. by N. of Carwell, off Crump Island, 24 faths., two. Clew Bay, 2 miles E. of Deace's Rock,  $18\frac{1}{2}$  faths., one.  $1\frac{3}{4}$  mile E.N.E. of Clare Island light, 21 faths., one. 1 mile N. by E. of Cleggan Hd., 19 faths., three. Ballinakill Harbour, 2–4 faths., one.

*Previous Irish Records*:—Dingle Bay, Valentia Harbour (Walker); Roundstone (Calman); several places in deep water off the West coast, 70–744 faths. (Porcupine).

*Distribution*:—Arctic Ocean, North Atlantic and North Sea from Norway to France.

**Ampelisca diadema** (A. Costa).

Blacksod Bay, 3–9 faths., three. Inishlyre Harbour, 5 faths., one.

New to the district.

*Previous Irish Records*:—Belfast Bay, Dublin Bay (Spence Bate); West of Ireland, 183 faths. (Porcupine).

*Distribution*:—North Atlantic and North Sea from Norway to France, Mediterranean.

**Ampelisca typica** (Bate).

Blacksod Bay, 4–8 faths., few. Bofin Harbour, in tow-nets, on six occasions.

New to the district.

*Previous Irish Records*:—Belfast Bay, Dublin Bay (Kinahan); Lough Foyle (Norman); West of Ireland, 90 faths. (Porcupine).

*Distribution*:—North Atlantic and North Sea from Norway to France.

**Ampelisca tenuicornis** Lilljeborg.

Blacksod Bay, 4–9 faths., common.  $\frac{3}{4}$  mile S. of Mulranny Pier, Clew Bay, 5–11 faths., two. Inishgowla Harbour, Clew Bay, 1–4 faths., five. Fahy Bay, Ballinakill Harbour, six. Bofin Harbour, in tow-nets, frequent.

New to the district.

*Previous Irish Records*:—Valentia Harbour (Walker); Donegal Bay (Norman); W. of Ireland, 183 faths. (Porcupine).

*Distribution*:—North Atlantic and North Sea from Norway to France.

Family **HAUSTORIIDAE**.**Bathyporeia guilliamsoniana** (Bate).

Blacksod Bay, in sand at low-water, common.

New to Ireland.

*Distribution*:—North Atlantic and North Sea from Norway to France.

**Bathyporeia pelagica** (Bate).

S. of Mulranny Pier, Clew Bay, 5–13 faths., two. Ballinakill Harbour, 1–3 faths., six. Bofin Harbour, in surface tow-nets, ten.

New to the district.

*Previous Irish Record* :—West of Ireland, 183 faths. (Porcupine).

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France.

**Urothoe marina** (Bate).

Elly Bay, Blacksod Bay, in sand, two. N. of Ardelly Point, Blacksod Bay, 5 faths., one. Inishlyre Harbour, tow-net, one. Off Bundowlish, tow-net, one. Bofin Harbour, tow-nets, common. Male specimens, caught in surface tow-nets, are beautifully rose-coloured when alive. In this respect they agree with *U. elegans* and *U. pulchella*, so that the colouration of specimens is no guide to their identity.

*Previous Irish Records* :—Dublin Bay (Kinahan); Ardbear Bay (Brady and Robertson).

*Distribution* :—Coasts of the British Isles and France.

**Urothoe brevicornis** Bate.

Elly Bay, Blacksod Bay, in sand, common.

New to the district.

*Previous Irish Record* :—Church Island, Valentia (Walker).

*Distribution* :—Coasts of the British Isles and France.

**Urothoe elegans** Bate.

Elly Bay, Blacksod Bay, tow-nets, two.  $3\frac{1}{4}$  miles E.S.E. of Clare Island light, 20 faths., three. Very abundant in tow-nettings in Bofin Harbour and in the open sea between Bofin and Cleggan Head.

*Previous Irish Records* :—Blacksod Bay (Walker); Dublin Bay (Kinahan); Berehaven, and several localities on the West coast of Ireland (Porcupine).

*Distribution* :—Atlantic coasts of Europe from Norway to the Azores.

Family **PHOXOCEPHALIDAE**.**Metaphoxus fultoni** (T. Scott).

Inishgowla Harbour, Clew Bay. 1–5 faths., seven. Bofin Harbour, taken sparingly on numerous occasions in surface tow-nets at night. Ballinakill Harbour on two occasions. Also taken occasionally in the open seas around Bofin, Shark, and Inishturk.

New to the district.

*Previous Irish Records* :—Galway (Calman) and Roundstone (Norman).

*Distribution* :—West and south coasts of the British Isles, France and the Mediterranean.

**Metaphoxus pectinatus** (Walker).

Ballinakill Harbour, in surface tow-nettings at night and in the dredge, 1–4 faths., on twelve occasions. Taken twice in the open sea near Bofin and High Island.

New to the district.

*Previous Irish Records* :—Valentia (Walker) and Roundstone (Norman).

*Distribution* :—West coast of the British Isles and France.

Patience (“Glasgow Naturalist,” vol. i, 1909) is of opinion that these two species of *Metaphoxus* should be united. It is not my intention to discuss the matter here; but it is interesting to record, in support of one of the arguments put forward by Patience for his view, that on two occasions I have dredged the two forms in company. This fact leaves no doubt that the two species live in association in their normal habitat, for, in dredging from a small boat, very little ground is covered in a single haul.

**Harpinia crenulata** (Boeck).

Off Mulranny Pier, 7 faths., one.

New to the district.

*Previous Irish Record* :—Valentia (Norman).

*Distribution* :—North Atlantic and North Sea from Norway to the west of France.

Family **AMPHILOCHIDAE**.

**Gitana sarsi** Boeck.

Inishlyre Harbour, 5 faths., one. Derryinver Bay, Ballinakill Harbour, 1–3 faths., one. Bofin Harbour, one.

*Previous Irish Records* :—Valentia and Carrigaholt (Walker).

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France, Mediterranean.

Family **LEUCOTHOIDAE**.

**Leucothoe spinicarpa** (Abildgaard).

Blacksod Bay, from an Ascidian, one.  $3\frac{1}{4}$  miles N.  $\frac{1}{2}$  W. of Clare Island light, 28 faths., three. Inishgowla Harbour, Clew Bay, 1–4 faths., one. Fahy Bay, Ballinakill Harbour, on ship's bottom, two.

New to the district.

*Previous Irish Records* :—Valentia (Walker) and Roundstone (Norman).

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France, Mediterranean, Azores.

***Leucothoe lilljeborgii* Boeck.**

Killary Bay, 7 faths., two.

New to Ireland.

*Distribution* :—North Atlantic and North Sea from South Norway to France, Mediterranean.

Family **METOPIIDAE.**

***Metopa rubrovittata* G. O. Sars.**

Ballinakill Harbour, from *Hydractinia echinata*, two.

New to Ireland.

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France.

Family **STENOTHOIDAE.**

***Stenothoe monoculoides* (Montagu).**

Blacksod Bay, 1–3 faths., two. Clare Island, south shore of Portanibb, one.  $3\frac{3}{4}$  miles N.W. of Clare Island light, 25 faths., one. Ballinakill and Bofin Harbours, frequent in tow-nets.

*Previous Irish Records* :—Valentia (Walker); Belfast Bay (Kinahan); Sligo (Bate); Ardbear Bay (Brady and Robertson); Roundstone (Norman).

*Distribution* :—North Atlantic and adjoining seas from Norway to the Azores, Mediterranean.

***Stenothoe marina* (Bate).**

Clare Island, 13–29 faths., nine. Ballinakill Harbour, three. Bofin Harbour, one.

*Previous Irish Records* :—Valentia (Walker); Donegal Bay, Bray Head, Valentia (Norman); Porcupine Station 6, 90 faths.

*Distribution* :—North Atlantic and North Sea from Norway to France, Adriatic.

Family **COLOMASTIGIDAE.**

***Colomastix pusilla* Grube.**

5 miles N.W. by W. of Clare Island light, 29 faths., one. Inishlyre Harbour, 5 faths., one.

New to the district.

*Previous Irish Record* :—Birterbuy Bay (Brady and Robertson).

*Distribution* :—West and South coasts of the British Isles, France and the Mediterranean.

Family **ACANTHONOTOZOMATIDAE**.

**Panoplea minuta** (G. O. Sars).

Coastguard Deep, Ballinakill Harbour, 2–8 faths., two specimens. North entrance to Ballinakill Harbour, 6–8 faths., five. Cleggan Bay, 5–10 faths., two.  $\frac{1}{2}$  mile E.S.E. of Clare Island, 7 faths., three.

New to the district.

*Previous Irish Records*:—Valentia Harbour, Dunbeacon Harbour, and the S.W. of Ireland, 6 faths. (Walker).

*Distribution*:—North Atlantic and North Sea from South Norway to the British Isles, Mediterranean.

Family **LILLJEBORGIIDAE**.

**Lilljeborgia brevicornis** (Bruzelius).

7 miles S.E. of Clare Island light, 16 faths., two.  $\frac{1}{2}$  mile S. of Mulranny Pier, 5–11 faths., one.

New to Ireland.

*Distribution*:—Arctic Ocean, North Atlantic and North Sea from Norway to France.

Family **OEDICEROTIDAE**.

**Perioculodes longimanus** (Bate and Westwood).

Feorinyeeo Bay, Blacksod Bay, 2 faths., one. S.W. of Mulranny Pier, 13 faths., one. Ballinakill and Bofin Harbours, very common in tow-nettings taken at night.

*Previous Irish Records*:—Valentia Harbour, Carrigaholt (Walker); Clew Bay (Norman).

*Distribution*:—Arctic Ocean, North Atlantic and North Sea from Norway to France, Mediterranean.

**Pontocrates arenarius** (Bate).

Blacksod Bay, 6–7 $\frac{1}{2}$  faths., fine sand, one. 3 $\frac{1}{4}$  miles E.S.E. of Clare Island light, 20 faths., one. Off the White Strand, Bofin Island, fine sand, 2–5 faths., ten.

New to Ireland.

*Distribution*:—North Sea from Norway to Holland, West and South coasts of the British Isles.

***Synchelidium haplocheles* (Grube).**

Clare Island, inside Portlea, 1 fath., one. Bofin Harbour, on eight occasions in tow-nettings taken at night.

New to the district.

*Previous Irish Records* :—Valentia (Walker) and W. of Ireland (Calman).

*Distribution* :—North Atlantic and North Sea from Norway to the British Isles, Mediterranean.

***Monoculodes carinatus* (Bate).**

Blacksod Bay, 5–7½ faths., fine sand, three. Ballinakill Harbour, tow-net at surface, at night, one. Bofin Harbour, tow-net at surface, at night, one. Outside Bofin Harbour, 17 faths., fine sand, three.

New to Ireland.

*Previous Irish Records* :—Off Galley Head, Co. Cork, Valentia Harbour and off Bull Rock (Walker).

*Distribution* :—North Atlantic and North Sea from Norway to France, Mediterranean.

**Family CALLIOPIIDAE.*****Calliopius rathkii* (Zaddach).**

Feorinyeo Bay, Blacksod Bay, shore, one. Killary Bay, 6 faths., one. Bofin Harbour, tow-net at night, two.

New to Ireland.

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France.

***Apherusa cirrus* (Bate).**

Blacksod Bay, shores, common. Bofin Harbour, on two occasions.

*Previous Irish Records* :—Valentia (Walker); Roundstone (Calman); Sligo, Bangor, Co. Down, and Belfast Lough (Bate).

*Distribution* : Arctic Ocean, North Atlantic and North Sea from Norway to France.

***Apherusa bispinosa* (Bate).**

Blacksod Bay, shores, common. Inishgowla Harbour, Clew Bay, 1–4 faths., one. Clare Island, Portlea, common. 1½ mile E.N.E. of Clare Island light, 21 faths., one. Ballinakill and Bofin Harbours, very abundant in tow-nettings taken at the surface at nights.

*Previous Irish Records* :—Valentia (Walker); Ardbear Bay (Brady and Robertson); Belfast Lough and Bangor, Co. Down (Kinahan); Carrigaholt (Walker); Kingstown Harbour (Tattersall).

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France, Mediterranean.

**Apherusa jurinei** (Milne-Edwards).

Blacksod Bay, shores, ten. Portlea, Clare Island, six. Ballinakill Harbour, surface tow-net, one. Bofin Harbour, on five occasions. Clifden Bay, one.

New to the district.

*Previous Irish Records*:—Valentia (Walker).

*Distribution*.—North Atlantic and North Sea from Norway to France, Mediterranean.

Family **PLEUSTIDAE**.

**Neopleustes monocuspis** (G. O. Sars).

Blacksod Bay, one specimen.

New to Ireland.

*Distribution*:—Norway, Irish Sea.

**Stenopleustes nodifer** (G. O. Sars).

S.S.W. Mulranny Pier, 13 faths., one.

New to Ireland.

*Distribution*:—Norway, North Sea and Irish Sea.

Family **ATYLIDAE**.

**Nototropis swammerdamei** (Milne-Edwards).

One of the most abundant and characteristic Amphipoda of the district. Taken on sixty-five occasions all over the area from Blacksod Bay to Ballinakill. Frequently there were two or three hundred specimens in a haul.

*Previous Irish Records*:—All round the coast from Valentia northwards to Kingstown (various authors).

*Distribution*:—Arctic Ocean, North Atlantic, and Mediterranean.

**Nototropis vedlomensis** (Bate and Westwood).

2 miles S.S.W. of Clare Island, 27 faths., two.  $1\frac{1}{2}$  mile N.N.W. of Conwell, off Crump Island, 24 faths., one. Off the entrance to Bofin Harbour, 16–19 faths., two.  $1\frac{1}{2}$  mile north of High Island, surface, three. Ballinakill Harbour, on three occasions.

New to the district.

*Previous Irish Records*:—Off Galley Head, Co. Cork, and Valentia (Walker).

*Distribution*:—North Atlantic and North Sea from Norway to France.

Family **MELPHIDIPPIDAE.****Melphidipella macra** (Norman).

4 miles W.S.W. of High Island, 54 faths., two.

New to the district.

*Previous Irish Records*:—Valentia and west of the Aran Isles, 44–46 faths. (Walker).

*Distribution*:—North Atlantic and North Sea from Norway to Ireland.

Family **GAMMARIDAE.****Gammarellus homari** (Fabricius).

Blacksod Bay, shores, on five occasions. Portlea, Clare Island, one. Tangaree anchorage, Achill Sound, one. Ballinakill and Bofin Harbours and neighbouring seas, in small numbers on seventeen occasions.

*Previous Irish Records*:—Valentia (Walker); Sligo (Bate); Bray (Bate and Westwood); S.W. Ireland; Dursey Sound.

*Distribution*:—Arctic Ocean, North Atlantic and North Sea from Norway to France, North America.

**Cheirocratus sundevalli** (Rathke).

Blacksod Bay, sixteen. Inishgowla Harbour, Clew Bay, 1–4 faths., one. Fahy Bay, Ballinakill Harbour, seven. Bofin Harbour, on three occasions.

*Previous Irish Records*:—Valentia (Walker); Ardbear Bay (Brady and Robertson); Roundstone (Norman).

*Distribution*:—Arctic Ocean, North Atlantic from Norway to France, Mediterranean.

**Melita palmata** (Montagu).

Blacksod Bay, shores, common. Clare Island, shore, one. Fahy Bay, Ballinakill Harbour, shores, common.

New to the district.

*Previous Irish Records*:—Valentia (Walker); Belfast Lough and Dublin Bay (Kinahan).

*Distribution*:—North Atlantic and North Sea from Norway to the Azores.

**Melita obtusata** (Montagu).

Very widely distributed throughout the area in shallow water, but not actually a shore species.

*Previous Irish Records*:—Off the Skelligs, 52–62 faths. (Walker); Ardbear Bay (Brady and Robertson); Roundstone (Norman).



*Distribution*:—North Atlantic and North Sea from Norway to France, Mediterranean.

**Ceradocus semiserratus** (Bate).

Ballinakill harbour, 1–3 faths., two.

*Previous Irish Records*:—Ardbear Bay (Brady and Robertson); Roundstone (Norman).

*Distribution*:—British Isles, West Coast of France.

**Maera tenuimana** (Bate).

Blacksod Bay, two.

New to Ireland.

*Distribution*:—British Isles.

**Maera othonis** (Milne-Edwards).

2½ miles S.E. of Inishturk, 13 faths., one. Ballinakill Harbour, 2–8 faths., two.

New to the district.

*Previous Irish Records*:—Valentia (Walker); Belfast Bay (Thompson); Dublin Bay (Kinahan); Berehaven.

*Distribution*:—North Atlantic and North Sea from Norway to France, Mediterranean.

**Gammarus marinus** Leach.

• Common on the shores throughout the district.

*Previous Irish Records*:—Round all the coasts (various authors).

*Distribution*:—North Atlantic and North Sea from Norway to France, Mediterranean and North America.

**Gammarus duebenii** Lilljeborg.

Elly Bay, Blacksod Bay, shores, several. Clare Island—Lough Avullin, Creggan Lough, stream at S.W. end of Harbour, pool at north base of Knocknaveen, common. Ballinakill Harbour, shores, not uncommon near streams. Found generally throughout the district on the shores near brackish water or in fresh and brackish water streams.

New to the district.

*Previous Irish Records*:—Lough Doon, Co. Kerry, Lough Corrib (Walker) Lough Erne (Kane).

*Distribution*:—Brackish water on the coasts of Norway, Holland, and the British Isles.

**Gammarus locusta** Linn.

Very abundant everywhere throughout the district, but always distinctly marine and a shallow-water rather than a shore species.

*Previous Irish Records* :—All round the coasts (various authors).

*Distribution* :—Arctic Ocean, North Atlantic and adjoining seas from Norway to France, North America.

Family **DEXAMINIDAE**.**Dexamine spinosa** (Montagu).

A very abundant and widespread species throughout the area. Has been taken on sixty-five occasions, sometimes in considerable numbers, more especially in tow-nets taken at night.

*Previous Irish Records* :—From all round the coasts (various authors).

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France, Mediterranean.

**Dexamine thea** (Boeck).

Blacksod Bay, three specimens. Ballinakill and Bofin Harbours, common, but never so abundant as the last species.

New to the district.

*Previous Irish Record* :—Galway (Calman).

*Distribution* :—Arctic Ocean, North Atlantic and North Sea from Norway to France.

**Tritaeta gibbosa** (Bate).

Blacksod Bay, shores, two. Bofin Harbour, on four occasions.

New to the district.

*Previous Irish Records* :—Valencia (Walker); Lambay.

*Distribution* :—North Atlantic and North Sea from Norway to the Azores, Mediterranean.

**Gurnea coalita** (Norman).

Blacksod Bay, tow-nets at surface, three. Bofin Harbour, frequently in surface tow-nettings taken at night. Ballinakill Harbour, on two occasions.

New to the district.

*Previous Irish Record* :—Valencia (Walker).

*Distribution* :—Coasts of the British Isles, France and the Mediterranean.

Family **TALITRIDAE**.**Talitrus saltator** (Montagu).

Louisburgh district, one. Louisburgh to Roonagh, two. Westport, Co. Mayo, one.

These specimens were collected by Mr. Nevin H. Foster, and are the only specimens I have seen from the district.

*Previous Irish Records* :—From all round the coasts (various authors).

*Distribution* :—North Atlantic and North Sea from South Norway to France, Mediterranean, Azores.

**Orchestia gammarellus** (Pallas).

Generally distributed throughout the area. Found in the nests of the Great Black-backed Gull and the Puffin on the Bills off Clare Is., from 50-120 ft. above the sea. This occurrence of *Orchestia* so far from the sea is interesting, but by no means rare on the cliffs of the west of Ireland coast. I have myself taken the species on the tops of the high cliffs of the western shore of the Aran Isles.

*Previous Irish Records* :—From all round the coasts (various authors).

*Distribution* :—North Atlantic and North Sea from South Norway to the Azores.

**Hyle prevestii** (Milne-Edwards).

Blacksod Bay, shores, not uncommon. Clare Island, rock-pools at Portlea, and south shore of Portanibb, one.

New to the district.

*Previous Irish Records* :—Valentia (Walker); Berehaven.

*Distribution* :—North Atlantic and North Sea from S. Norway to the Azores.

Family **AORIDAE**.

**Aora typica** Kröyer.

Clare Island, 10-20 faths., twenty-four. Bofin Harbour, sixteen. Ballinakill Harbour, five.

*Previous Irish Records* :—Lambay, Valentia, and Dunbeacon Harbour. (Walker); Roundstone (Calman); Ardbear Bay (Brady and Robertson).

*Distribution* :—North Atlantic coasts of Europe, South America, New Zealand, Australia, and Kerguelen.

**Microdeutopus anomalus** (Rathke).

Blacksod Bay, common. Inishlyre Harbour, one. S. of Mulranny Pier, 5 faths., one. Inishgowla Harbour, Clew Bay, 1-4 faths., four. Ballinakill and Bofin Harbour, frequent.

*Previous Irish Records* :—Killybegs (Walker); Ardbear Bay (Brady and Robertson).

*Distribution* :—North Atlantic and North Sea from Norway to France, Mediterranean.

**Microdeutopus danmoniensis** (Bate).

Blacksod Bay, twenty-six. Ballinakill and Bofin Harbours, not uncommon.

New to the district.

*Previous Irish Record* :—Valentia (Walker).

*Distribution* :—South of England, Bay of Naples.

**Coremepas versiculatus** (Bate).

Blacksod Bay, seventeen. Killary Bay, 7 faths., one. S. of Mulranny Pier, Clew Bay, 5–11 faths., one. Ballinakill and Bofin Harbours, common.

*Previous Irish Record* :—Ardbear Bay (Brady and Robertson).

*Distribution* :—West and south coasts of the British Isles.

**Lembos websteri** (Bate).

Blacksod Bay, eleven,  $2\frac{1}{2}$  miles S. E. by E. of Clare Island light, 17–19 faths., three. Ballinakill Harbour, one. Bofin Harbour, seven.

New to the district.

*Previous Irish Record* :—Dunbeacon Harbour (Walker).

*Distribution* :—North Atlantic and adjoining seas from Norway to France, Mediterranean.

Family **PHOTIDAE**.

**Microprotopus maculatus** Norman.

Blacksod Bay, tow-net, one. South of Mulranny Pier, 7– $15\frac{1}{2}$  faths., three.  $\frac{3}{4}$  mile S. E. of Clare Island light, 14 faths., three. Ballinakill and Bofin Harbours, on twelve occasions.

*Previous Irish Records* :—Valentia, Killybegs, and Carrigaholt (Walker).

*Distribution* :—North Atlantic and North Sea from Norway to the Azores, Mediterranean.

**Photis longicaudata** (Bate and Westwood).

1 mile E. of Blacksod light, 8–9 faths., four.  $1\frac{1}{4}$  miles N.E. by E. of Clare Island light,  $25\frac{1}{2}$  faths., one. S.W. of Mulranny Pier, 5–13 faths., seven.  $2\frac{3}{4}$  miles W. by N. of High Island, 54 faths., one.

New to the district.

*Previous Irish Record* :—Valentia (Walker).

*Distribution* :—North Atlantic and North Sea from Norway to France, Mediterranean.

**Eurystheus maculatus** (Johnston).

Blacksod Bay, shores, six.  $2\frac{1}{4}$  miles E.  $\frac{1}{2}$  N. of Clare Island light, 19–25 faths., one.  $2\frac{1}{2}$  miles N.E. by E. of Clare Island light, 5 faths., one. Bofin Harbour, two.

*Previous Irish Records* :—Lambay and Valentia (Walker); Ardbear Bay (Brady and Robertson).

*Distribution* :—Arctic Ocean and North Atlantic from Norway to the Azores.

**Megamphopus cornutus** Norman.

Bofin Harbour, two.

New to the district.

*Previous Irish Record* :—Valentia (Walker).

*Distribution* :—Arctic Ocean and North Atlantic from the Lofoten Isles to the south of England.

Family **ISAEIDAE**.

**Isaea montagui** Milne-Edwards.

Barnaderg Bay, Ballinakill Harbour, 3 faths., thirty-two from *Mamaia squinado*.

New to Ireland.

*Distribution* :—North Atlantic and Mediterranean, from the British Isles to the Adriatic.

Family **AMPHITHOIDAE**.

**Amphithoe rubricata** (Montagu).

Very abundant in shallow water throughout the area.

*Previous Irish Records* :—Several localities all round the coasts (various authors).

*Distribution* :—North Atlantic and North Sea from Norway to France.

**Pleonexes gammaroides** Bate.

Common in the littoral zone throughout the area.

New to the district.

*Previous Irish Records* :—Valentia and Dungarvan (Walker); Kingston (Tattersall).

*Distribution* :—North Atlantic and adjoining seas from Norway to the Azores.

**Sunamphithoe pelagica** Milne-Edwards.

Blacksod Bay, three. Ballinakill and Bofin Harbours, occasional specimens on twelve occasions.

New to Ireland.

*Distribution*:—North Atlantic and North Sea from Norway to the Azores.

Family **JASSIDAE**.

**Parajassa pelagica** (Leach).

Clare Island, south shore of Portanibb, three.

New to Ireland.

*Distribution*:—Arctic Ocean and North Atlantic from Norway to the British Isles.

**Jassa falcata** (Montagu).

**Jassa dentex** (Czerniawsky).

Common in the littoral zone throughout the area.

*Previous Irish Records*:—Several localities round the coasts (various authors).

*Distribution*:—Arctic Ocean, North Atlantic and adjoining seas from Norway to the Azores, Mediterranean, Rio Janeiro, Indian Ocean, Pacific Ocean, and Australian Seas.

Mrs. Sexton has, to my mind, conclusively proved that *Jassa falcata* (Montagu) is synonymous with *Jassa pulchella* Leach; and I therefore have used the former name in preference to the latter, used by Stebbing in his monograph.

I have given the two specific names above to indicate that I have seen the two forms of male to which these names were given, and not because I believe the species are really distinct. Indeed I share Walker's doubts as to the validity of the two supposed species, and I believe that future research will show that they are only forms or varieties of a single polymorphic species.

**Jassa ocinus** (Bate).

3¼ miles N. ½ W. of Clare Island light, 25 faths., eight.

New to Ireland.

*Distribution*:—Irish Sea, Mediterranean.

**Ischyrocerus anguipes** Kröyer.

Ballinakill Harbour, five specimens. Bofin Harbour, two.

New to the district.

*Previous Irish Records*:—Valentia and Dalkey (Walker).

*Distribution*:—Arctic Ocean, North Atlantic and adjoining seas from Norway to the British Isles.

Family **COROPHIIDAE**.

**Erichthonius brasiliensis** (Dana).

Blacksod Bay, shallow water, common. Inishgowla Harbour, Clew Bay, one. Bofin Harbour, ten. Ballinakill Harbour, on six occasions.

*Previous Irish Records*:—Belfast Lough (Kinahan); Valentia (Walker); Ardbear Bay (Brady and Robertson).

*Distribution*:—North Atlantic and adjoining seas from Norway to the Mediterranean, N.E. coast of America, Brazil, California.

**Siphonoecetes colletti** Boeck.

One mile E. of Blacksod light, 8–9 faths., one. Seas between Clare Island and Westport, 5–20 faths., common. Bofin Harbour, one.

New to the district.

*Previous Irish Records*:—Dalkey (Walker).

*Distribution*:—North Atlantic and North Sea from Norway to the British Isles, north-east coast of America.

**Corophium volutator** (Pallas)

Muddy flats at Rossadillisk, five.

*Previous Irish Records*:—Several localities in which muddy tidal flats occur round the coasts.

*Distribution*:—North Atlantic from Norway to the Mediterranean.

**Corophium crassicorne** Bruzelius.

Fahy Bay, Ballinakill Harbour, six. Bofin Harbour, twenty-one.

*Previous Irish Records*:—Ardbear Bay (Brady and Robertson); Killybegs (Walker).

*Distribution*:—Arctic Ocean, North Atlantic and adjoining seas from Norway to the Mediterranean.

**Corophium bonelli** (Milne-Edwards).

Very common throughout the area, especially in tow-nets taken at night. A much more abundant species than the last.

New to the district.

*Previous Irish Records*:—Valentia (Walker) and Kingstown (Tattersall).

*Distribution*:—North Atlantic and adjoining seas from Norway to France.

## AMPHIPODA CAPRELLIDEA.

**Proto venticosa** O. F. Müller.

Taken on fifty-three occasions within the area. A widely distributed and abundant form, very commonly taken in tow-nettings at night.

*Previous Irish Records*:—From several localities all round the coast.

*Distribution*:—North Atlantic from Norway to the Azores, Mediterranean, S. America.

**Pseudoprotella phasma** (Montagu).

Blacksod Bay, shores of Elly Bay, one.  $2\frac{1}{4}$  miles S.E. of Inishturk, 13 faths., two. Ballinakill Harbour, ten.

New to the district.

*Previous Irish Records*:—Cork, Dublin Bay, Strangford Lough.

*Distribution*:—North Atlantic from Norway to the coast of Africa and the Azores, Mediterranean.

**Podalirius typicus** Kröyer.

Blacksod Bay, two. S.W. of Mulranny Pier, 5–17 faths., six. Bofin Harbour, one. Ballinakill Harbour, two. Killary Harbour, one.

New to Ireland.

*Distribution*:—North Atlantic from Norway to the Azores, Mediterranean.

**Caprella linearis** Linn.

Blacksod Bay, Feorinyeeo Bay, shore, twenty-seven.  $3\frac{1}{2}$  miles S. by E. of Clare Island light, 10 faths., two.

New to the district.

*Previous Irish Records*:—Several localities on the east coast.

*Distribution*:—North Atlantic from Norway to the British Isles, North America, California, Behring Sea, and Kamtschatka.

**Caprella fretensis** Stebbing.

$3\frac{1}{2}$  miles S. by E. of Clare Island light, 10 faths., one male, bright red in colour when alive.  $\frac{1}{2}$  mile S. of Mulranny Pier, Clew Bay, 5–11 faths., one male.

New to Ireland.

*Distribution*:—N. Atlantic, coasts of England, France, and Spain.



**Caprella acanthifera** Leach.

Blacksod Bay, six. 5 miles N.W. by W. of Clare Island light, 29 faths., one.  $\frac{1}{2}$  mile E.S.E. of Clare Island, 7 faths., one. Ballinakill and Bofin Harbours, young specimens frequent in surface tow-nettings at night.

*Previous Irish Records* :—Valentia and Dalkey (Walker); Springvale, Co. Down (Bate and Westwood); Ardbear Bay (Brady and Robertson).

*Distribution* :—North Atlantic from Norway to the Azores, Mediterranean.

AMPHIPODA HYPERIIDEA.

Family **HYPERIIDAE**.

**Hyperia galba** (Montagu).

Clare Island Harbour, one. Fahy Bay, Ballinakill Harbour, from *Pelagia perla*, abundant in the year 1901.

**Hyperoche tauriformis** (Bate and Westwood).

Open sea between Bofin and the mainland, on six occasions, all in the autumn of three different years. On one occasion associated with *Bolina*.

An oceanic species with an autumnal inshore migration.

**Parathemisto oblivia** (Kröyer).

Common in open sea tow-nettings throughout the area, especially in the autumn.

**Euthemisto compressa** (Goës).

The most abundant Hyperid in the area. Met with at all times of the year, sometimes in great numbers.

Family **LYCAEIDAE**.

**Tryphaena malmi** Boeck.

Six specimens taken from the stomach of a spur dog-fish, *Acanthias vulgaris* captured in mackerel nets drifting 7 miles W. by S. of Beetle Head, Clare Island. The dog-fish had, in all probability, previously swallowed a mackerel which had been feeding, as is their custom, on planktonic organisms of which the Hyperid formed a part.

## GEOGRAPHICAL DISTRIBUTION OF THE SPECIES NOTED ABOVE.

The list of Clare Island Amphipoda includes ninety-five species, of which seventy-nine are known from the coasts of Norway and forty-five from the Mediterranean, while thirty-nine are common to all three places. Thirty-three of the species are Arctic forms, of which fourteen extend to the Mediterranean, the remaining nineteen having not yet been recorded from further south than the coasts of France.

Of the non-Arctic species, twenty five extend from Norway to the Mediterranean, and a further twenty-one are known from the Atlantic coasts of Europe from Norway to France, but have so far not been met with in the Mediterranean.

The following six species :—*Metaphoxus fultoni*, *Colomastix pusilla*, *Guernea coalita*, *Microdeutopus danmoniensis*, *Isaea montagui*, and *Jassa ocius*, are Mediterranean forms which have the northern limit of their distribution in the waters of the British Isles, and do not reach Norway.

The following ten species have the centre of their distribution in British waters, and are not at present known from either Norway or the Mediterranean :—

<i>Lysianassa ceratinus</i>	<i>Urothoe elegans</i> .
<i>Socarnes erythrophthalmus</i> .	<i>Ceradocus semiserratus</i> .
<i>Metaphoxus pectinatus</i> .	<i>Maera tenuimana</i> .
<i>Urothoe marinus</i> .	<i>Coremepas versiculatus</i> .
<i>Urothoe brevicornis</i> .	<i>Caprella fretensis</i> .

Finally seventeen of the species are known from the coasts of North America :

<i>Hoplonyx cicada</i> .	<i>Amphithoe rubricata</i> .
<i>Leucothoe spinicarpa</i> .	<i>Ischyrocerus anguipes</i> .
<i>Ampelisca spinipes</i> .	<i>Erichthonius brasiliensis</i> .
<i>Calliopius rathkii</i> .	<i>Siphonocetes colletti</i> .
<i>Gammarellus homari</i> .	<i>Proto ventricosa</i> .
<i>Gammarus locusta</i> .	<i>Caprella linearis</i> .
<i>Gammarus marinus</i> .	<i>Hyperia galba</i> .
<i>Dexamine thea</i> .	<i>Euthemisto compressa</i> .
<i>Microdeutopus danmoniensis</i> .	

All but five of these species—*Gammarus marinus*, *Microdeutopus danmoniensis*, *Amphithoe rubricata*, *Erichthonius brasiliensis*, and *Siphonocetes colletti*—are Arctic species.

The following table summarizes the distribution of the Clare Island species under the various families of the Amphipoda.

	Species known from Arctic Ocean.	Species known from Norway.	Species known from British Isles.	Species known from Europe to the south of British Isles.	Species known from the Mediterranean.	Species known from N. America.	Species common to Norway and the Mediterranean.
GAMMARIDEA.							
Lysianassidae, . . .	3	8	10	8	4	1	4
Ampeliscaidae, . . .	2	5	5	5	1	1	1
Haustoriidae, . . .	1	2	5	5	1	—	1
Phoxocephalidae, . . .	0	1	3	3	1	—	1
Amphilochidae, . . .	1	1	1	1	1	—	1
Leucothoidae, . . .	1	2	2	2	2	1	2
Metopidae, . . .	1	1	1	1	0	—	0
Stenothoidae, . . .	0	2	2	2	2	—	2
Colomastigidae, . . .	0	0	1	1	1	—	0
Acanthonotozomatidae,	0	1	1	1	1	—	1
Lilljeborgiidae, . . .	1	1	1	1	0	—	0
Oedicerotidae, . . .	1	4	4	3	3	—	3
Calliopiidae, . . .	3	4	4	4	3	1	2
Pleustidae, . . .	0	2	2	0	0	—	0
Atylidae, . . .	1	2	2	2	1	—	1
Melphidippidae, . . .	0	1	1	0	0	—	0
Gammaridae, . . .	3	8	10	9	4	3	4
Dexaminidae, . . .	3	3	4	4	3	1	2
Talitridae, . . .	0	3	3	3	1	—	1
Aoridae, . . .	0	3	5	3	3	1	2
Photidae, . . .	2	4	4	3	2	—	2
Isaeidae, . . .	0	0	1	1	1	—	0
Amphithoidae, . . .	0	3	3	3	0	1	0
Jassidae, . . .	3	3	4	1	2	1	1
Corophiidae, . . .	1	5	5	4	3	2	3
CAPRELLIDEA, . . .	2	5	6	6	5	2	5
HYPERIIDAE, . . .	4	5	5	4	0	2	0
Total, . . .	33	79	95	80	45	17	39

Summarized in another way, the Amphipod fauna of the Clare Island marine area is made up as follows :—

*Arctic species*, 33,

of which 14 extend to the Mediterranean,

19       ,,       British Isles,

12       ,,       N.E. coast of America.

*Non-Arctic species*, 62,

of which 25 extend from Norway to the Mediterranean,

21       ,,       ,,       ,,       British Isles,

6       ,,       British Isles to the Mediterranean,

10 are centred mainly round the British Isles.

## MARINE ISOPODA AND TANAIIDACEA.

BY W. M. TATTERSALL, D.Sc.

Read APRIL 22. Published JUNE 4, 1912.

THE area covered by the present report is the same as that given by me in the report on the Cumacea and Schizopoda, namely, from Blacksod Bay in the north to Slyne Head in the south, and seaward to the 50-fathom line. I have already published a paper on the Isopoda of Ballynakill and Bofin Harbours,<sup>1</sup> and I have incorporated the records from that paper in the present report, which is, therefore, a complete list of the species of marine Isopoda known to occur in the Clare Island district.

One species, *Tanais cavolinii*, is now recorded from Ireland for the first time, while the specimens of *Pseudione* sp. from *Porcellana longicornis* appear to be the first Bopyrids found on this crab in British waters. One species, *Paratanais batei*, is new to the district. In the paper mentioned above I have given tables indicating the known geographical distribution of the British and Irish Isopoda. It will, therefore, be sufficient here to mention that out of the thirty-six species of shallow-water Isopoda known to occur in the Clare Island marine area, twenty-two extend to Norway and eighteen to the Mediterranean, while only nine species are common to all three districts. Eight of the species are known from the coasts of North America. This result is very similar to that noted for the Cumacea and Schizopoda, namely, that the shallow-water marine fauna of the west of Ireland is a blending of boreal and Mediterranean species, in very nearly equal proportions.

Only four of the species noted below extend into deep water, namely, *Gnathia oxyuraea*, *Cirolana borealis*, *Janira maculosa*, and *Munna kröyeri*, while *Eurydice truncatu* and *Idotea metallica* are pelagic species which extend occasionally far out to sea. In fact, *I. metallica* is a true oceanic species, usually associated with floating barnacles and timber, and only reaching littoral waters under stress of weather.

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<sup>1</sup> Fisheries, Ireland, Sci. Invest., 1904, II. (1905).

## TANAIDACEA.

Fam. *Apseudidae*.

*Apseudes hibernicus*, Walker.—Ballynakill Harbour, common in dredgings from the muddy ground in Coastguard Bay, 5–8 fms. Bofin Harbour, one specimen from Port Island Bay.  $2\frac{1}{2}$  miles S.E. of Clare Island light-house, 18 fms., one specimen. Inishlyre Harbour, 5 fms., one specimen.  $\frac{1}{2}$  mile S. of Mulranny pier, Clew Bay, 8 fms., seven specimens.

Fam. *Tanaidae*.

*Tanais cavolinii*, H. Milne-Edwards.— $1\frac{1}{4}$  mile S.E. of Clare Island light, 18 fms., three specimens. Elly Bay, Blacksod Bay, shore-collecting, one specimen.

This species is now for the first time added to the Irish list. I have also received specimens from Valencia.

*Leptochelia dubia* (Krøyer).—This species is common in dredgings on muddy ground in Ballynakill and Bofin Harbours in 5–8 fms. Inishlyre Harbour, 5 fms., eleven specimens.

*Paratanais batei*, G. O. Sars.—Inishlyre Harbour, 5 fms., two specimens. Blacksod Bay, Carrigeenmore Rocks, two specimens. New to the district, the only other Irish locality known for the species being Galway Bay.

*Leptognathia longiremis* (Lilljeborg).—Coastguard Bay, Ballynakill Harbour, one specimen.

*Tanaopsis laticaudata*, G. O. Sars.—Ballynakill Harbour, common.

## ISOPODA.

## Tribe FLABELLIFERA.

Fam. *Anthuridae*.

*Anthura gracilis* (Montagu).—Coastguard Bay, Ballynakill Harbour, 6 fms., one specimen. Fahy Bay, Ballynakill Harbour, 3 fms., three specimens.  $2\frac{1}{2}$  miles east of Clare Island light, 22 fms., one specimen.  $3\frac{1}{2}$  miles N.W.  $\frac{1}{4}$  N. of Clare Island light, 25 fms., one specimen.  $1\frac{1}{2}$  miles S.E. by E. of the Bills, off Achill Island,  $27\frac{1}{2}$  fms., one specimen.

Fam. Gnathiidae.

*Gnathia oxyuraca* (Lilljeborg).—Very common in dredgings from Bofin and Ballynakill Harbours. The larvae are frequently taken in tow-nets at night and attached to the fins of fishes such as Coalfish, Pollack, Gurnard, and White Trout. Off Ardelly Point, Blacksod Bay, in one fm., two male specimens.

Following Sars, I named this species *Gnathia maxillaris* (Montagu) in my former paper. Norman has shown, however, that *G. maxillaris* is quite a different species, and that the species so named by Sars must bear the name here given to it.

Fam. Cirolanidae.

*Cirolana borealis*, Lilljeborg.—Not rare in the sand of Coastguard Bay, Ballynakill Harbour, from which specimens may be dug at low-water, spring tides.  $\frac{1}{2}$  mile S. of Mulranny Pier, Clew Bay, 8 fms., two specimens.

*Conilera cylindracea* (Montagu).—One mile N. of Cleggan Head, 19 fms., one specimen.

*Eurydice pulchra*, Leach.—Achill Sound, surface tow-net, one specimen. Bofin Harbour, surface tow-nets, on three occasions. Elly Bay, Blacksod Bay, one specimen dug from sand at low water, and two from a surface tow-netting.

*E. spinigera*, Hansen.—Ballynakill and Bofin Harbours, single specimens occasionally in surface tow-nets.

*E. truncata* (Norman).—Ballynakill and Bofin Harbours, very common in surface tow-nettings.  $1\frac{1}{4}$  miles N.N.W. of Corwell, off Crump Island, Co. Galway, 24 fms., one specimen.

Fam. Limnoriidae.

*Limnoria lignorum* (Rathke).—Found boring into the bottoms of two hulks moored in Ballynakill Harbour, and also attacking wooden stakes at low water.

Fam. Sphaeromidae.

*Sphaeroma serratum* (Fabricius).—Clifden Harbour, under stones at high-water mark. Elly Bay, Blacksod Bay, shore-collecting, two specimens.

**Dynamene bidentata** (Montagu).—Ballynakill Harbour, under a stone on Ross shore, one male. From Saxicava-bored limestone, Black Rocks, Ballinakill, several specimens. Clare Island, shore of harbour, three specimens, Feorinyeeo Bay, Blacksod Bay, shore, thirteen specimens. Elly Bay. Blacksod Bay, shore, two specimens. Moyrahan, Blacksod Bay, shore, one specimen.

**Cymodoce truncata** (Montagu).—Ballynakill Harbour, from Saxicava-bored limestone, several.  $\frac{1}{4}$  mile S. W. of Gun-rock, Inishbofin, 16 fms., one specimen. Bofin Harbour, one specimen. Clare Island harbour, three specimens.  $\frac{1}{2}$  mile E. S. E. of Clare Island harbour, 7 fms., five specimens.  $\frac{1}{2}$  mile W. by S. of Cloghcormick Buoy, Clew Bay, 10 fms., three specimens.

#### Tribe VALVIFERA.

#### Fam. Idoteidae.

**Idotea baltica** (Pallas).—Abundant in shallow water among Laminaria, everywhere throughout the area.

**I. pelagica**, Leach.—Occasional specimens have been met with at Ballynakill and Bofin among floating weeds.

**I. granulosa**, Rathke.—Ballynakill and Bofin Harbours, occasional specimens from Laminaria. Clare Island harbour, three specimens. Louisburgh, Co. Mayo, one specimen.  $3\frac{1}{2}$  miles N. of Clare Island light, 25 fms., nine specimens. Elly Bay, Blacksod Bay, 3 fms., two specimens; also shore-collecting, two specimens.

**I. viridis** (Slabber).—Not uncommonly met with in Ballynakill and Bofin Harbours, in Laminaria and Zostera beds.

**I. neglecta**, G. O. Sars.—Taken once in Ballynakill Harbour from the hollowed stems of dead Laminaria and once in Bofin Harbour among floating weeds. Clare Island harbour, two specimens. Carrigeenmore Rocks, Blacksod Bay, shore, one specimen.

**I. emarginata** (Fabricius).—Almost as common in the district as *I. baltica*, in Laminaria and floating weeds of all kinds.

**I. metallica**, Bosc.—One male and one female specimen from the surface of the sea between Inisgort and Gun-rock, Inishbofin.

**I. linearis** (Pennant).—Very common in Ballynakill and Bofin Harbours. S. of Mulranny pier, Clew Bay, 7 fms., one specimen.



Tribe ASELOTA.

Fam. Janiridae.

**Janira maculosa**, Leach.—Coastguard Deep, Ballynakill Harbour, 6 fms., one specimen.  $3\frac{1}{2}$  miles N. of Clare Island light, 25 fms., two specimens. Carrigeenmore Rocks, Blacksod Bay, shore at low-water spring tides, seven specimens.  $1\frac{1}{2}$  miles S. E. by S. of the Bills, off Achill Island, one specimen.

**Jaera marina** (Fabricius).—Common throughout the district, under stones on the shore between tide-marks, especially where a stream of fresh water enters the sea.

**J. nordmanni** (Rathke).—Usually found associated with the last species, and almost equally abundant.

Fam. Munnidae.

**Munna kröyeri**, Boeck.—Ballynakill Harbour, twice taken in 7 fms. of water. Bofin Harbour, one specimen.

**M. fabricii**, Kröyer.—Ballynakill Harbour, 7 fms., three specimens.

**Pleurogonium rubicundum**, G. O. Sars.—Coastguard Deep, Ballinakill Harbour, 7 fms., common.

Tribe EPICARIDEA.

Fam. Bopyridae.

**Bopyrus squillarum**, Latreille.—Ballynakill Harbour, one specimen from *Palaemon serratus*.

**Bopyrina virbii** (Walz).—Bofin Harbour, one specimen from *Hippolyte varians*.

**Pleurocrypta galathea**, Hesse.—Ballynakill Harbour, two specimens from *Galathea squamifera*.  $2\frac{1}{2}$  miles S. E. of Clare Island light, three young specimens. Feorinyeeo Bay, Blacksod Bay, three specimens from *Galathea squamifera*.

**Pseudione sp.?**—Blacksod Bay, 5 fms., two specimens from *Porcellana longicornis*.

The only Bopyrid which has up till now been found parasitic on *Porcellana longicornis* is *Pleurocrypta porcellanae*, Hesse. The males of this species, as, indeed, of all species belonging to the genus *Pleurocrypta*, have the abdomen unsegmented. In the specimens now under notice, however, both males have the abdomen markedly segmented. This would seem to place them in the genus *Pseudione*, Kossmann; and indeed they bear a strong resemblance to the

males of *Pseudione hyndmanni* as figured by Sars in his "Crustacea of Norway," vol. ii. The latter species is, however, generally found parasitic on *Eupagurus bernhardus*, though Scott has recorded it from *Hippolyte varians*. The present specimens are the first, so far as I am aware, to be found on *Porcellana longicornis* in British waters. I prefer leaving their identity an open question till more specimens have been obtained. I may mention that I have since seen two specimens of *Pleurocrypta porcellanae* Hesse, from *Porcellana longicornis* taken at Port Erin, Isle of Man, and in both specimens the males conformed to the type in having the abdomen unsegmented. It seems probable, therefore, that these specimens from Blacksod Bay represent an undescribed species.

The genus is new to the district.

**Athelges paguri**, Rathke.—Ballynakill, a single specimen from a Pagurid.

**Epicaridan larvae**.—Larval Epicaridea are of very common occurrence in tow-nettings from Ballynakill and Bofin Harbours, either free or attached to Copepoda. A single Cryptoniscid larva was also found attached to *Dynamene bidentata*.

LAND AND FRESH-WATER ISOPODA.

By NEVIN H. FOSTER, M.B.O.U.

Read APRIL 22. Published JUNE 4, 1912.

ISOPODA TERRESTRIA.

THE survey of the Land Isopods (Woodlice) of Clare Island shows that in this group the fauna of the island does not reveal any striking difference from that of the adjacent mainland. Although only one species, *Cylisticus convexus*, which has not been taken elsewhere in Co. Mayo, was discovered on the island, it is likely that this woodlouse (very sparingly found throughout Ireland, although recorded from fourteen counties<sup>1</sup>) has been so far overlooked in this county.

Of the twenty-seven species of woodlice known in Ireland four—*Trichoniscus pusillus*, *Philoscia muscorum*, *Oniscus asellus*, and *Porcellio scaber*—are abundant in every county; and in respect of these species the same obtains on Clare Island and the Clew Bay islands, as also on Caher, Inishturk and Inishbofin. At least five of the recorded Irish species must be regarded as introduced exotics, and none of these has been observed in Co. Mayo.

The following nine species have been found on Clare Island:—

<i>Ligia oceanica</i> (Linn.).	<i>Oniscus asellus</i> Linn.
<i>Trichoniscus pusillus</i> Brandt.	<i>Porcellio scaber</i> Latreille.
<i>Trichoniscoides albidus</i> (Budde- Lund).	<i>P. pictus</i> Brandt.
<i>Philoscia muscorum</i> (Scopoli).	<i>P. dilatatus</i> Brandt.
	<i>Cylisticus convexus</i> (De Geer).

All the species recorded from West Mayo have been observed on Clare Island, with the exception of one, *Metoponorthus cingendus*, which had been noted on Achill Island. It seems probable that this species may eventually be found on Clare Island, as it is by no means rare in the west of Ireland.

<sup>1</sup> D. R. PACK BERESFORD and Nevin H. FOSTER: "The Woodlice of Ireland: their distribution and classification." Proc. R. I. Acad., vol. xxix, sect. B, No. 4, March, 1911.

*Haplophthalmus mengii* and *Trichoniscus pygmaeus* may also prove resident there, as in the case of the former species the general experience is that wherever found in this country it is only in very small numbers (except in greenhouses, where it often occurs in considerable colonies), and its minuteness renders it easily overlooked; but the latter species, though so diminutive, is readily recognized in the field, and, though the special attention of Mr. Stelfox and myself was directed to its discovery, we failed to find it either on the island or the adjoining mainland. This is rather surprising, as we have succeeded in finding it in every other Irish county in which we have searched for it. *H. mengii* and *T. pygmaeus* have recently been taken (A. W. S.) at Manulla Junction in Mayo East, only some few miles from the boundary line between the western and eastern divisions of the county.

For assistance in collecting specimens of woodlice in the district I have to tender thanks to Dr. Scharff (referred to below as R.F.S.), Rev. Canon Lett (H. W. L.), Rev. W. F. Johnson (W. F. J.), Messrs. D. R. Pack Beresford (D. R. P. B.), J. N. Halbert (J.N.H.), R. Ll. Praeger (R. Ll. P.), A. W. Stelfox (A. W. S.), R. J. Welch (R. J. W.), and numerous other collectors who materially aided me in the survey of this group.

The following notes on the various species found on Clare Island are appended:—

***Ligia oceanica* (Linn.).**

This species is common in suitable situations all round the shore-line of Clare Island, as well as on the shores of Clew Bay and its islands. It has also been taken on Mweelaun Rocks. Those observed in this district were mainly of small size, rarely exceeding 25 mm. in length, and usually very dark (almost black) in colour, but a specimen found at Belclare on the southern shore of Clew Bay was of a brick-red colour.

***Trichoniscus pusillus* Brandt.**

In damp situations this little species was met with everywhere in considerable numbers. It is not confined to low-lying situations, having been taken on the face of the Croaghmore cliffs at an altitude of 1,300 feet. A few specimens of the violet-coloured variety were observed.

***Trichoniscoides albidus* (Budde-Lund).**

When examined in life under a lens this small species is easily recognized. Its colour is white, but its bright pink eyes and the pink ramifications on the dorsal surface are distinctive characteristics, which, however, immediately disappear on the specimen being put into spirit. Two specimens were taken (R. Ll. P. and N. H. F.) under a deeply embedded stone (which also covered the nest of an

ant, *Lasius flavus*) on the top of the low cliffs of the southern shore beyond the Abbey; and it was also found in a similar situation (R. F. S.) on the eastern shore of the island. The only other localities in Mayo where this species has been obtained are Old Head, Louisburgh (A. W. S.), and on the shore at Westport demesne (J. N. H.).

***Philoscia muscorum* (Scopoli).**

This species is common in the district, though not seen on any of the islands in the eastern part of Clew Bay, except on Annagh Island. On Clare Island it was obtained up to elevations of 900 feet. As a rule the specimens were dark-coloured, but a few of the bright yellow variety were noted.

***Oniscus asellus* Linn.**

As obtains elsewhere in Ireland, this species shares with *Porcellio scaber* the distinction of constituting our commonest species of woodlouse. On Clare Island it was not observed at an altitude higher than 1000 feet; but in the lower parts of the island and all through the mainland district it is present in great numbers. Many of the specimens of this species measured  $17 \times 9$  mm., and all through the district the average size must be considered greater than usually obtains in Ireland. The coloration in this species was generally typical, but some tawny-coloured examples were found in the vicinity of Westport.

***Porcellio scaber* Latreille.**

Like the preceding the average size of this species was larger than obtains in the north-eastern parts of Ireland, a very broad form being common both on the island and throughout the district. Only the uniformly dark-coloured typical examples were seen on Clare Island; but the mainland yielded numerous specimens lighter in colour—some of them tawny-coloured with brown markings, or even uniformly of a brownish orange shade. This species, on Clare Island, exists in countless numbers on the shore, and cannot be regarded as uncommon in inland situations. *P. scaber* was the only woodlouse found on Bills of Achill.

***Porcellio pictus* Brandt.**

This species affects drier habitats than those usually tenanted by woodlice, and was frequently observed inside houses—even invading the beds in several of our stopping-places in the district. The specimens seen were all of small size, none of them attaining 14 mm. in length, and the coloration was not so vivid as generally obtains in this species. On the mainland it was

found at Achill Sound (D. R. P. B. and H. W. L.), Louisburgh (H. W. L.), Belclare (N. H. F.), and also at Curraun, near Achill Island.

**Porcellio dilatatus** Brandt.

A single specimen of this species was captured in the hotel garden on Clare Island. Elsewhere in Mayo it has been found at Louisburgh (also in a garden) and at Killala. It seems probable that this species is not native in the district, but has been introduced with garden plants.

**Cylisticus convexus** (De Geer).

Outside Clare Island this species has not yet been found in Co. Mayo, and it cannot be regarded as common on the island. A little colony was discovered under stones near the base of the castle at the harbour, and it was also captured in the hotel garden. A collection of woodlice made by various workers on Clare Island contains one specimen of this species, the precise locality not being stated.

ISOPODA FLUVIATILA.

**Asellus aquaticus** Linn.

The only fresh-water Isopod observed on Clare Island was *Asellus aquaticus*, which was obtained in the small lakes of the island, as well as on the mainland. This species is common in ponds, lakes, and streams all over Ireland, and is the only fresh-water Isopod so far detected in this country.

MARINE ENTOMOSTRACA.

BY G. P. FARRAN, B.A.

PLATES I-III.

Read JANUARY 27. Published APRIL 11, 1913.

THE sources from which the lists of species of the various groups included in this paper (comprising, as they do, many records other than those obtained during the Clare Island Survey) are taken, are given in detail at the head of each group.

The lists themselves vary very much in completeness. The Cladocera, four in number, probably include all that usually occur on this part of the coast. The Ostracoda, numbering 65, comprise two-thirds of those recorded from the west coast of Ireland, and doubtless represent about the same proportion of the fauna of the district.

The Copepoda number 159, about 30 of these being free-swimming, more or less planktonic forms, and the remainder littoral or living on the bottom. The former section is probably fairly complete, the species comprising it being few in number and uniformly distributed; but the latter must be regarded merely as a preliminary list, since it is probable that, if more time were given to collecting and working out the results, the number of species would be more than doubled. The Cirripede list only contains a few of the commoner forms whose presence has been casually noted.

The material, as a whole, being so far from complete, it would be unprofitable to compare the entomostreacan fauna with those of other localities, very few of which, it may be remarked, are any better known, or to discuss the respective faunas of different parts of the district.

Attention may be called, however, to one dredging, made in May, 1909, in 24 fathoms off the mouth of Killary Harbour, which contained a large number of scarce species of Copepods. The bottom consisted of finely broken shells with a slight admixture of sand and stones. Out of eighteen species

identified from this station, the following may be noted as being little-known forms:—

<i>Amphiascus attenuatus.</i>	<i>Leptomesochra attenuata.</i>
<i>Amphiascus simulans.</i>	<i>Paramesochra dubia.</i>
<i>Amphiascus spinifer, n. sp.</i>	<i>Tetragoniceps malleolata.</i>
<i>Ameira tenella.</i>	<i>Pteropsyllus consimilis.</i>
<i>Ameiropsis nobilis.</i>	<i>Laophonte denticornis.</i>
<i>Stenocopia spinosa.</i>	<i>Cylindropsyllus laevis.</i>

Most of these species have been recorded by Professor G. O. Sars ("Crustacea of Norway") from one or two localities on the west coast of Norway at similar depths.

#### CLADOCERA.

- Evadne Nordmanni** Lovén.—Abundant in Ballynakill Harbour, 1901–2. Frequent in the open sea.
- Podon intermedius** Lillj.—Frequent in the open sea off Cleggan.
- P. Leuckarti** (G. O. Sars).—Common in Ballynakill Harbour, 1901–2. Killary Harbour. Scarce in the open sea.
- P. polyphemoides** Leuck.—Frequent in Ballynakill Harbour, especially the least saline parts, 1901–2. Killary Harbour. Not found in the open sea.

#### OSTRACODA.

Although no collection of Ostracoda from the Survey has been worked out, yet a considerable number of marine species has been recorded from the Clare Island district. These records have been extracted from the paper by Canon Norman on "Irish Crustacea Ostracoda," published in the "Irish Naturalist" (vol. xiv). They are due mainly to Brady and Robertson or to Canon Norman himself. The names of the recorded species are given below; and for details reference should be made to the paper in question.

##### Fam. CYPRIDAE.

- Aglaia complanata* B. & R.  
*Paracypris polita* G. O. Sars.  
*Pontocypris mytiloides* (Norman).  
*trigonella* G. O. Sars.  
*Argilloecia cylindrica* G. O. Sars.

##### Fam. BAIRDIIDAE.

- Bairdia inflata* Norman.

##### Fam. CYTHERIDAE.

- Cythere lutea* O. F. Müll.  
*confusa* Brady & Norman.  
*pellucida* Baird.  
*porcellanea* Brady.  
*macallana* B. & R.  
*semipunctata* Brady.  
*badla* Norman.  
*crispata* Brady.



OSTRACODA.—*continued.*Fam. CYTHERIDAE.—*continued.*

- Cythere gibbosa* B. & R.  
*albomaculata* Baird.  
*Robertsoni* Brady.  
*convexa* Baird.  
*cuneiformis* Brady.  
*villosa* G. O. Sars.  
*quadridentata* Baird.  
*emaciata* Brady.  
*tuberculata* (G. O. Sars).  
*ungulata* (G. O. Sars).  
*antiquata* (Baird).  
*Jonesii* (Baird).  
*Cytheridea elongata* Brady.  
*papillosa* Bosquet.  
*Eurycythere declivis* Norman, var.  
*argus*.  
*anglica* Brady.  
*Loxocoacha impressa* (Baird).  
*viridis* (O. F. Müll.).  
*guttata* (Norman).  
*tamarindus* (T. R. Jones).  
*multifora* Norman.  
*pusilla* B. & R.  
*Xestoleberis aurantia* (Baird).  
*depressa* G. O. Sars.  
*Cytherura gibba* (O. F. Müll.).  
*cornuta* Brady.

Fam. CYTHERIDAE.—*continued.*

- Cytherura sella* G. O. Sars.  
*acuticostata* G. O. Sars.  
*striata* G. O. Sars.  
*producta* Brady.  
*undata* G. O. Sars.  
*nigrescens* (Baird).  
*fulva* B. & R.  
*cellulosa* (Norman).  
*Cytheropteron nodosum* Brady.  
*punctatum* Brady.  
*depressum* Brady & Norman.  
*Bythocythere recta* Brady.  
*Sclerochilus contortus* (Norman).  
*laevis* G. W. Müll.  
*Cytherideis subulata* Brady.  
*Cytherois Fischeri* G. O. Sars.  
*Paradoxosoma variabile* (Baird).  
*obliquum* (G. O. Sars).  
*hibernicum* Brady.  
*fasciatum* Brady & Norman.  
*arcuatum* Brady.  
*flexuosum* Brady.  
*Machaerina tenuissima* (Norman).

## Fam. POLYCOPEIDAE.

- Polycope orbicularis* G. O. Sars.  
*Polycopsis compressa* B. & R.

## COPEPODA.

The list of species has been compiled from several sources. A number of records from the district, chiefly from Westport Bay and Clifden Bay, are to be found in Brady and Robertson's paper "On Marine Copepoda taken in the West of Ireland" (Ann. Mag. Nat. Hist., 1873), and in Brady's "Monograph of the British Copepoda." These are indicated in the list by (B. and R.) and (Brady, Mon.). The ms. records of the Marine Laboratory at Ballynakill for 1901-2 contain several references to both free-swimming and bottom forms, though very little detailed work was done on the latter group; and finally during the last few years several small collections have been made by the

ss. "Helga," both in Blacksod Bay and Clew Bay. For the identification of the Ballynakill and Blacksod and Clew Bay specimens I am myself responsible. Species new to Ireland are marked with an asterisk. They number seventy, and, in addition, four species, which appear to be new to science, are described.

## COPEPODA GYMNOPLA.

Family **CALANIDAE.**

**Calanus helgolandicus** (Cls.).—Better known under the name of *C. finmarchicus*, which has, however, in recent years been reserved for the slightly different and larger form which inhabits the Norwegian seas. *C. helgolandicus* forms, in the spring and summer, immense swarms all along the west coast of Ireland, which extend seawards for from ten to twenty miles, and form the main food of the spring mackerel on their arrival on the coast. It seems to require water of a moderately high salinity for its development, but penetrates into the bays and harbours when driven shorewards by a westerly wind.

**Paracalanus parvus** (Cls.).—Common along all the west coast, both in the open sea and in bays and harbours.

**Pseudocalanus elongatus** (Boeck).—Very common both in the open sea and in bays and inlets, and often occurs in shoals.

**Calocalanus styliremis** Giesbr.—An oceanic species, taken off Shark Head in May and August, 1901.

**Clausocalanus arcuicornis** (Dana).—An oceanic species, taken three times in the beginning of 1901, off Clare Island, Inishturk, and Inishbofin.

**Ctenocalanus vanus** Giesbr.—An oceanic species, taken once off Inishturk in June, 1901.

**Chiridius armatus** (Boeck).—An oceanic species, taken once off Shark Head in April, 1901.

**Bradyidius armatus** Giesbr.—Taken off Clare Island, 42 fathoms, in a bottom tow-net in February, 1901. It is a bottom-haunting species usually found on muddy ground.

\***Stephos Scotti** G. O. Sars.—Taken occasionally in Fahy Bay, Ballynakill, in 1901.

**Scolecithricella minor** (Brady).—In a bottom tow-net off Shark Head, 54 fms., in July, 1901. Probably should be regarded as an oceanic species.

**Diaixis pygmaea** (Scott).—In tow-nettings taken off Cleggan in 1901, one to two miles from shore, scarce.

Family **CENTROPAGIDAE.**

**Centropages typicus** Kroyer.—Common at Ballynakill in 1901, both in the harbour and in the open sea.

**C. hamatus** (Lilljeborg).—Very common in inshore tow-nettings at Ballynakill in 1901, much scarcer in the open sea. Killary Harbour.

**Isias clavipes** Boeck.—Clifden Bay (B. and R.). Common in Ballynakill Harbour in 1901, and in the open sea close to shore.

**Temora longicornis** (Müll.).—Very common in bays and inlets and in the open sea close to shore. Ballynakill Harbour, Clew Bay, Blacksod Bay.

**Metridia lucens**, Boeck.—Very common in the open sea along all the west coast of Ireland, and found in much smaller numbers in the bays and inlets.

Family **PSEUDOCYCLOPIDAE.**

**Pseudocyclops obtusatus** Brady.—Frequent in Ballynakill Harbour, 1901–2.

Family **CANDACIIDAE.**

**Candacia armata**, Boeck.—Occasionally in the open sea off Cleggan, 1901. Clew Bay, surface, August, 1911.

Family **PONTELLIDAE.**

**Anomalocera Pattersoni** Templeton.—Occasionally in the open sea off Cleggan, 1901.

**Parapontella brevicornis** (Lubbock).—Westport and Clifden Bays (B. and R.). Plentiful close to shore, and in all the bays and inlets.

**Acartia Clausi** Giesbr.—Universally distributed throughout the district both in the open sea and in bays and inlets. A small form, ♀ = 7 mm., was found plentifully in Blacksod Bay in September, 1909, in company with others of normal size, ♀ = ca. 1.15 mm.

**A. discaudata** (Giesbr.).—Common in Ballynakill and Killary Harbours. This species is characteristic of water of low salinity.

COPEPODA PODOPLEA.

Family **CORYCAEIDAE.**

**Corycaeus anglicus** Lubbock.—Frequent both in Ballynakill Harbour and in the open sea in the winter of 1901–2.

Family **ONCAEIDAE.**

**Oncaea conifera** Giesbr.—A common oceanic species taken a few times off Cleggan and Clare Island in 1901.

Family **LICHOMOLGIDAE**.

**Lichomolgus fucicolus** Brady.—Clifden and Westport Bays (B. and R.).  
Ballynakill Harbour, October, 1901.

\***L. agilis** (Leydig).—Ballynakill Harbour, parasitic on *Eolis papillosa*  
February, 1902.

\***L. albens** Thorell.—Ballynakill, 1901, in *Ascidia mentula*, few.

**L. forficula** Thorell.—Blacksod Bay, in *Ascidia mentula*, September, 1910.

\***Hermanella arenicola** (Brady).—Ballynakill Harbour, several, December,  
1900.

\***H. maxima** (I. C. Thompson).—Ballynakill Harbour, 2 fms., in *Pecten  
maximus*, May, 1902.

**Pseudanthessius furcillatus** (Thorell).—Westport Bay (B and R.).

Family **BOMOLOCHIDAE**.

\***Bomolochus soleae** Claus.—Ballynakill, 1900, one.

Family **MISOPHRIIDAE**.

**Misophria pallida** Boeck.—Ballynakill, 1–2 fms., one, February, 1901

Family **LONGIPEDIIDAE**.

**Longipedia Scotti** G. O. Sars.—Clifden Bay (B. and R. sub *L. coronata*)  
Ballynakill, frequent, 1901–2. Clew Bay, 14 fms., August, 1910, common.  
Blacksod Bay, 4 fms., September 10, few.

**L. minor** Scott.—Ballynakill, common, 1901–2, often in the open sea close  
to shore. Inishlyre Roads, March, 1910. Blacksod Bay, September,  
1911, frequent.

\***Sunaristes paguri** Hesse.—Blacksod Bay, washed from weeds between tide-  
marks, March, 1911, one male.

\***Canuella perplexa** Scott.—Blacksod Bay, 4 fms., September 1910, one.  
Inishgowla, Clew Bay, 1–4 fms., August, 1909, one.

Family **ECTINOSOMIDAE**.

**Ectinosoma melaniceps** Boeck.—Ballynakill, 1901–2; off Clare Island,  
18 fms., August, 1910; Inishlyre Roads, March, 1910; Blacksod Bay,  
1911, frequent.

**E. erythrops** Brady.—Off Killary Harbour, 24 fms., May, 1909, one. The  
*E. gracile*, figured in Sars' "Crustacea of Norway," appears to be  
identical with *E. erythrops*, and does not agree at all with the *E. gracile*  
of Scott's original description.

- \***E. gothiceps** Giesbr.—Off Clare Island, 18 fms., August, 1910.  
**E. propinquum** Scott.—Off Killary Harbour, 24 fms., May, 1909.  
 \***E. tenuipes** T. & A. Scott.—Off Killary Harbour, 24 fms., May, 1909.  
 \***E. curticorne** Boeck.—Ballynakill Harbour, 1½ fms., April, 1901.  
 \***Pseudobradya minor** (T. & A. Scott).—Off Killary Harbour, 24 fms., May, 1909. The fifth foot of the single specimen, ♀, resembles Scott's figure more than that given by Sars.

Family **HARPACTICIDAE**.

- Harpacticus chelifer** (Müller).—Clew Bay, 18 fms., August, 1910; off Clare Island, 5 fms., August, 1911.  
 \***H. littoralis** G. O. Sars.—L. Leam, Blacksod Bay (brackish), September, 1909, several.  
 \***H. uniremis**, Kröyer.—I record this species with some doubt, both on account of the locality in which it was taken, between tide-marks in Blacksod Bay, and because the form of the fifth foot (Pl. II, fig. 12), in the ♀, differs slightly from that figured by Sars, the exopod being a little broader, and its setae longer. The other characters agree fairly well, and the size, ♂ 1·45 mm., ♀ 1·35 mm., is approximately the same. Sars records this species from 20 to 100 fathoms on the west coast of Norway.  
**H. gracilis** (Claus).—Ballynakill Harbour, 1901, common. Clew Bay, common, August, 1910, August, 1911.  
**H. flexus** Br. & Rob.—Westport Bay, type specimen (B. & R.). Ballynakill Harbour, 1½ fms., January, 1901. Inishlyre Roads, 2-4 fms., March, 1910. Blacksod Bay, 4 fms., September, 1910.  
**Zaus spinatus** Goodsir.—Ballynakill Harbour, February, 1901. Clew Bay, 18 fms., August, 1910, several. Blacksod Bay, between tide-marks, March 11th, abundant.  
 \***Z. abbreviatus** G. O. Sars.—Blacksod Bay, between tide-marks, March, 1911, one specimen.

Family **PELTIDIIDAE**.

- Alteutha depressa** Baird (*Peltidium crenulatum*).—Clew Bay, 18 fms., August, 1910, several. Frequent at Ballynakill, 1901-2. Killary Harbour, 1901.  
**A. interrupta** (Goodsir) (*Alteutha bopyroides*).—Plentiful in tow-nettings in Ballynakill Harbour, 1901-2.  
**A. purpurocincta** Norman (= *P. depressum*, Brady, non Baird). Clifden Bay (B. & R. sub *P. depressum*). Occasionally dredged in 1-4 fms. Ballynakill, 1901-2.

## Family TEGASTIDAE.

- \**Parategastes sphericus* (Claus).—Inishlyre Roads, 2-4 fms., February, 1910, common. Blacksod Bay, 1-2 fms., September, 1911, several.
- \**Tegastes nanus* G. O. Sars.—Blacksod Bay, 4 fms., September, 1910, one.

## Family PORCELLIDIIDAE.

- Porcellidium fimbriatum* Claus.—Clifden Bay (B. & R.). Westport Bay (B. & R., sub *P. viride*). Ballynakill Harbour, frequent. Blacksod Bay, between tide-marks, few.
- P. tenuicauda* Claus.—Clifden Bay (B. & R.).
- \**P. lecanoides* Claus.—Blacksod Bay, between tide-marks, March, 1911, two specimens. The colour of this species is remarkable, the centre of the cephalon and of the abdominal segments being dark crimson, and the thoracic segments and margins of the body colourless, though rather opaque.

## Family IDYIDAE.

- Aspidiscus littoralis* G. O. Sars.—Clifden Bay (B. & R. sub *A. fasciatus*). Ballynakill Harbour, 1910, frequent.
- \**A. fasciatus* Norman.—Blacksod Bay, between tide-marks, 1911, two specimens.
- Psamathe longicauda* Philippi.—Clifden Bay (B. & R. sub *Scutellidium thisboides*). Ballynakill Harbour, 3-4 fms., December, 1901, two. Blacksod Bay, between tide-marks, September, 1911, one.
- Idyaea furcata* (Baird).—Blacksod Bay, between tide-marks, 1911, common.
- \**I. angusta* G. O. Sars.—Blacksod Bay, 1-3 fms., September, 1909, three, 2 fms., September, 1911, one.
- \**I. tenera* G. O. Sars.—Clew Bay, 18 fms., Aug. 1910, one; 5-6 fms. August, 1911, three.
- \**I. longicornis* (Scott).—Off Clare Island, 56 fms., August, 1911, two.

## Family THALESTRIDAE.

- Thalestris longimana* Claus.—Common at Ballynakill both in dredged material and in tow-nettings taken at night, as are many other species of the Thalestridae. Occasionally taken in the open sea. Frequent in Blacksod Bay.
- Parathalestris Clausi* (Norman).—Clifden and Westport Bays (B. & R.). Ballynakill, 1901-2, common. Clew Bay, 5-7 fms., May, 1899, August, 1911, common.

- P. harpactoides** (Claus).—Ballynakill, 1901, frequent. Clew Bay and Blacksod Bay, common. Found swarming in immense numbers under stones between tide-marks, below the whaling station in Blacksod Bay.
- P. hibernica** (Br. & Rob.).—Westport Bay, type-specimen (B. & R.). Ballynakill Harbour, 1911. Blacksod Bay, surface tow-net, September, 1909.
- Phyllothalestris mysus** (Claus).—Westport and Clifden Bays (B. & R.). Ballynakill, 1901, frequent in small numbers. Inishlyre Harbour. March, 1910. Blacksod Bay, September, 1909.
- Rhynchothalestris rufocincta** (Norman).—Clew Bay and Clifden Bay (Brady, Mon.). Ballynakill, 1901, frequent. Blacksod Bay, between tide-marks, September, 1911, common.
- R. helgolandica** (Claus).—Clifden Bay (Brady, Mon.). Ballynakill, 1901–2 frequent. Blacksod Bay, between tide-marks, September, 1911, frequent.
- \***Microthalestris littoralis** G. O. Sars.—All the specimens of *Microthalestris* examined from Clew Bay and Blacksod Bay agree in the form of the fifth feet with *M. littoralis*; but as the variation in size is considerable (.5 mm.—.85 mm.), it is possible that a second species may also be present. Frequent between tide-marks, Blacksod Bay; Clew Bay, 18 fms., August, 1910.
- Dactylopusia thisboides** (Cls.).—Clifden and Westport Bays (B. & R.). Ballynakill, 1901–2, common. Blacksod Bay, September, 1911, few. A ♀ form of this species with seven setae on the exopodite of the fifth foot and a nine-jointed first antenna, was taken in 24 fms. off Killary Harbour in May, 1909.
- D. vulgaris** G. O. Sars.—Clew Bay (Brady, Mon. sub *D. Stromii*). Ballynakill, 1901–2, common. Clew Bay, 18 fms., August, 1910, common. Blacksod Bay, 2 fms.
- Dactylopodella flava** (Cls.).—Clew Bay (Brady, Mon.). Ballynakill, 1901–2, several. Inishlyre Roads, March, 1910, one. Blacksod Bay, between tide-marks, September, 1911, several.
- Idomene forficata**, Phil.—Off Killary Harbour, 24 fms., May, 1909, one.
- Westwoodia nobilis** (Baird).—Ballynakill, 1901, few. Clew Bay, 18 fms., August, 1910, several. Blacksod Bay, between tide-marks, September, 1911, several.
- W. minuta**, Cls.—Westport Bay (Brady, Mon.). Blacksod Bay, between tide-marks and in 2 fms., September, 1911, common.

- \***W. pygmaea** (Scott).—Ballynakill, 1–2 fms., 1901, one. Blacksod Bay, between tide-marks and in 2 fms., September, 1911, several.
- \***W. monensis** (Brady).—Ballynakill, in stomach of white trout, 1901, one. Clew Bay, 18 fms., August, 1910, one.
- W. SATURNI**. n. sp. (Pl. I, figs. 1–4).—**FEMALE** (Pl. I, fig. 1), length, .8 mm. Body short and stout, but not so robust as in *W. nobilis*; abdomen bent sharply backwards, about half as long as the cephalothorax, slightly tapered; caudal rami broad and short; 2nd caudal seta from the inside markedly thickened at the base. 1st antenna (Pl. I, fig. 2) short, six-jointed, the terminal part consisting of three joints; proportional length of joints,  $\frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6}{14 \cdot 11 \cdot 24 \cdot 6 \cdot 9 \cdot 4}$ . Other cephalic appendages as in *W. nobilis*. 1st pair of feet (Pl. I, fig. 4) with endopodite about two and a half times as long as the exopodite. Outer edge seta of 1st joint of endopodite not reaching to the end of the joint, inner terminal claw about three times as long as the outer; exopodite two-jointed, 1st joint with one outer-edge spine, 2nd joint with three outer-edge spines, the middle one being very small, one terminal spine and one terminal seta. 5th pair of feet (Pl. I, fig. 3) almost as in *W. nobilis*, except that the innermost seta on the endopodite is proportionately much shorter. Colour, yellow.

Two specimens dredged in Fahy Bay, Ballynakill, in 1½ fms., February, 1901.

This species agrees in size with *W. nobilis*, but differs in the jointing of the 1st antenna, the two-jointed exopodite of the first feet, and the length of the setae on the 5th feet. It agrees with *W. (Pseudothalestris) imbricata* Scott, from Ceylon, in most respects, differing in its larger size and in the presence of a small additional outer-edge seta on the second joint of the exopodite of the first feet and in the absence of an inner-edge seta on the same joint.

#### Family DIOSACCIDAE.

- Diosaccus tenuicornis** (Cls.).—Clifden and Westport Bays (B. & R.). Ballynakill, 1901–2, frequent. Inishlyre Roads, Clew Bay, to 18 fms., and Blacksod Bay, between tide-marks and 18 fms., frequent.
- AMPHIASCUS VARICOLOR** n. sp. (Pl. II, figs. 1–8; Pl. III, figs. 1, 2).—**FEMALE** (Pl. III, figs. 1, 2), length 1.05 mm. Body of the usual *Amphiascus* form, moderately slender, with well-developed rostrum ending bluntly in dorsal view. Anal segment a little shorter than the preceding one. Caudal rami short, about as wide as long, and widely separated. Caudal setae



uniformly tapering. 1st antenna (Pl. II, fig. 1) eight-jointed, moderately long; proportional length of joints,  $\frac{25.24.18.22.12.17.10.15.}{1.2.3.4.5.6.7.8}$ . 2nd antenna as usual in the genus, exopodite two-jointed, first joint with one, and second with three setae. Mandible (Pl. II, fig. 4) with strongly denticulate cutting edge, three inner-edge setae on second joint, exopodite very small with two setae, and endopodite with two lateral and five terminal setae. Maxilla (Pl. II, fig. 3) with strongly chitinized and denticulate inner basal lobe, which almost forms a second mandible, distal portion feebly developed, but of usual form. 2nd maxilla (Pl. II, fig. 8) with three stout basal lobes as in *Diosaccus*, with short spines. Maxillipede (Pl. II, fig. 9) with large concave hand and strong claw as in *Diosaccus*, but comparatively smaller than in that genus. 1st pair of feet (Pl. II, fig. 5) as in *Diosaccus* rather than *Amphiascus*, both branches being rather slender, and the two terminal joints of the endopodite smaller than in *Amphiascus*. 2nd pair of feet, exopodite with 1 . 1 . 3 outer-edge and one terminal spine, and 0 . 1 . 3 inner-edge setae, endopodite with 0 . 0 . 1 outer-edge, one terminal and 1 . 2 . 2 inner-edge setae. 3rd pair of feet, exopodite with 1 . 1 . 3 outer-edge and one terminal spine, and 0 . 1 . 4 inner-edge setae, endopodite with 0 . 0 . 1 outer-edge, one terminal, and 1 . 2 . 3 inner-edge setae. 4th pair of feet similar to the 3rd, except that there are only 1 . 1 . 3 inner-edge setae on the endopodite. 5th pair of feet (Pl. II, fig. 6), small, with comparatively short spiniform setae, inner extension of basal joint with five setae, distal joint with six setae. The 6th pair of feet is represented by three fine setae on each side of the front margin of the genital segment.

MALE, length 1.0 mm. 1st antenna of usual prehensile form. 1st pair of feet with a short, blunt hook on the inner margin of the second basal joint. Endopodite of 2nd pair of feet with the second joint terminated by two strong spines and two very small setae. 5th pair of feet (Pl. II, fig. 7) with two setae on the inner extension of the first joint, and four on the second joint.

Colour, second and third thoracic segments bright crimson, abdomen yellow.

This species might be mistaken for *Amphiascus cinctus*, which it greatly resembles when fresh, but it may be distinguished by the absence of the longitudinal dorsal band on the cephalon, and by the abdomen being yellow instead of colourless. A few specimens have been found of a uniform yellow colour.

This species is in some respects intermediate between the genera *Diosaccus* and *Amphiascus*; it is, however, quite distinct from Scott's *Pseudodiosaccus*, which also exhibits characters of both genera. The first pair of feet and the 1st and 2nd maxillipedes agree with *Diosaccus* rather than *Amphiascus*, but the form and proportions of the body and the form of the 2nd antenna are of the *Amphiascus* type.

- \**A. cinctus* (Claus.)—? Westport Bay (B. & R.). Blacksod Bay, between tide-marks, September, 1911, common.
- \**A. obscurus* G. O. Sars.—Clew Bay, 18 fms., August, 1910, two. Blacksod Bay, between tidemarks, March, 1911, two. These specimens do not agree exactly with Sars' description and figures. They are distinctly larger, ♀ 1.28 mm., ♂ 1.12 mm., and the female has only six setae on the second joint of the 5th pair of feet, which thus resemble those of *A. cinctus*. The colour is the same as in Sars' specimens, the thoracic and abdominal segments being of a dark reddish chocolate with the appendages and caudal rami stained indigo.
- \**A. similis* Claus.—Ballynakill, 1901, 6-8 fms., one, 1-2 fms., one. Blacksod Bay, between tidemarks, September, 1911, one.
- \**A. phyllopus* G. O. Sars.—Blacksod Bay, 4 fms., September, 1910, one ♀. The 5th feet in this specimen are slightly wider than shown in Sars' figure, approaching in form those of *A. latifolius*.
- \**A. minutus* Claus.—Inishlyre Roads, 2-4 fms., March, 1910, several.
- \**A. longirostris* Claus.—Clew Bay, 18 fms., August, 1910, two.
- \**A. debilis* G. O. Sars.—Ballynakill, 2 fms., 1901, one.
- A. imus* (Brady).—Clew Bay, in dredge (Brady, Mon.).
- \**A. simulans* (Scott).—Off Killary Harbour, 24 fms., May, 1909, several. The peculiar form of the first antennae, amongst other characters, distinguishes this species from the allied *A. sinuatus* and *A. spinulosus*.
- \**A. attenuatus* G. O. Sars.—Off Killary Harbour, 24 fms., May, 1909, two.
- A. hispidus* (Brady).—Clew Bay, 10 fms. (Brady, Mon.). Ballynakill, 1901, one.
- A. SPINIFER**, n. sp. (Pl. III, figs. 3-9).—FEMALE (Pl. III, fig. 3), length 6 mm. Body moderately slender, slightly tapered posteriorly. Rostrum (Pl. III, fig. 6) very long, more than half the length of the cephalic segment, contracted towards the tip as in *A. lagenirostris*, but not so wide basally as in that species. The 5th thoracic segment bears dorsally a pair of large upward-directed spines, and the posterior dorsal margins of the abdominal segments (Pl. III, fig. 4) bear transverse rows of much smaller spines, about eight spines in each row. Anal segment short, deeply hollowed between the furcal rami, which are short, slightly longer than

wide, and separated by about two and a half times their own width. First antenna (Pl. III, fig. 6) slender, eight-jointed, proportional length

of joints  $\frac{1. 2. 3. 4. 5. 6. 7. 8}{16. 22. 7. 10. 3. 4. 4. 7}$ , the second joint with a small tooth

on its upper distal margin. Second antenna (Pl. III, fig. 7) slender, outer branch three-jointed, the first two joints each with a distal seta, the third joint with a lateral and two much smaller terminal setae. Maxillipede (Pl. III, fig. 9) with a slender hand and claw. First foot (Pl. III, fig. 5) slender, outer branch much shorter than the inner, inner branch with second and third joints together equal to about one-third of the first joint, third joint twice as long as the second. Second to fourth feet almost exactly as in *A. lagenirostris*.

Fifth feet with long and narrow parallel-sided second joint bearing one inner edge, two terminal and three lateral setae. First joint with three terminal and two lateral setae and a small tooth distally on the outer margin.

This species is allied to *A. lagenirostris*, but can easily be recognized by its narrower rostrum and the great development of spines on the abdomen and last thoracic segment. Several specimens were taken in May, 1909, off Killary Harbour in 24 fms. in a tow-net attached to a dredge.

#### Family CANTHOCAMPTIDAE.

- \**Mesochra pygmaea* Cls.—Blacksod Bay, between tidemarks, one.
- \**Ameira attenuata* Thomps.—Off Killary Harbour, 24 fms., one. Agrees with Sars' figures as given under *A. tenella*.
- \**A. tau* (Giesbrecht).—Ballynakill, 1901, 1–3 fms., one.
- \**A. minuta* Boeck.—Blacksod Bay, March, 1911, between tidemarks, two.
- \**Ameiropsis longicornis* G. O. Sars.—Blacksod Bay, September, 1911, 2 fms., one. The specimen differs slightly from Sars' figures; and I give figures of the first and fifth feet (Pl. II, figs. 13, 14).
- \**A. nobilis* G. O. Sars.—Off Killary Harbour, 24 fms., May, 1909, one.
- \**Stenocopia spinosa* (Scott).—Off Killary Harbour, 24 fms., May, 1909, few.
- \**S. longicaudata* (Scott).—Ballynakill, 1901, 1–2 fms., one.
- \**Leptomesochra attenuata* (Scott).—Off Killary Harbour, 24 fms., May, 1901, one.
- \**Paramesochra dubia* Scott.—Off Killary Harbour, 24 fms., May, 1909, two females, length .54 mm.
- \**Tetragoniceps malleolata* Brady.—Off Killary Harbour, 24 fms., May, 1909, few. This is the true *T. malleolatus* of Brady, and not the species referred

to under that name by Scott, which, as Sars has pointed out, was a new species (*T. Scotti* Sars). Both females and males were present, the latter, until now, unknown. The fifth feet of the male are here figured (Pl. III, fig. 10).

\**Pteropsyllus consimilis* Scott.—Off Killary Harbour, 24 fms., May, 1909, few.

Family **LAOPHONTIDAE**.

\**Laophonte cornuta* Phil.—Ballynakill, 1901, few. Blacksod Bay, between tide-marks, several. Inishlyre Harbour, 24 fms., March, 1910, few. Clew Bay, 18 fms., August, 1910, two.

*L. similis* (Claus).—Westport and Clifden Bays (B. & R.). Clew Bay, 18 fms., August, 1910, common. Blacksod Bay, between tidemarks, March, 1911, one.

*L. horrida* Norman.—Inishgowla Harbour, Clew Bay, 1-4 fms., August, 1909, one.

\**L. stromi* (Baird).—Clew Bay, 18 fms., August, 1910, two. Blacksod Bay, between tidemarks, March, 1911, one.

*L. serrata* (Claus).—Clew Bay (Brady, Mon.). Clew Bay, 18 fms., August, 1910, one.

\**L. thoracica* Boeck.—Inishlyre Harbour, 2-4 fms., March, 1910, one.

\**L. Koreni* Boeck.—Clew Bay, 18 fms., August, 1910, one. Blacksod Bay, between tidemarks, March, 1911, several.

\**L. brevirostris* (Claus).—Blacksod Bay, between tidemarks, September, 1911, common. Inishlyre Harbour, 2-4 fms., March, 1910, two.

*L. BULLIGERA* n. sp. (Pl. I, figs. 5-10, Pl. II, fig. 11).—FEMALE (Pl. I, fig. 5), length .53 mm. Body slightly depressed, thus appearing slender in lateral view, with posterior margins of all the segments finely spinulose. There is a marked constriction indicating the fusion of the 1st and 2nd abdominal segments to form the genital segment, and the posterolateral margins of 1st-3rd abdominal segments are produced and spinulose (Plate I, fig. 10). Anal segment as long as the preceding. Furcal rami small, widely separated, about half as long as the anal segment, and two-thirds as wide as long. Furcal setae long and slender, uniformly tapering. First antenna (Pl. I, fig. 7) slender, moderately long, six-jointed, with scanty setae; proportional length of joints

1.	2.	3.	4.	5.	6.
21.	24.	23.	7.	4.	19.

Second antenna (Pl. I, fig. 6); endopodite one-jointed with one stout terminal and three more slender lateral setae. Maxilliped with narrow hand and slender finger. First feet (Pl. I, fig. 8), endopodite slender with moderately strong terminal claw, exopodite two-

jointed, first joint with one, second with five setae. Second and third feet of the usual type. Fourth feet (Pl. II, fig. 11), endopodite two-jointed, first joint without setae, second joint with two terminal and two inner-edge setae. The second inner edge seta has a remarkable expanded base, to the distal side of which is attached a curious glandular or sensory organ which appears to consist of an oval mass of protoplasm without any definite structure or chitinous covering, analogous probably to the "aesthetascs" of the 1st antennae, occurring throughout the order, or the modified setae on the second maxillae of the Scolecithricidae. Fifth feet (Pl. I, fig. 9) of the same type as in *Laophonte elongata* and *L. typhlops*, the second joint being parallel-sided, about five times as long as broad, with four outer-edge setae, the two most proximal being placed almost alongside each other, one slender terminal seta and one on the inner edge. The short parallel-sided portion of the first joint carries two terminal setae, and there are two setae on the inner margin.

This species is closely allied to *Laophonte elongata*, *L. typhlops*, and *L. longiremis*, but may be readily distinguished from the first two by its much shorter furcal rami, and from the last by its six-jointed antenna, two-jointed exopodite of the first feet, and different number and arrangement of setae on the fifth feet. In the peculiar structure of the fourth feet it agrees with none of the three.

Several specimens were taken in Blacksod Bay, 1-3 fms., in September, 1909, and September, 1911.

\**L. littoralis* Scott.—Clew Bay, 18 fms., August, 1910, two. Though the habitat, tidal pools and brackish water, recorded by Scott and Sars for this species, differs from that in which specimens were found in Clew Bay, there seem to be no structural grounds for regarding them as distinct.

*L. curticauda* Boeck.—Clifden and Westport Bays (Brady, Mon.).

\**L. congenera* Sars.—Ballynakill, 1901, 6-8 fms., one.

\**L. denticornis* Scott.—Off Killary Harbour, 25 fms., May, 1909, one.

*L. longicaudata* Boeck.—Off Killary Harbour, 25 fms., May, 1909, one.

\**L. elongata* Boeck.—Off Killary Harbour, 25 fms., May, 1909, several.

\**L. bulbifera* Norman.—Ballynakill, 1901, in dredged material from 1-2 fms., one; Blacksod Bay, 4 fms., September, 1910, one.

*Laophontopsis lamellifera* (Claus).—Ballynakill, 1901, 1-2 fms., one.

*Asellopsis hispida* Br. & Rob.—Westport Bay, surface-net, type-specimen (B. & R.). Clew Bay, 15-17 fms., tow-net on dredge, August, 1910, one.

\**Laophontodes bicornis* (A. Scott).—Ballynakill, 1901, frequent in dredged material. Inishlyre Roads, 2-4 fms., March, 1910, one. Blacksod Bay, between tide-marks, September, 1911, few.

*Normanella minuta* (Boeck).—Clew Bay (Brady, Mon., sub *Normanella dubia*).

Family **CLETODIDAE**.

*Cletodes limicola* Brady.—Westport Bay, dredge (B. & R.).

\**C. tenuipes* Scott.—Inishowla Harbour, Clew Bay, 1-4 fms., August, 1909.

*Orthopsyllus linearis* (Claus).—Westport Bay, on a sponge (B. & R.).

\**Eurycletodes similis* (Scott).—Ballynakill, 1901, 1-2 fms., one. Off Killary Harbour, 24 fms., May, 1909, one. Blacksod Bay,  $\frac{1}{2}$ -3 fms., September, 1909, one.

*Enhydrosoma propinquum* (B. & R.).—Clew Bay (Brady, Mon.). Blacksod Bay, 4 fms., September, 1910, one.

\**E. curticaudatum* (Boeck).—Ballynakill,  $1\frac{1}{2}$ -2 fms., one.

*Rhizothrix curvata* Brady.—Inishgowla Harbour, Clew Bay, 4 fms., August, 1909, several.

Family **CYLINDROPSYLLIDAE**.

\**Cylindropsyllus laevis* Brady.—Off Killary Harbour, 24 fms., May, 1909, two.

Family **TACHIDIIDAE**.

*Tachidius brevicornis* Lilljeb.—L. Leam, Blacksod Bay, September, 1909, one.

Family **METIDAE**.

*Metis ignea* Phil.—Blacksod Bay, between tide-marks, September, 1909, September, 1911, several.

Family **CYCLOPIDAE**.

*Cyclopina littoralis* Brady.—Ballynakill and Killary Harbour, 1901, frequent.

*C. gracilis* Claus.—Ballynakill Harbour, 1901.

*Eurete longicaudata* Phil.—Westport and Clifden Bays (B. & R. sub *Thorellia brunnea*).

*Oithona nana* Giesbr.—Common in Ballynakill and Killary Harbours in 1901.

*O. similis* Giesbr.—Common throughout the district, both in the open sea and in bays and inlets.

**O. pelagica** Farran.—I use this name for the species usually recorded from the north-east Atlantic as *O. plumifera*, although it appears to be specifically distinct. It is an oceanic form, but occurred a few times in the open sea off Cleggan in 1901.

**Cyclops aequoreus** Fischer.—Clifden Bay (B. & R.).

#### Family MONSTRILLIDAE.

\***Thaumaleus rostratus** Scott.—Off Inishbofin Harbour, 1900, two females.

\***T. rigidus** (I. C. Thompson).—Ballynakill Harbour, 1901–2, tow-nets 1–2 fms., four females, lengths, 2·1–2·7 mm. These specimens agree in size and proportion with *T. rigidus* as re-described by T. Scott. The last two segments of the abdomen are, however, completely separated—not partially as in Scott's specimens.

#### Family ASCIDICOLIDAE.

\***Ascidicola rosea** Thorell.—Blacksod Bay, March, 1911, 2 fms., one in *Cynthia* sp.

**Notodelphys Allmanni** Thorell.—Killary Bay (Brady, Mon.). Blacksod Bay, September, 1911, from *Ascidia mentula* between tide-marks.

\***Notopterophorus elongatus** Buchholz. (*Dorypygus auritus*).—Blacksod Bay between tide-marks, September, 1910, in *Ascidia mentula*; September, 1911, in *Ascidia mentula*.

\***Notopterophorus papilio** Hesse.—Ballynakill, 1902, in *Ascidia mentula*, many. These agree with the form figured by Scott, in which the wings are not greatly developed.

\***Enterognathus comatulæ** Giesbr.—Taken a few times in Ballynakill Harbour in 1901, parasitic in *Antedon rosea* dredged in about 5 fms. The parasite is to be found lodged in the anal extremity of the intestine of the Antedon with the furcal rami projecting into the open. When disturbed it withdraws itself completely within the body of its host.

#### Family ASTEROCHERIDAE.

**Asterocheres lilljeborgi** Boeck.—Westport Bay, on a sponge (B. & R.).

**Dermatomyzon nigripes** (Br. & Rob.).—Ballynakill, 1902, 3–8 fms., one.

\***Rhynchomyzon purpurocinctum** (Scott).—Ballynakill, 1901, 4–6 fms., one.

**Acontiophorus scutatus** (Br. & Rob.).—Clifden Bay, on *Laminaria* fronds, type-specimen (B. & R.). Westport Bay (Brady, Mon.). Ballynakill, 1902, 3–8 fms., one.

\**Scottocheres elongatus* (Scott).—Ballynakill, 1902, 4–6 fms., one.

*Dyspontius striatus* Thorell.—Ballynakill, 1902, 3–8 fms., one.

\**Cancerilla tubulata* Dalyell.—Killary Harbour, 1911, 3 fms., on *Amphiura elegans*.

#### CIRRIPEDIA.

*Lepas anatifera* Linn.—Frequently drifted into the district on floating timber.

*L. fascicularis* Ell. & Soll.—Much scarcer than the last, but occasionally occurs on floating weed. Unusually large numbers of well-grown colonies were noticed off Cleggan, and for several miles to seaward in August, 1903.

*Verruca stromia* Müll.—Plentiful in Blacksod Bay, from L. W. M. downwards, on bare rocks and stones. Only exposed by very low spring-tides.

*Balanus balanoides* Linn.—Universally covering exposed rocks and stones from high- to low-water mark.

*B. porcatus* Da Costa.—Blacksod Bay, September, 1909, on *Mytilus modiolus* from 4 $\frac{3}{4}$  fms.



EXPLANATION OF PLATES.

PLATE I.

*Westwoodia saturni*, n. sp.

FIG.

1. Female lateral view.
2. „ first antenna.
3. „ fifth foot.
4. „ first foot.

*Laophonte bulligera*, n. sp.

5. Female, lateral view.
6. „ second antenna.
7. „ first antenna.
8. „ first foot.
9. „ fifth foot.
10. „ abdomen dorsal view.

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PLATE II.

*Amphiascus varicolor*, n. sp.

FIG.

1. Female, first antenna.
2. „ endopodite of second antenna.
3. „ first maxilla.
4. „ mandible.
5. „ first foot.
6. „ fifth foot.
7. Male, fifth foot.
8. Female, second maxilla.
9. „ maxillipede.
10. „ endopodite of second foot.

*Laophonte bulligera*, n. sp.

11. Female, fourth foot.

*Harpacticus uniremis* Kröyer.

12. Female, fifth foot.

*Ameiropsis longicornis*, G. O. Sars.

13. Female, fifth foot.
14. „ first foot.

## PLATE III.

*Amphiascus varicolor*, n. sp.

FIG.

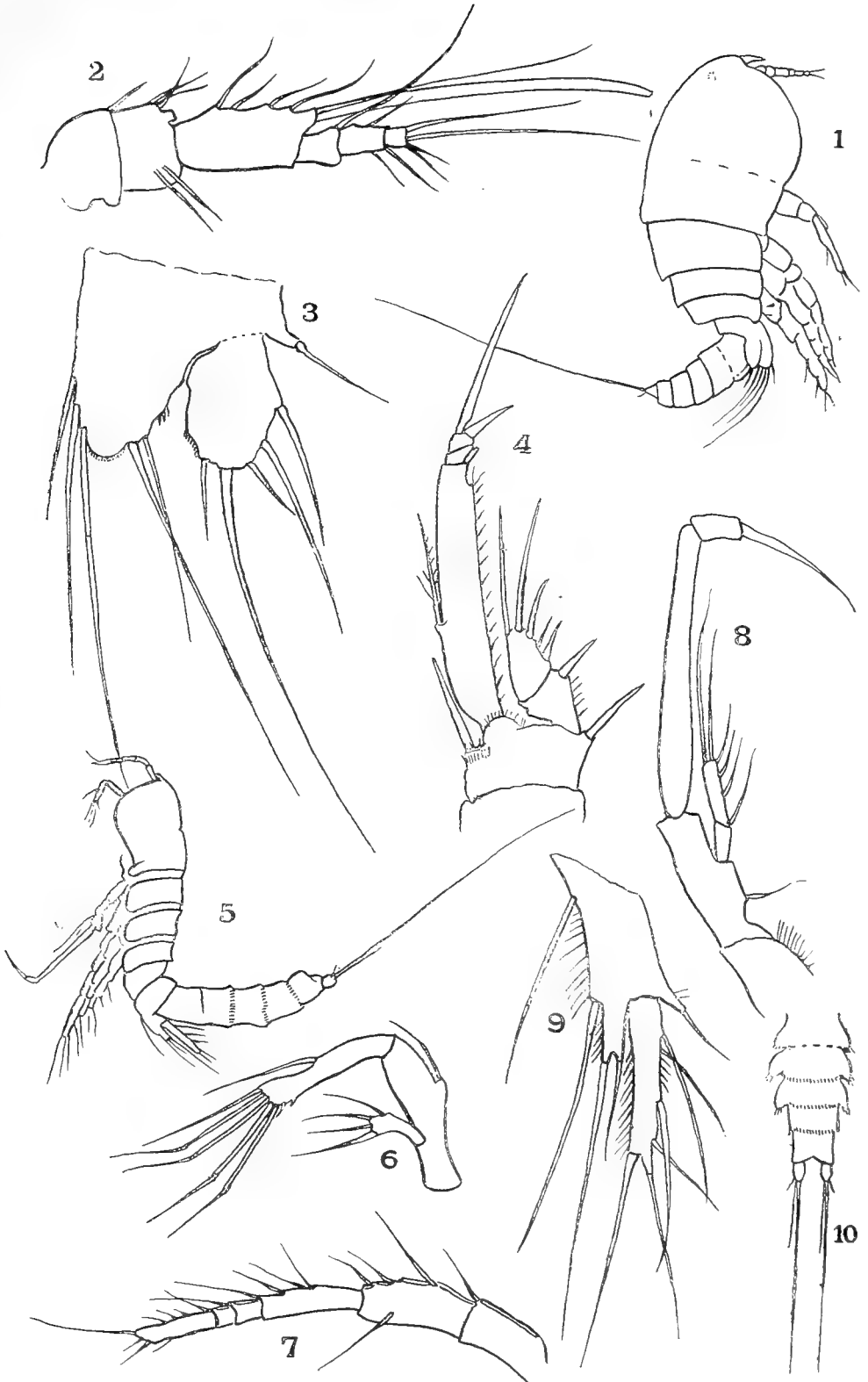
1. Female, dorsal view.
2. „ lateral view.

*Amphiascus spinifer*, n. sp.

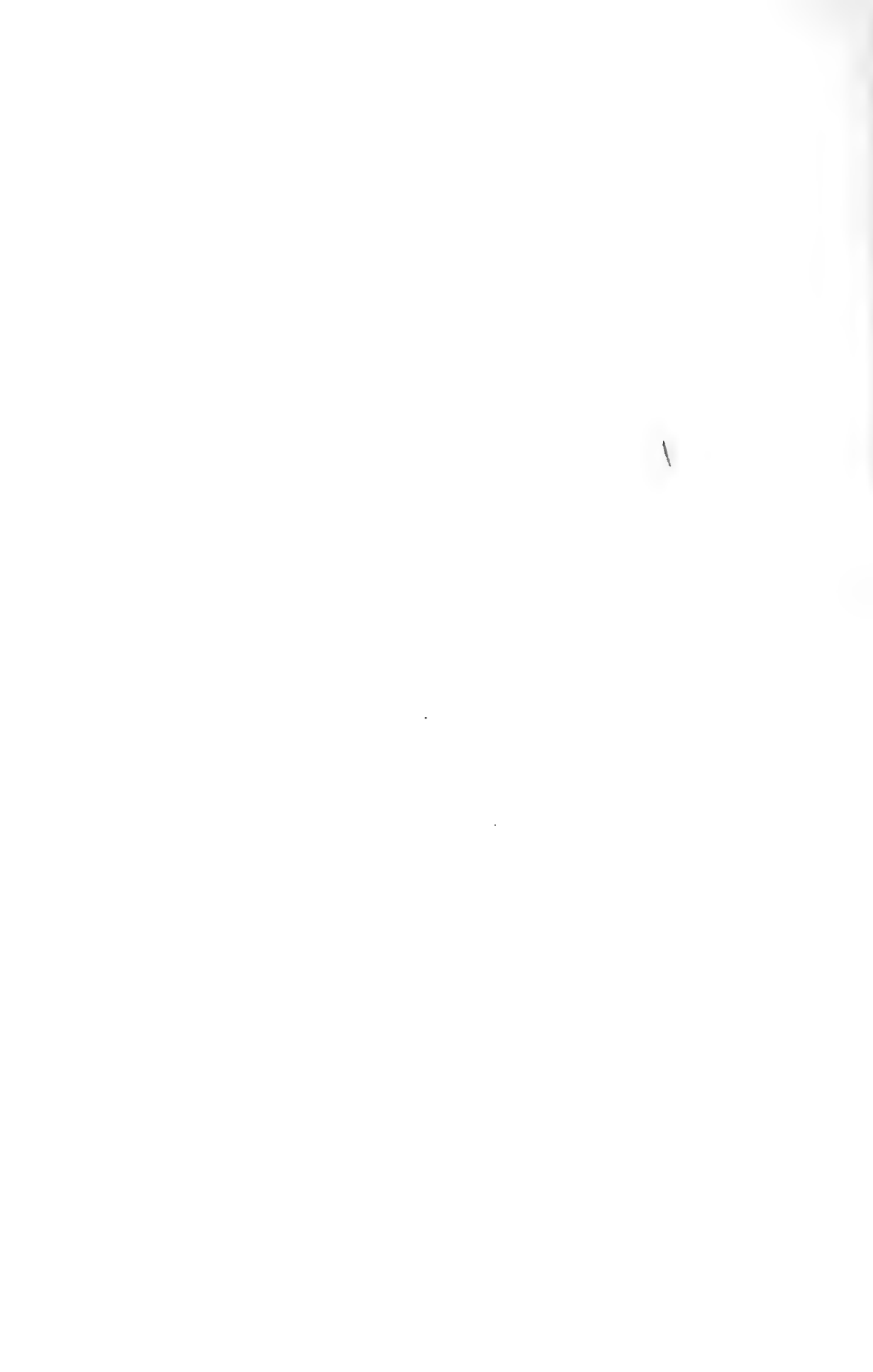
3. Female, lateral view.
4. „ abdomen dorsal view.
5. „ first foot.
6. „ rostrum and first antenna.
7. „ second antenna.
8. „ fifth foot.
9. „ maxillipede.

*Tetragoniceps malleolata*, Brady.

10. Male, fifth foot.

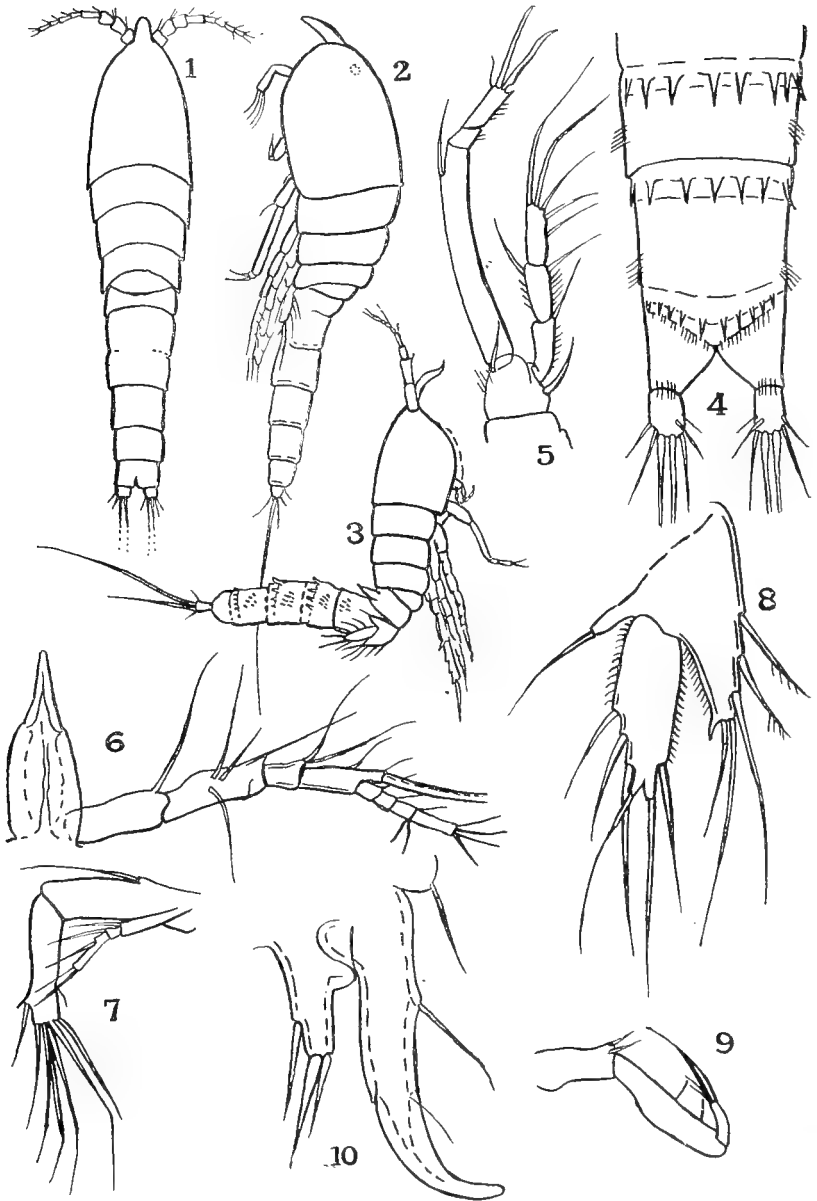


CLARE ISLAND SURVEY.—FARRAN: MARINE ENTOMOSTRACA.













FRESH-WATER ENTOMOSTRACA.

BY D. J. SCOURFIELD, F.Z.S., F.R.M.S.

PLATE I.

Read JUNE 10. Published JULY 22, 1912.

THE collections forming the basis of the present report were made for the most part in Clare Island, in the north-eastern part of Achill Island, and in the immediate neighbourhood of Westport, though a few were also obtained from Castlebar and Islandeady Loughs and some others from the district on the southern side of Clew Bay as far inland as Doo Lough. All the localities are situated, therefore, either in Clare Island or within 10 miles of the shores of Clew Bay, and this may be considered as the area covered by the Survey so far as fresh-water Entomostraca are concerned.

No previous collections of fresh-water Entomostraca had apparently been made in Clare Island itself, and very little had been done in the country surrounding Clew Bay. In 1868 Brady and Robertson (9) visited Westport, and recorded a few Cladocera and Ostracoda, among these being a new species, *Limnocythere sancti-patricii*, obtained from Lough Moher, and the rare *Monospilus dispar*. Canon Norman visited Westport in 1874, but only the Ostracoda obtained on that occasion seem to have been recorded (20). Mr. Kane also visited the district prior to 1909, and recorded the remarkable *Holopedium gibberum* from L. Keel, Achill (19), while Messrs. W. & G. S. West made collections of phyto-plankton in two lakes in Achill in 1904, and incidentally refer to the presence of certain Entomostraca (24).

Much more attention had been given to the district to the south, embracing Connemara and Loughs Corrib and Mask, and a considerable number of species from this area are to be found in the papers and notes by Andrews, Norman, Brady, Kane, West, and others. Nevertheless the records are very imperfect even for this district, owing mainly to the fact that no attempt has hitherto been made to compile a complete list of species, including the commoner as well as the rarer forms.

Most of the collections dealt with in this paper were made in June, 1909, either by the writer or by Mr. Kane. Later in the same year, and again in 1910 and 1911, Mr. Kane collected in the same area, and small gatherings were also made by Mr. James Murray (March, 1911), and Mr. J. S. Dunkerly (April, 1911). I wish to express my thanks to these gentlemen for the

trouble they have taken in this matter, and especially to Mr. Kane, who has rendered invaluable help in many ways in the preparation of this paper.

As regards the methods of collection employed, it may be mentioned that, in addition to the gatherings made with various kinds of nets, some attention was given to washing wet mosses from bogs, mountain torrents, &c., and by this means a few species were obtained which were not found in any other way. A certain amount of bottom material was also passed through fine sieves; but it was not found possible to employ this method as frequently as could have been wished. Generally speaking, the collections were obtained from quite small pieces of water, such as bog-pools, peat-cuttings, ponds, and small lakes. The only lakes of any size investigated were Castlebar Lough, Islandeady Lough, and Doo Lough; and it is much to be regretted that no collections could be obtained from the two largest lakes in the district, viz., Loughs Feeagh and Beltra.

The total number of species now recorded for the district is 90, including three recorded by Brady and Robertson, one found by Mr. Kane, and one given by Canon Norman, but not found again during the progress of the present investigation. The species are distributed among the three Orders as follows:—Cladocera 48, Copepoda 26, and Ostracoda 16. The majority of the species are fairly common types in the British Isles, being either generally distributed or abundant in particular localities. One, however, a species of Copepod from Clare Island, herein described as *Canthocamptus (Attheyella?) praegeri* appears to be new to science, and there are a few others which may be specially mentioned on account of their rarity in the British records, e.g., *Latona setifera*, *Ceriodaphnia affinis*, *Alona intermedia* (in the British Isles hitherto recorded only from Scotland), *Rhynchotalona falcata*, *Alonella exigua*, and *Cyclops rubellus*.

The following species are recorded for Ireland for the first time:—

CLADOCERA :—	<i>Latona setifera</i> .	<i>Alona intermedia</i>
	<i>Ceriodaphnia affinis</i> .	<i>Alonella exigua</i> .
	<i>Acroperus angustatus</i> .	
COPEPODA :—	<i>Eurytemora velox</i> .	<i>Cyclops affinis</i> .
	<i>Cyclops languidus</i> .	<i>Canthocamptus lucidulus</i> .
	<i>nanus</i> .	<i>crassus</i> .
	<i>vernalis</i> .	<i>pygmaeus</i> .
	<i>bisetosus</i> .	<i>zschokkei</i> .
	<i>bicolor</i> .	<i>praegeri</i> n.sp.
	<i>rubellus</i> .	<i>hirticornis</i> .
	<i>varicans</i> .	<i>Nitocra spinipes</i> .
OSTRACODA :—	<i>Cypris obliqua?</i>	

A number of slight variations from the typical forms have been noted, some of which are referred to under the notes on the species, but nothing apparently of real importance, except in one specimen from Clare Island of what seems to be *Canthocamptus hirticornis*. In this case the furca and their setae, as shown on Plate I, fig. 10, are completely changed from the usual type to something unlike what is found in any known species. It may be merely an example of malformation, although, as the structures are perfectly symmetrical, it more probably represents a distinct mutation.

A comparison of the Entomostracan faunas of the different sections of the area comprised in the Survey brings out a number of interesting facts. Considering first the relation of Clare Island to the country around Clew Bay, we find that whereas the total number of species of the Cladocera recorded from the island is only about one-half the number from the mainland, the number of Copepoda is very nearly the same, and the number of Ostracods about two-thirds. The actual figures are as follows:—

	Cladocera.	Copepoda.	Ostracoda.	Total.
Clare Island, . . . . .	24	19	10	53
Mainland (including Achill),	48	21	15	84

The Clare Island fauna is mainly noticeable, as perhaps was to have been expected, for negative rather than positive characters. It is true that a few species have been obtained there which have not hitherto been found in the mainland area (e.g. *Cyclops bisetosus*, *Canthocamptus hirticornis*, *C. praegevi*, n. sp., *Nitocra spinipes*, and *Cypris obliqua* ?), but these, with the exception of the new species, about which nothing can be said, may be confidently expected to occur on the mainland also. On the other hand, there are some rather remarkable absences from the Clare Island list, viz., *Diaphanosoma*, *Bosmina*, *Alonopsis*, and *Polyphemus*. It seems almost impossible to imagine that these absences can be without significance, as representatives of the genera mentioned are fairly common on the mainland. What the significance may be is not known, but it may be surmised to be connected with the means of dispersal.

The Achill Island list contains the following species which have not been noticed in other parts of the area covered by the survey:—*Latona setifera*, *Holopedium gibberum*, *Ilyocryptus sordidus*, *Cyclops nanus*, *Limnocythere inopinata*. As none of these, however, can be considered as common species, it is not possible to draw any inferences from their presence in Achill and apparent absence elsewhere. The absence of *Simocephalus vetulus*, a very common species in all parts of the country, is rather surprising, but may be only accidental.

The Westport-Castlebar list shows the following characteristic species:—*Ceriodaphnia pulchella*, *C. affinis*, *Bosmina longirostris*, *Pleurocus trigonellus*,

*Monospilus dispar*, *Cyclops bicolor*, *C. varicans*, *Canthocamptus lucidulus*, *Notodromas monacha*, *Ilyocypris bradyi*, *Limnocythere sancti-patricii*, and *Cytheridea torosa*. The first and third named at least may be considered as typical "lowland" species, for they are rarely if ever found in mountainous and moorland districts, and, taken in connexion with the other species enumerated and the rarity of such forms as *Acantholeberis curvirostris* and *Alonopsis longuta*, clearly indicate the influence of the different physical conditions of this district as compared with the others.

The Louisburgh-Croaghpatrick list exhibits the following peculiarities:—*Diaphanosoma brachyurum* var. *nasuta*, *Daphnia hyalina* var. *galeata*, *Simocephalus exspinosus*, *Ceriodaphnia reticulata*, and *Bosmina longicornis*. I am indebted to Mr. Kane for all the records from this district except those from Croaghpatrick itself. The species recorded from the latter mountain are as follows:—*Acantholeberis curvirostris*, *Alona rustica*, *Chydorus sphaericus*, *Cyclops viridis*, *C. fuscus*, *C. prasinus*, and *Canthocamptus zschokkei*. These I obtained by collecting in bog-pools at various heights up to about 1500 feet, and by washing mosses taken from the sides of the small streams. *Acantholeberis curvirostris*, *Chydorus sphaericus*, and *Cyclops prasinus* were characteristic of the former, *Alona rustica* and *Canthocamptus zschokkei* of the latter. Mr. Kane's collections were made about Louisburgh, and as far west as Roonah Lough, and as far south as Doo Lough. The Copepoda and Ostracoda were only partially studied.

Taking the district worked over by the Survey as a whole and comparing it, so far as the imperfect records allow, with the rest of the counties of Mayo and Galway, the most noticeable differences are to be found in the absence from the former of a number of typically plankton species of Cladocera and Copepoda (e.g. *Bosmina coregoni*, *Bythotrephes*, *Leptodora*, *Diaptomus laticeps*, &c.) and a considerable number of Ostracods. The explanation of the missing plankton forms is almost certainly to be found in the fact that the larger lakes of the survey area were not examined, while the larger number of Ostracods in the list from the remainder of Mayo and Galway is accounted for by the attention devoted to this group, especially in Connemara, by such well-known authorities as Brady, Robertson, and Norman.

Combining the survey results with the records from the other parts of Mayo and Galway, we obtain for the first time in Ireland a list from a fairly large and compact area (practically the "West of Ireland" *par excellence*) showing some signs of approaching completeness. The total of 115 species compares not very unfavourably with the numbers recorded from some much more thoroughly worked districts in England and Scotland, and considerably

exceeds the total yet recorded from Wales. It only falls short of the complete Irish list by about twenty-eight species.<sup>1</sup>

In addition to the species recorded in this paper for the first time for Ireland, the Mayo-Galway list comprises quite a number of forms which have not hitherto been seen in other parts of Ireland, but little or no importance can be attached to this at present, owing to the fragmentary nature of the records outside the two counties named.<sup>2</sup> It contains three species, *Diaptomus sancti-patricii*, *Canthocamptus praegeri*, n. sp., and *Cypridopsella picta* (the first-named, however, only doubtfully distinct from *D. laciniatus*), which have not been found elsewhere in the British Isles. It also includes two species, *Alona rectangula* and *Candona stagnalis* (or three species if we consider *Diaptomus sancti-patricii* as only a variety of *D. laciniatus*) and one variety, *Diaphanosoma brachyurum* var. *nasuta*, which have also been found in Scotland, but nowhere else in the British Isles. With the English list it has five species in common which have not yet been found in Scotland, viz. *Acroporus angustatus*, *Cyclops oithonoides*, *C. rubellus*, *Cypridopsella obesa*, and *Metacypris cordata*. On the other hand, the Mayo-Galway list, as well as the complete Irish list, contains no representative of the *Daphnia magna* group, nor of the genera *Moina* and *Moraria*, and naturally a number of individual species from several other genera are also absent.

<sup>1</sup> In view of the subsequent remarks on distribution the names of these additional Irish species may be usefully given here:—

CLADOCERA.

*Daphnia cucullata*.  
*Ceriodaphnia laticaudata*.  
*Macrothrix laticornis*.  
*Alona tenuicaudis*.  
*Leydigia acanthocercoides*.  
*Pleuroxus laevis*.  
     *aduncus*.  
*Anchistropus emarginatus*.  
*Bythotrephes cederströmii*.

COPEPODA.

*Diaptomus castor*. \*  
*Cyclops leuckarti*.  
     *phaleratus*.  
     *aequoreus*.  
*Argulus foliaceus*.

OSTRACODA.

*Cypris pubera*.  
     *virens*.  
     *affinis*.  
     *bispinosa*.  
*Herpetocypris tumefacta*.  
*Ilydromas olivaceus*.  
     *robertsoni*.  
*Cypridopsella variegata*.  
*Candona angulata*.  
     *elongata*.  
     *lactea*.  
     *compressa*.  
     *fragilis*.  
*Cytheridea lacustris*.

<sup>2</sup> It is very much to be desired that good lists of Entomostraca from various districts in Ireland should be obtained in the near future. I would suggest that attention should be paid particularly to the north-west, south-west, and east or south-east.

\* NOTE.—The records of *Diaptomus graciloides* by W. and G. S. West (24) are probably incorrect, as this species as defined by Schmeil has never been seen in the British Isles.

LIST OF FRESH-WATER ENTOMOSTRACA from Clare Island and the Clew Bay District, together with the species recorded from the remaining parts of Mayo and Galway.

[NOTE.—The figures in the first four columns, except the totals which refer to the number of species, indicate the number of separate stations where the species have been found, and consequently give a rough idea of the relative commonness or rarity of the forms.]

SPECIES.	Clare Island.	CLEW BAY DISTRICT.			Rest of Mayo and Galway.
		Achill Island.	Westport and Castlebar.	Louisburgh and Croaghpatrick.	
Total number of stations, . . .	21	15	14	9	—
<b>CLADOCERA.</b>					
SIDIDAE.					
<i>Sida crystallina</i> (O. F. M.), . . .	1	2	3	2	×
<i>Diaphanosoma brachyurum</i> (Liévin), . . .	—	4	2	1	×
<i>nasuta</i> , Kane, . . . . .	—	—	—	1	×
<i>leuchtenbergianum</i> , Fischer, . . . . .	—	—	—	—	×
<i>Latona setifera</i> (O. F. M.), . . . . .	—	1	—	—	—
HOLOPEDIDAE.					
<i>Holopedium gibberum</i> , Zaddach, . . . . .	—	1	—	—	×
DAPHNIDAE.					
<i>Daphnia pulex</i> (De Geer), . . . . .	—	—	—	—	×
<i>obtusa</i> , Kurz; <i>propinqua</i> , Sars, . . . . .	—	1	—	—	—
var., . . . . .	—	1	—	—	—
<i>longispina</i> , O. F. M., . . . . .	1	—	3	—	×
<i>hyalina</i> , Leydig, s. str., . . . . .	—	—	1	—	—
<i>lacustris</i> , Sars, . . . . .	1	1	1	—	×
<i>galeata</i> , Sars, . . . . .	—	—	—	1	×
<i>Scapholeberis mucronata</i> (O. F. M.), . . . . .	—	—	3	1	×
<i>Simocephalus vetulus</i> (O. F. M.), . . . . .	7	—	3	1	×
<i>exspinosus</i> (Koch), . . . . .	—	—	—	1	×
<i>Ceriodaphnia reticulata</i> , Jurine, . . . . .	—	—	—	1	—
<i>megalops</i> , Sars, . . . . .	—	—	—	—	×
<i>quadrangula</i> (O. F. M.), . . . . .	6	3	3	—	×
<i>pulchella</i> , Sars, . . . . .	—	—	1	—	—
<i>affinis</i> , Lilljeborg, . . . . .	—	—	1	—	—
BOSMINIDAE.					
<i>Bosmina longirostris</i> (O. F. M.), . . . . .	—	—	1	—	—
<i>obtusirostris</i> , Sars, . . . . .	—	4	1	—	×
<i>longicornis</i> , Schoedler, . . . . .	—	—	—	2	—
<i>longispina</i> , Leydig, . . . . .	—	—	—	—	?
<i>coregoni</i> , Baird; <i>mixta</i> , Lillj., . . . . .	—	—	—	—	×
LYNCODAPHNIDAE.					
<i>Ilyocryptus sordidus</i> (Liévin), . . . . .	—	1	—	—	—
<i>Macrothrix rosea</i> (Jurine), . . . . .	—	—	—	—	×
<i>Lathonura rectirostris</i> (O. F. M.), . . . . .	—	—	—	—	×

## LIST OF FRESH-WATER ENTOMOSTRACA—continued.

SPECIES.	Clare Island.	CLEW BAY DISTRICT.			Rest of Mayo and Galway.
		Achill Island.	Westport and Castlebar.	Louisburgh and Croaghpatrick.	
Total number of stations,	21	15	14	9	—
LYNCODAPHNIDAE—continued.					
<i>Streblocerus serricaudatus</i> (Fischer),	—	2	1	1	×
<i>Drepanothrix dentata</i> (Eurén),	2	2	—	—	×
<i>Acantholeberis curvirostris</i> (O. F. M.),	3	7	1	3	×
LYNCEIDAE.					
<i>Eurycercus lamellatus</i> (O. F. M.),	6	2	5	1	×
<i>Camptocercus rectirostris</i> , Schoedler,	—	—	—	—	×
<i>Acroperus harpae</i> , Baird,	7	1	5	2	×
<i>angustatus</i> , Sars,	4	—	—	1	—
<i>Alonopsis elongata</i> , Sars,	—	8	1	3	×
<i>Alona quadrangularis</i> (O. F. M.),	4	—	—	2	×
<i>affinis</i> , Leydig,	9	5	5	2	×
<i>costata</i> , Sars,	2	—	5	4	×
<i>guttata</i> , Sars,	6	3	2	2	×
<i>intermedia</i> , Sars,	—	1	1	—	?
<i>rectangula</i> , Sars,	2	—	3	1	×
<i>rustica</i> , Scott,	—	1	—	1	×
<i>rostrata</i> (Koch)	—	—	3	2	×
<i>Rhynchotalona falcata</i> (Sars),	—	1	1	3	—
<i>Graptoleberis testudinaria</i> (Fischer),	9	3	2	2	×
<i>Alonella excisa</i> (Fischer)	10	5	3	5	×
<i>exigua</i> (Lilljeborg),	3	2	1	—	—
<i>nana</i> (Baird),	7	6	6	1	×
<i>Peracantha truncata</i> (O. F. M.),	6	2	4	2	×
<i>Pleuroxus trigonellus</i> (O. F. M.),	—	—	1	—	×
<i>uncinatus</i> , Baird,	—	1	3	—	—
<i>Chydorus globosus</i> , Baird,	—	1	1	—	×
<i>ovalis</i> , Kurz,	2	2	2	1	×
<i>latus</i> , Sars,	?	—	—	?	?
<i>sphaericus</i> (O. F. M.),	14	9	5	5	×
<i>barbatus</i> (Brady),	4	2	—	1	×
<i>Monospilus dispar</i> , Sars,	—	—	1	—	—
POLYPHEMIDAE.					
<i>Polyphebus pediculus</i> (Linn.),	—	5	5	4	×
<i>Bythotrephes longimanus</i> , Leydig,	—	—	—	—	×
LEPTODORIDAE.					
<i>Leptodora kindtii</i> (Focke),	—	—	—	—	×
Total Cladocera (Mayo and Galway, 58),	24	31	35	31	45
Clew Bay District, 48					

## LIST OF FRESH-WATER ENTOMOSTRACA—continued.

SPECIES.	Clare Island.	CLEW BAY DISTRICT.			Rest of Mayo and Galway.
		Achill Island.	Westport and Castlebar.	Louisburgh and Croagh- patrick.	
Total number of stations.	21	15	14	9	—
<b>COPEPODA.</b>					
<b>CENTROPAGIDAE.</b>					
<i>Diaptomus gracilis</i> , Sars.	5	6	6	1	×
<i>laticeps</i> , Sars.	—	—	—	—	×
<i>sancti-patricii</i> , Brady.	—	—	—	—	×
<i>Eurytemora velox</i> (Lilljeborg).	1	1	—	—	—
<b>CYCLOPIDAE.</b>					
<i>Cyclops strenuus</i> , Fischer.	—	2	2	—	×
<i>oithonoides</i> , Sars.	—	—	—	—	×
<i>ebicuspidatus</i> , Claus.	1	—	—	—	—
<i>languidus</i> , Sars.	2	1	—	—	—
<i>nanus</i> , Sars.	—	1	—	—	—
<i>vernalis</i> , Fischer.	2	—	2	—	—
<i>bisetosus</i> , Rehberg.	1	—	—	—	—
<i>viridis</i> (Jurine).	4	4	1	2	—
<i>bicolor</i> , Sars.	—	—	1	—	—
<i>rubellus</i> , Lilljeborg.	3	—	2	—	—
<i>varicans</i> , Sars.	—	—	2	—	—
<i>fuscus</i> (Jurine).	—	—	2	1	—
<i>albidus</i> (Jurine).	6	—	4	—	×
<i>serrulatus</i> , Fischer; <i>varius</i> , Lillj.	14	3	4	?	?
<i>macruroides</i> , Lillj.	3	2	3	—	—
<i>prasinus</i> (Jurine).	3	2	—	2	—
<i>affinis</i> , Sars.	1	—	2	—	—
<i>imbriatus</i> , Fischer.	4	—	1	—	—
<b>CANTHOCAMPTIDAE.</b>					
<i>Canthocamptus minutus</i> (O. F. M.).	—	—	—	—	×
<i>lucidulus</i> , Rehberg.	—	—	1	—	—
<i>crassus</i> , Sars.	2	—	1	—	—
<i>pygmaeus</i> , Sars.	5	1	2	1	—
<i>zschokkei</i> , Schmeil.	1	—	—	2	—
<i>praegeri</i> , n.sp.,	1	—	—	—	—
<i>hirticornis</i> , Scott.	1	—	—	—	—
<i>Nitocra hibernica</i> Brady.	—	—	1	—	—
<i>spinipes</i> , Boeck.	1	—	—	—	—
Total Copepoda (Mayo and Galway, 30),	19	9	16	7	5
Clew Bay District. 21.					



LIST OF FRESH-WATER ENTOMOSTRACA—continued.

SPECIES.	Clare Island.	CLEW BAY DISTRICT.			Rest of Mayo and Galway.
		Achill Island.	Westport and Castlebar.	Louisburgh and Croaghpatrick.	
Total number of stations, . . .	21	15	14	9	—
<b>OSTRACODA.</b>					
CYPRIDIDAE.					
<i>Cypria exsculpta</i> (Fischer), . . .	—	—	—	—	×
<i>ophthalmica</i> (Jurine), . . .	2	—	—	1	×
<i>Cylocypris globosa</i> (Sars), . . .	—	—	—	—	×
<i>serena</i> (Koch), . . .	3	—	—	1	×
<i>laevis</i> (O. F. M.), . . .	1	—	1	—	×
<i>Cypris fuscata</i> (Jurine), . . .	1	—	—	1	×
<i>incongruens</i> , Ramdohr, . . .	—	—	—	—	×
? <i>obliqua</i> , Brady, . . .	2	—	—	—	—
<i>Cyprinotus prasinus</i> (Fischer), . . .	1	1	2	—	×
<i>Herpetocypris reptans</i> (Baird), . . .	1	2	—	—	×
<i>Cypridopsis vidua</i> (O. F. M.), . . .	2	1	2	—	×
<i>obesa</i> , Brady and Robertson, . . .	—	1	—	—	×
<i>Cypridopsella aculeata</i> (Costa), . . .	2	1	—	1	—
<i>villosa</i> (Jurine), . . .	—	—	—	—	×
<i>picta</i> (Straus), . . .	—	—	—	—	×
<i>Potamoocypris fulva</i> (Brady), . . .	—	—	—	—	?
<i>Notodromas monacha</i> (O. F. M.), . . .	—	—	1	—	×
<i>Ilyocypris bradyi</i> , Sars, . . .	—	—	1	—	×
<i>Candona candida</i> (O. F. M.), . . .	2	—	2	1	×
<i>stagnalis</i> , Sars, . . .	—	—	—	—	×
<i>fabaeformis</i> (Fischer), . . .	—	—	—	—	×
<i>Candonopsis kingsleii</i> (Brady and Robertson), . . .	—	—	—	—	×
DARWINULIDAE.					
<i>Darwinula stevensoni</i> , Brady and Robertson, . . .	—	—	—	—	×
CYTHERIDAE.					
<i>Metacypris cordata</i> , Brady and Robertson, . . .	—	—	—	—	×
<i>Limnicythere inopinata</i> (Baird), . . .	—	2	—	—	×
<i>sancti-patricii</i> , Brady & Robertson, . . .	—	—	1	—	—
<i>Cytheridea torosa</i> (Jones), . . .	—	—	2	—	×
Total Ostracoda (Mayo and Galway, 27), . . .	10	6	8	5	24
		Clew Bay District, 15.			
Total Fresh-water Entomostraca (Mayo and Galway, 115), . . .	53	46	59	43	76
		Clew Bay District, 84.			

## NOTES ON SOME OF THE SPECIES.

- Diaphanosoma brachyurum** (Liévin) var. **nasuta** Kane.—This variety, first described by Mr. Kane from Loughs Mask and Corrib (19), has now been found by him in Glencullin Lough within the Survey area. So far as the evidence goes at present this is one of the forms which seem to specially connect the fauna of the west of Ireland with Scotland, and possibly also with Scandinavia, for a practically identical variety has been found in the first-named country, and exceedingly closely allied varieties (e.g. *productifrons* Sars and *frontosa* Lilljeborg) in both Norway and Sweden, whereas similar forms have not yet been found in other parts of Ireland or in England and Wales.
- Latona setifera** (O. F. M.).—Only one specimen of this rare species was found in a collection from a bog-pool near Sraheens Lough, Achill. It is recorded for the first time for Ireland.
- Holopedium gibberum** Zaddach.—This record depends upon a single specimen taken by Mr. Kane in L. Keel, Achill (19) before the commencement of the Survey. Previously Mr. Kane had found it at Ballynahinch, Connemara, and in L. Mask (17). It has not been found elsewhere in Ireland.
- Daphnia obtusa** Kurz var.—The form referred to is a rather small variety (maximum size  $\frac{1}{13}$ "') showing the characteristic *obtusa* bump supporting the first antennae in a very marked degree. Its shell spine is not so excessively short as in the typical form of the species, but corresponds with what is found in the variety "propinqua." It may be the same as the form figured in Lilljeborg's 'Cladocera Sueciae,' Tab. xi, fig. 7. I have seen it on several occasions in various parts of the British Isles and it has always been rose-pink in colour, quite different from the usual reddish tint of typical *D. obtusa*. The specimens seen, which included males and ephippial females as well as ordinary parthenogenetic females, were found in a bog-pool near Valley Lough, Dugort, Achill.
- Simocephalus exspinosus** (Koch).—Only seen from a bog-pool at Louisburgh by Mr. Kane. Although a comparatively common species in the south and east of England, it seems to be much rarer in other parts of the British Isles.
- Ceriodaphnia pulchella** Sars.—Only found in Castlebar Lough. In spite of its close relationship to *C. quadrangula*, the two species seem to be mutually exclusive, not only in the same piece of water, but in the same district. The present form is characteristic of what may be called, for want of a better name, "lowland" country.

- Ceriodaphnia affinis** Lilljeborg.—Barley Hill Lough, near Westport, is the only place where this has been found. It is decidedly rare in the British Isles, there being but three previously recorded localities for it, two in England and one in Scotland.
- Bosmina longirostris** (O. F. M.).—Only obtained from Islandeady Lough between Westport and Castlebar. The particular form seen seems to be close or identical with the var. *similis* Lilljeborg.
- Ilyocryptus sordidus** Liévin.—A post-abdomen only of this species was seen in a collection from a deep pond on the moor between Dugort and Achill Sound.
- Acroperus angustatus** Sars.—Under this name are included all forms of *Acroperus* having the dorsal and ventral margins nearly straight and nearly parallel. Some of them would probably come under *A. neglectus* Lilljeborg, but it is very doubtful if that form can be regarded as a good species.
- Alona intermedia** Sars.—Found only in the deep pond already alluded to under *Ilyocryptus sordidus* and in Castlebar Lough. The previous British records of this species have all been from Scotland; and as it also occurs in Norway and Sweden, it may perhaps be looked upon as one of the representatives of the fauna common to the west of Ireland, Scotland, and Scandinavia.
- Alona rustica** Scott.—The two stations for this are Sraheens Lough, Achill, and Croaghpatrick. In the latter case the specimens were only obtained by washing wet mosses.
- Rhynchotalona falcata** (Sars).—I obtained this rather rare species from the deep pond previously referred to under *I. sordidus* and *A. intermedia*, and Mr. Kane found it in Roonah Lough and a neighbouring lakelet, and also in Glencullin Lough. Brady and Robertson record its occurrence in Lough Moher in the Westport district (9).
- Alonella exigua** (Lilljeborg).—This species, as distinct from *A. excisa*, is now definitely recorded for the first time for Ireland. As both species were formerly included under *A. exigua*, it is impossible to say whether the *Lynceus exiguus* recorded by Brady and Robertson from Connemara (9) included the typical form or not, and Mr. Kane also informs me that the entry under this name in his "Additional Records" (19), p. 307, should be deleted, being uncertain. From the number of stations where it has been found, it does not appear to be a rare form in the district under review, although by no means approaching its very near relative *A. excisa* in abundance.

- Pleuroxus trigonellus** (O.F.M.).—Not found during the progress of the Survey, but recorded by Brady and Robertson from near Westport (9).
- Chydorus latus** Sars.—Specimens appearing superficially at least to belong to this species have been seen both by myself and Mr. Kane on several occasions, but I am not quite sure that they are to be looked upon as distinct from *C. sphaericus*.
- Monospilus dispar** Sars.—Recorded many years ago from Westport by Brady and Robertson (9), but not seen since in any part of Mayo and Galway.
- Diaptomus sancti-patricii** Brady.—It is very unfortunate that this species is not more certainly characterized, and that it should not have been recognized since first taken by Brady in Connemara (5). If it is really distinct from *D. laciniatus*, it is one of the very few species peculiar to the British Isles. If, on the other hand, it is identical with that species, it is still one of the forms linking the west of Ireland with Scotland and Scandinavia.
- Eurytemora velox** (Lilljeborg).—On Clare Island this species was only found in Kinnacorra marsh pond, where the water is distinctly brackish, while the Achill locality was a bog-pool near Valley Lough, Dugort, in which the water was apparently quite fresh. Although now recorded for the first time in Ireland, it is probably by no means an uncommon form in slightly brackish water all round the Irish coast.
- Cyclops languidus** Sars.—The Clare Island stations for this species are Creggan Lough and a pond near the old Signal Tower at the extreme west of the island. In Achill the species was found in collections made from the moor north of Sraheens Lough. New to Ireland.
- Cyclops nanus** Sars.—Only recorded from the moor north of Sraheens Lough, Achill. New to Ireland.
- Cyclops vernalis** Fischer.—Of the two Clare Island stations one was the pond near the Signal Tower already mentioned, and the other a brackish pond in the marsh near the hotel. In the latter case the first antennae were 18-jointed owing to the splitting of what is ordinarily the 7th joint (of 17-jointed species) into two. The fourth and fifth were also partially split. In the Westport district this species was seen in the river at Belclare and in Barley Hill Lough. New to Ireland.
- Cyclops bisetosus** Rehberg.—Only seen in the brackish Kinnacorra marsh pool, Clare Island. The specimens were pitted in the same way as is usual in *C. bicuspidatus*. New to Ireland.
- Cyclops bicolor** Sars.—The solitary record for this species was from Barley Hill Lough, Westport. New to Ireland.

- Cyclops rubellus** Lilljeborg.—This species was found in three of the gatherings from Clare Island (Creggan Lough, L. Leinapolbaudy, and marsh pond near the light-house) and in Castlebar and Islandeady Loughs. New to Ireland.
- Cyclops varicans** Sars.—Only seen in the river at Westport and in Castlebar Lough. New to Ireland.
- Cyclops serrulatus**, Fischer.—Of the three forms into which *C. serrulatus* has been divided by Lilljeborg, only two have been recognized during the Survey. By far the larger number of specimens seen were of the “*varius*” type; but examples of the “*macruroides*” type were also taken in many places. No examples of *C. serrulatus*, in the strict sense, were seen anywhere; and indeed this form of the species seems to be much the rarest of the three in the British Isles. Specimens apparently agreeing with each of Lilljeborg’s three forms of “*varius*,” viz. *speratus*, *proximus*, and *brachyurus*, were noted, but it is very doubtful if the separate recording of these fine subdivisions of the species is of any real value.
- Cyclops affinis** Sars.—This widely distributed though rather rare species is now recorded for the first time in Ireland. On Clare Island it was found in a little lough not far from Craigmore and on the mainland in Castlebar Lough and in the river at Westport.
- Canthocamptus lucidulus** Rehberg (= *C. minutus* Claus).—Only found in Castlebar Lough. New to Ireland.
- Canthocamptus (Attheyella) crassus** Sars.—The two localities on Clare Island for this species are Creggan Lough and a little lough near the coast west of Craigmore. The mainland station is Castlebar Lough. New to Ireland.
- Canthocamptus (Attheyella) pygmaeus** Sars.—It is a clear proof of the small amount of attention hitherto paid to the fresh-water Copepoda of Ireland that this species has not been previously recorded in the country. Although not very common in collections made among the ordinary vegetation of ponds, etc., it is usually to be found in wet moss from almost any locality. Most of the specimens seen during the Survey were obtained by washing wet mosses and liverworts.
- Canthocamptus (Attheyella) zschokkei** Schmeil.—The only place where this species was obtained on Clare Island was a small lough in the neighbourhood of Craigmore on the south side of the island. It was also found in moss from the sides of Croaghpatrick, and Mr. Kane found it in a lakelet by the side of Roonah Lough.

**Canthocamptus** (*Attheyella*?) **praegeri**, n.sp. (pl. I, figs. 1-9).—*Specific characters*.—*Female*: Body rather short and thick, tapering considerably behind. Rostrum small, situated on a rostral plate, indistinctly separated from the rest of the cephalic segment. Abdominal segments spinulose on posterior margins; also rows of excessively small spines on the dorsal surface of the last thoracic and first abdominal segments (fig. 6). Edge of anal plate fringed with numerous fine hairs. Furca (fig. 8) short, obliquely truncate, armed with strong spines on both inner and outer margins. The two principal setae on each lobe stout and widely divergent; small inner seta bent inwards a little beyond base. First antennae short, seven-jointed (with last joint very indistinctly divided), the last five joints being at an angle to the first two. Accessory branch of second antennae indistinctly two-jointed with four stout setae (two lateral and two terminal) and a very small spinule near the tip. First pair of feet (fig. 4) with both branches three-jointed, inner just a trifle longer than the outer. Second, third, and fourth feet with three-jointed outer and two-jointed inner branches (fig. 5). Fifth feet (fig. 7) with distal joint moderately large, broadly ovate, and armed with five setae, the two outer being short. Inner expansion of basal joint broad, extending slightly beyond distal joint and armed with six setae, the two outer and two inner being short. Length (in preserved condition), without tail setae,  $\frac{1}{80}$  inch.

*Male* unknown. Spermatophore (fig. 9) cylindrical, with rounded distal and more tapering proximal end, attached to genital segment of female by an unusually long, slender tube, bent near junction with body of spermatophore.

Only a single specimen of this new species has been seen. It was obtained from wet moss from the side of the little stream flowing from the Light-house Marsh to the coast on Clare Island. The most striking feature, and one which separates it at a glance from all other species of *Canthocamptus*, is the peculiarly divergent character of the two large setae on each furcal lobe. The species belongs in the main to the *Attheyella* section of the genus *Canthocamptus*, but presents some unusual characteristics, e.g., seven-jointed first antennae. I have much pleasure in naming it after Mr. R. Lloyd Praeger, to whom the Clare Island Survey owed its inception and continued inspiration, and to whose patient labour and never-failing enthusiasm and encouragement is due so much of what is known to-day of the Irish fauna and flora.

**Canthocamptus** (*Mesochra*) **hirticornis** Scott.—Only found in Kinnacorra marsh pond on Clare Island, the water there being slightly brackish, as might

indeed be anticipated from the presence of this species. New to Ireland.

One specimen, agreeing in all other respects with the typical form of the species, exhibited the remarkable modification of the furca (Pl. I, fig. 10) which has been already referred to in connexion with the question of variations.

**Nitocra spinipes** Boeck (= *Canthocamptus palustris* Brady, var. *elongatus* Scott).—This species, which must, like the foregoing, be regarded rather as a brackish than a fresh-water form, was only taken in little pools on the rocks not far above high-water mark on the north-east coast of Clare Island. The water in these pools was turbid and noticeably green, due to the presence of great numbers of various kinds of microscopic algae. Among the latter, Professor G. S. West informs me, were the two very interesting species, *Brachiomonas submarina* and *Oocystis submarina*. New to Ireland.

**Cyclocypris serena** (Koch).—The specimens from one of the Clare Island localities (Loughanaphuca) recorded under this name seemed to me to be somewhat peculiar. To the naked eye they were almost black and uniformly coloured, but showed under the microscope brown patches similar to those in *Cyprina ophthalmica*, only much darker. They were not so tumid as in typical *C. serena*. Dr. Vávra, however, considers them as belonging to this species.

**Cypris ? obliqua** Brady.—The specimens from two ponds in the south-western portion of Clare Island were not quite adult, but appeared to belong to *C. obliqua*. If this determination is correct, they represent a new record for Ireland.

**Cypridopsis vidua** (O. F. M.).—The specimens from Clare Island and Achill were not so tumid nor so evidently marked with colour-bands as is usually the case in this species. On the other hand, they showed much more pronounced pitting of the shell. Upon reference to Dr. Vávra, however, he said that they exhibited the typical anatomical details of *C. vidua*.

**Limnocythere sancti-patricii** B. & R.—Recorded by Brady and Robertson from L. Moher (9), but not seen during the progress of the survey.

**Cytheridea torosa** (Jones).—Recorded by Norman from Newport and Westport (20), but not seen during the progress of the survey.

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## EXPLANATION OF PLATE I.

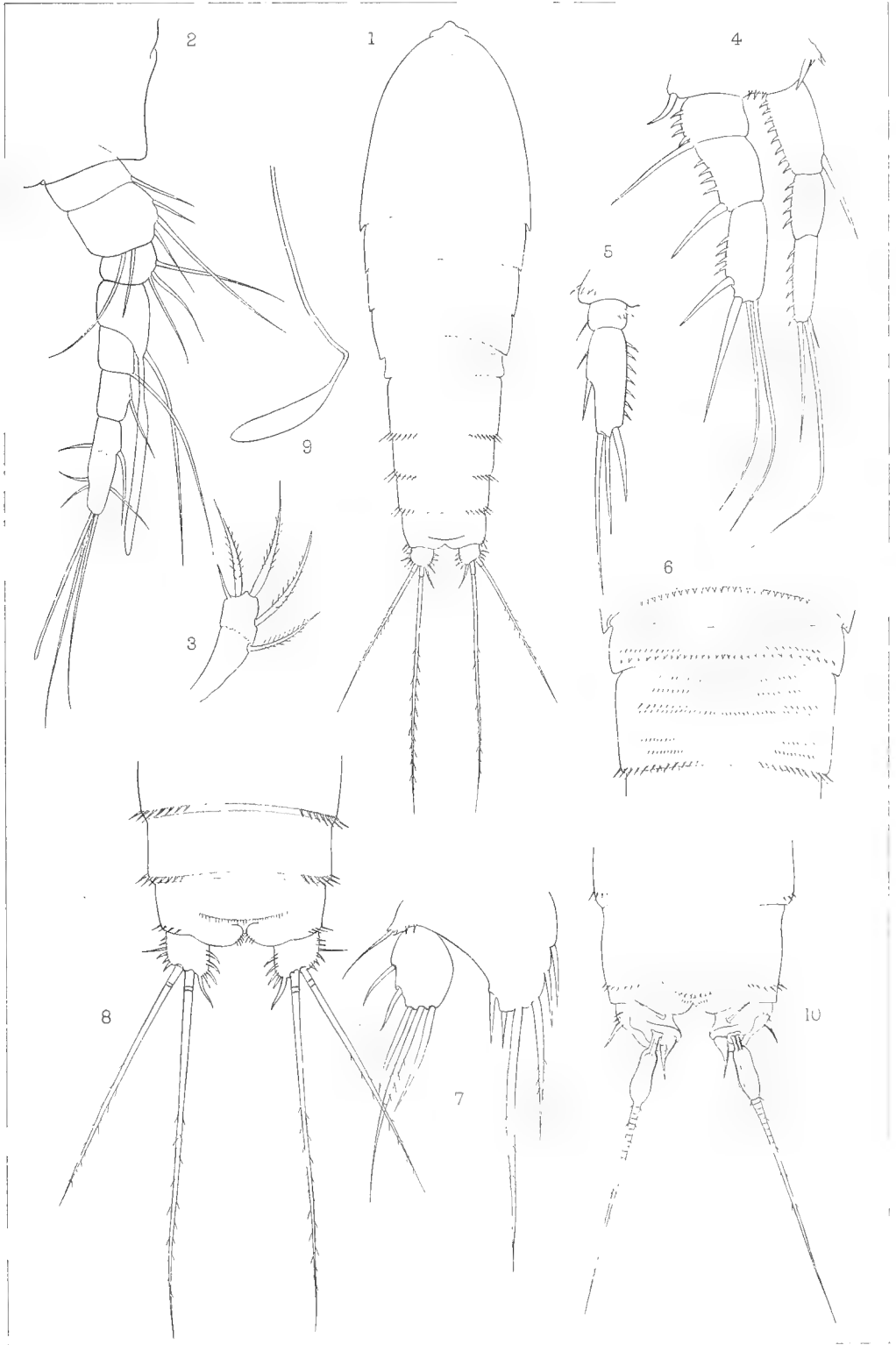
*Canthocamptus (Attheyella ?) praegeeri*, n. sp.

Fig.

1. Dorsal view.  $\times 200$ .
2. First antenna.  $\times 650$ .
3. Accessory branch of second antenna.  $\times 1000$ .
4. First foot.  $\times 650$ .
5. Inner ramus of second foot.  $\times 500$ .
6. Last thoracic and first abdominal segments—dorsal view.  $\times 350$ .
7. Fifth foot.  $\times 550$ .
8. Last abdominal segments and furca—dorsal view.  $\times 350$ .
9. Spermatophore.  $\times 250$ .

*Canthocamptus (Mesochra) hirticornis* Scott.

10. Furca of sport?  $\times 350$ .



D.J. Scourfield del.

West, Newman lith.

1-9. *Canthocamptus* (*Attheyella*?) *praegeri* n. sp.

10. do. (*Mesochra*) *hirticornis*? (*sport*?)



ARCHIANNELIDA AND POLYCHAETA.

BY R. SOUTHERN, B.Sc.

PLATES I-XV.

Read JUNE 9 and DECEMBER 8, 1913. Published JULY 15, 1914.

INTRODUCTION.

FOR the purposes of this paper the Clare Island area stretches from Blacksod Bay on the north to High Island, off Aughrus Point, on the south, and its seaward boundary is the 50-fathom line. This area is larger than that which has been adopted by the majority of workers in the present Survey, and was selected for the following reasons. In the first place, I had small opportunity of doing shore-collecting on Clare Island and in Clew Bay itself, whilst, owing to reasons unconnected with the Survey, very large shore-collections were made a few miles to the north, in Blacksod Bay. Secondly, a large collection from Ballynakill Harbour, Bofin Harbour, and the adjacent open sea, made by the officers of the Irish Fisheries Branch, was available for study. These collections, together with those made in Clew Bay itself during the course of the Survey, probably constitute the largest mass of material ever assembled for the study of the Polychaeta of a limited area, and the list of species which follows is considerably larger than any similar one hitherto published for such an area.

A list of the species is given below, and their local distribution roughly indicated under a number of headings. These faunistic sub-areas may now be defined, and some indication given of the nature of the shore or sea-bottom, and of the size of the collections from each district. A much more complete description of the area, and of the fauna characteristic of each part of it, will be given in Part 67 of this series.

I. BLACKSOD BAY.—Five visits, each of a week's duration, were paid to Blacksod Bay during the period of low spring-tides of September, 1909–1911, and March, 1910–1911. In the course of these visits the eastern shore of the Mullet peninsula, from Barranagh on the north to Carrigeenmore on the south, was thoroughly investigated. The shore here consists of stretches

of schistose reefs and boulders, changing to granite on Carrigeenmore. The rocky shore alternates with stretches of clean sand or *Zostera* beds. On the north side of Barranagh is a patch of muddy gravel. An extensive *Laminaria* belt fringes the rocks at low-water, and the fauna which it shelters was very thoroughly investigated. This varied littoral sheltered an exceedingly rich fauna. A considerable amount of dredging was done in the adjacent waters of the bay, but the sea-bottom is here very uniform, and the fauna is comparatively poor in species.

II. CLEW BAY.—Geographically speaking, the western limits of Clew Bay are formed by lines joining Clare Island to Achillbeg on the north and to Roonagh Head on the south. Large collections, however, were accumulated by dredging operations carried out in the area lying to the west of these lines, for which there is no convenient name. For the purposes of this paper, therefore, I propose to apply the name 'Clew Bay' to the open water east of a line joining Achill Head to Inishark. The eastern portion of this area, comprising Westport Bay and Newport Bay, forms a separate faunistic area, and is divided from Clew Bay by a line running from Mulranny Station to Dillisk Rocks. None of the species listed in the 'Clew Bay' sub-area were obtained by shore-collecting.

The sea-bottom of 'Clew Bay' is predominantly sandy. To the north-east and east of Clare Island lies a large area of trawling ground, having a bottom of clean sand. In this area drifted *Laminaria* roots are frequently taken in the trawl or dredge. To the north and north-west of Clare Island the ground is rocky, with loose boulders, and yielded very few species. In the area lying south of Clare Island and east of Inishbofin are many patches of gravel and loose stones. This type of bottom yielded the largest number of new or rare forms, and is characterized by a rich fauna of species of small size. The characteristic species is *Polygordius lacteus* Schneider, and hence this type of ground may be called for convenience "Polygordius ground." Similar ground occurs to the south of the Curraun peninsula. Round the patches of "Polygordius ground" are extensive deposits of shelly sand, which yield a very interesting micro-fauna, somewhat resembling that of the "Polygordius ground."

III. CLARE ISLAND.—Shore-collecting for Polychaetes in Clew Bay was confined to the shores of Clare Island, and was by no means exhaustive. The north, south, and west shores are much exposed to storms, and yielded practically no species of Polychaeta. The east shore is more sheltered, and there are numerous rock-pools, loose boulders, and growths of *Lithothamnion*. Near the harbour is a patch of clean sand.

IV. NEWPORT BAY and WESTPORT BAY.—For the purposes of this paper

this area is defined as lying east of a line from Mulranny Station to Dillisk Rocks. It is separated from Clew Bay as a distinct faunistic sub-area by the nature of the sea-bottom, and the nature of the shores of the numerous islands which it contains. The most characteristic element of the sea-bottom is mud, more or less mixed with sand. Between the islands are deposits of mud and of corallines. Many of the beaches are formed of loose boulders, which shelter a rich fauna; but unfortunately only a few Polychaetes were collected from these beaches, by other workers in the Survey.

V. BOFIN HARBOUR.—Collections were made here, both on shore and by means of the dredge and tow-net, by the officers of the Irish Fisheries Branch, in 1899–1900.

VI. BALLYNAKILL HARBOUR.—The collections from Ballynakill, made by the officers of the Irish Fisheries Branch in the years 1899–1904, are both large and important, and contain numerous species not found elsewhere in the district. The characteristics of the shore and the nature of the sea-bottom are very varied. Many species were here taken commonly in the tow-net, especially at night, which would otherwise not have been found.

In addition to these districts, from which collections of some size were obtained, specimens in much smaller numbers were collected at Achill Sound, Cleggan Bay, and in Killary Harbour. In Killary the sea-floor is composed of rich black mud, of a kind not found elsewhere in the district; and consequently the fauna, though not rich in numbers of species, is peculiar and of considerable interest.

[TABLE OF SPECIES.

TABLE OF SPECIES.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Lofn Harbour.	Ballynacill Harbour.	Other Stations.
ARCHIANNELIDA.							
<i>Polygordius lacteus</i> <i>Schneider</i> ,	—	×	—	—	—	—	—
<i>P. appendiculatus</i> <i>Fraipont</i> ,	—	×	—	—	—	—	—
<i>Nerilla antennata</i> <i>Schmidt</i> ,	×	—	—	—	—	—	—
POLYCHAETA.							
SYLLIDAE.							
<i>Exogone gemmifera</i> <i>Pag.</i> ,	×	×	—	×	×	×	—
<i>E. hebes</i> <i>var. hibernica</i> <i>var. nor.</i> ,	×	×	—	—	—	—	Killary Harbour.
<i>Sphaerosyllis hystrix</i> <i>Clap.</i> ,	×	×	—	×	×	×	Achill Sound.
<i>S. erinaceus</i> <i>Clap.</i> ,	—	—	—	—	—	×	—
<i>S. bulbosa</i> <i>sp. n.</i> ,	—	×	—	—	—	—	—
<i>Grubea clavata</i> ( <i>Clap.</i> ),	×	×	—	×	—	×	—
<i>Grubea pusilla</i> ( <i>Duj.</i> ),	×	×	—	—	—	—	—
<i>Pionosyllis lamelligera</i> <i>de St.-Joseph</i> ,	×	×	—	×	×	—	—
<i>P. serrata</i> <i>sp. n.</i> ,	×	×	—	—	×	×	Off Cleggan Head.
<i>Streptosyllis Websteri</i> <i>sp. n.</i> ,	—	—	—	—	×	×	—
<i>S. bidentata</i> <i>sp. n.</i> ,	—	×	—	—	—	—	—
<i>Opisthodonta pterochaeta</i> <i>sp. n.</i> ,	—	×	—	—	—	—	—
<i>Eusyllis tubifex</i> ( <i>Gosse</i> ),	×	×	—	×	×	×	—
<i>Odontosyllis gibba</i> <i>Clap.</i> ,	×	×	—	×	×	×	—
<i>O. ctenostoma</i> <i>Clap.</i> ,	×	×	—	—	×	×	—
<i>Trypanosyllis zebra</i> ( <i>Grube</i> ),	×	×	—	—	×	—	—
<i>T. coeliaca</i> <i>Clap.</i> ,	—	×	—	—	—	—	—
<i>Eurysyllis paradoxa</i> ( <i>Clap.</i> ),	×	×	—	—	—	—	Killary Harbour.
<i>Syllis armillaris</i> ( <i>Müller</i> ),	×	×	×	×	—	×	—
<i>S. hyalina</i> <i>Grube</i> ,	×	—	—	—	—	—	—
<i>S. prolifera</i> <i>Krohn</i> ,	×	×	×	—	×	×	—
<i>S. Krohnii</i> <i>Ehlers</i> ,	×	×	—	—	—	×	—
<i>S. vittata</i> <i>Grube</i> ,	—	×	—	—	—	—	—
<i>S. variegata</i> <i>Grube</i> ,	—	×	—	—	—	—	Off Cleggan Head.
<i>S. cornuta</i> <i>Rathke</i> ,	—	×	—	—	×	—	—



TABLE OF SPECIES—*continued*.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
<i>Syllis simplex</i> Lang., . . . . .	—	—	×	—	—	—	—
<i>S. ferrugina</i> (Lang.), . . . . .	×	—	—	—	—	—	—
<i>S. gracilis</i> Grube, . . . . .	×	—	×	—	—	—	—
<i>S. spongicola</i> Grube, . . . . .	×	×	—	—	—	—	—
<i>Autolytus longeferiens</i> de St.-Jos., . . . . .	×	—	—	×	—	—	—
<i>A. rubropunctatus</i> (Grube), . . . . .	—	—	—	×	—	×	—
<i>A. pictus</i> (Ehlers), . . . . .	×	×	—	×	—	—	—
<i>A. macrophthalma</i> (Marenz.), . . . . .	—	×	—	×	—	—	—
<i>A. brachycephala</i> (Marenz.), . . . . .	×	×	—	—	—	—	—
<i>A. ehbiensis</i> de St.-Jos., . . . . .	×	×	—	×	×	×	—
<i>A. punctatus</i> de St.-Jos., . . . . .	×	—	—	—	—	—	—
<i>A. Edwardsi</i> de St.-Jos., . . . . .	×	×	—	—	—	×	—
<i>A. prolifer</i> (Müller), . . . . .	—	×	—	—	—	—	—
<i>Autolytides inermis</i> (de St.-Jos.), . . . . .	×	—	—	—	—	—	—
<i>Amblyosyllis lineata</i> Grube, . . . . .	×	×	×	—	×	×	—
<i>Myrianida pinnigera</i> (Montagu) . . . . .	—	—	—	—	—	×	—
HESIONIDAE.							
<i>Microphthalmus Sczelkowi</i> (Mecz.), . . . . .	×	—	—	—	—	—	—
<i>Magalia perarmata</i> Mar. & Bobr., . . . . .	×	×	—	×	—	×	—
<i>Oxydromus propinquus</i> (Mar. & Bobr.), . . . . .	—	—	—	—	—	×	—
<i>Ophiodromus flexuosus</i> (D. Chijsje), . . . . .	×	—	—	—	—	×	—
<i>Castalia punctata</i> (Müller), . . . . .	×	×	—	—	—	×	—
<i>C. fusca</i> (Johnston) typ., . . . . .	×	×	×	×	—	×	—
<i>C. fusca</i> var <i>hibernica</i> var. <i>nov.</i> , . . . . .	—	×	—	—	—	—	—
<i>C. fusca</i> var., . . . . .	—	—	—	—	—	×	—
AMPHINOMIDAE.							
<i>Euphrosyne foliosa</i> Aud. & Edw., . . . . .	—	×	—	—	—	×	—
APHRODITIDAE.							
<i>Aphrodite aculeata</i> L., . . . . .	×	×	—	×	—	×	—
<i>Lepidonotus squamatus</i> (L.), . . . . .	×	×	×	×	—	×	—
<i>L. clava</i> (Mont.), . . . . .	×	×	×	—	—	×	—
<i>Gattyana cirrosa</i> (Pallas), . . . . .	×	×	—	—	—	—	—

TABLE OF SPECIES—continued.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
<i>Lagisca floccosa</i> (Sav.), . . . .	×	×	×	×	—	×	Cleggan Bay.
<i>L. Elizabethae</i> M'Intosh, . . . .	×	×	×	×	—	—	—
<i>Harmothoe imbricata</i> (L.), . . . .	×	×	×	×	—	×	Cleggan Bay.
<i>H. spinifera</i> (Ehlers), . . . .	×	×	—	—	—	—	Killary Harbour.
<i>H. zetlandica</i> M'Intosh, . . . .	—	×	—	—	—	—	—
<i>H. lunulata</i> (D. Chiaje), . . . .	×	×	—	—	—	×	—
<i>H. setosissima</i> (Sav.), . . . .	—	×	—	—	×	—	—
<i>Evarne impar</i> (Johnston), . . . .	×	×	—	—	—	×	Cleggan Bay.
<i>Scalissetosus communis</i> (D. Chiaje), . . . .	×	×	—	×	—	—	Killary Harbour. Cleggan Bay.
<i>S. assimilis</i> M'Intosh, . . . .	—	×	—	×	—	—	—
<i>Halosydna gelatinosa</i> (Sars), . . . .	×	×	—	×	×	×	—
<i>Polynoe scolopendrina</i> Sav., . . . .	×	—	—	×	×	×	Achill Sound.
<i>Achloë astericola</i> (D. Chiaje), . . . .	—	×	—	—	—	—	—
<i>Sthenelais boa</i> (Johnston), . . . .	×	—	—	×	×	×	—
<i>S. zetlandica</i> M'Intosh, . . . .	—	×	—	—	—	—	—
<i>S. limicola</i> Ehlers, . . . .	—	×	—	—	—	—	—
<i>Sigalion Mathildae</i> Aud. & Edw., . . . .	×	×	—	—	—	—	—
<i>Pholoë minuta</i> (Fabr.), . . . .	×	×	×	×	—	×	—
<i>P. tuberculata</i> sp. n., . . . .	×	×	—	—	—	—	—
PALMYRIDAE.							
<i>Chrysopetalum debile</i> (Grube), . . . .	—	×	—	—	—	—	—
PISIONIDAE.							
<i>Praegeria remota</i> gen. et sp. nov., . . . .	—	×	—	—	—	—	—
PHYLLODOCIDAE.							
<i>Lacydonia miranda</i> Mar. & Bobr., . . . .	—	×	—	—	—	—	—
<i>Notophyllum foliosum</i> (Sars), . . . .	—	×	—	—	—	—	—
<i>Eulalia bilineata</i> (Johnston), . . . .	×	×	—	—	—	×	—
<i>E. punctifera</i> Grube, . . . .	×	—	—	—	—	×	—
<i>E. viridis</i> Müller, . . . .	×	×	×	×	—	×	Killary Harbour.
<i>E. tripunctata</i> M'Intosh, . . . .	×	—	—	×	—	—	—
<i>E. macroceros</i> Grube, . . . .	—	×	—	×	—	—	—
<i>E. pusilla</i> Oersted, . . . .	×	—	—	—	—	×	—

TABLE OF SPECIES—continued.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
<i>Eumida sanguinea</i> (Oersted), . . .	×	×	—	×	—	×	Killary Harbour.
<i>Paranaitis Wahlbergi</i> (Malm.), . . .	—	×	—	—	—	—	—
<i>P. Jeffreyi</i> (M <sup>c</sup> Intosh), . . .	×	×	—	×	×	×	—
<i>Phyllodoce lamelligera</i> (Gmelin), . . .	×	—	×	×	—	×	—
<i>P. Paretti</i> (Blainville), . . .	×	×	—	—	—	—	—
<i>P. groenlandica</i> Oersted, . . .	×	×	—	—	—	—	—
<i>P. maculata</i> (L.), . . .	×	×	—	×	×	×	Killary Harbour.
<i>P. rubiginosa</i> de St.-Jos., . . .	×	×	—	—	—	×	—
<i>P. Lizziae</i> (M <sup>c</sup> Intosh), . . .	—	—	—	—	—	×	—
<i>Mystides bidentata</i> Lang., . . .	—	×	—	—	—	—	—
<i>M. limbata</i> de St.-Jos., . . .	—	×	—	×	—	—	—
<i>M. borealis</i> Théel, . . .	—	×	—	—	—	—	—
<i>M. elongata</i> sp. n., . . .	—	×	—	—	—	—	—
<i>Mysta barbata</i> Malmgren, . . .	×	—	—	—	—	—	—
<i>Eteone picta</i> , Quatr., . . .	×	×	—	×	×	×	—
<i>E. foliosa</i> Quatr., . . .	×	×	—	—	—	—	Killary Harbour.
<i>E. arctica</i> Malmgren, . . .	×	—	—	—	—	—	—
<i>E. depressa</i> Malmgren, . . .	×	—	—	—	—	—	—
TOMOPTERIDAE.							
<i>Tomopteris helgolandica</i> Greeff, . . .	—	×	—	—	×	×	—
NEREIDAE.							
<i>Nereis pelagica</i> L., . . .	×	×	×	×	—	×	—
<i>N. cultrifera</i> Grube, . . .	×	—	×	—	×	×	—
<i>N. Dumerilii</i> Aud. & Edw., . . .	×	×	×	×	×	×	{ Killary Harbour. Cleggan Bay.
<i>N. diversicolor</i> Müller, . . .	×	—	—	×	—	—	Achill Sound.
<i>N. longissima</i> Johnston, . . .	×	—	—	×	—	—	—
<i>N. fucata</i> Savigny, . . .	×	×	—	—	—	—	—
NEPHTHYDIDAE.							
<i>Nephtys caeca</i> (Müller), . . .	×	—	—	—	×	×	—
<i>N. Homborgii</i> Lamarck, . . .	×	×	—	×	—	×	—
<i>N. ciliata</i> (Müller), . . .	×	×	×	—	—	—	—
<i>N. hystericis</i> M <sup>c</sup> Intosh, . . .	×	—	—	×	—	—	Killary Harbour.

TABLE OF SPECIES—*continued*.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
<i>Nephtys cirrosa Ehlers</i> , . . . .	X	X	—	—	—	—	—
<i>N. longisetosa Oersted</i> , . . . .	—	X	—	—	—	—	—
EUNICIDAE.							
<i>Ophryotrocha puerilis Clap. &amp; Mecz.</i> , . .	X	X	—	—	—	—	—
<i>Staurocephalus rubrovittatus Grube</i> , . .	X	X	—	—	—	—	—
<i>S. Kefersteini M'Intosh</i> , . . . .	X	X	—	—	—	X	—
<i>S. pallidus Langerhans</i> , . . . .	—	X	—	—	—	—	—
<i>Lumbriconereis Latreilli Aud. &amp; Edw.</i> , .	X	X	—	—	—	—	—
<i>L. impatiens Clap.</i> , . . . .	—	X	—	—	—	—	—
<i>L. gracilis Ehlers</i> , . . . .	—	X	—	X	—	X	—
<i>Arabella iricolor Montagu</i> , . . . .	X	—	—	—	—	—	—
<i>Notocirrus scoticus M'Intosh</i> , . . . .	—	X	—	—	—	—	—
<i>Onuphis britannica M'Intosh</i> , . . . .	—	X	—	—	—	—	—
<i>Hyalinoecia sicula (Quatr.)</i> , . . . .	—	X	—	—	—	—	—
<i>Marphysa fallax Mar. &amp; Bobr.</i> , . . . .	X	—	—	—	—	—	—
<i>M. sanguinea (Montagu)</i> , . . . .	—	—	—	—	—	X	—
<i>M. Belli Aud. &amp; Edw.</i> , . . . .	—	—	—	—	X	—	—
<i>Nematonereis unicornis (Grube)</i> , . . . .	—	X	—	—	—	—	—
<i>Lysidice punctata (Risso)</i> , . . . .	X	X	—	X	—	—	—
SPHAERODORIPAE.							
<i>Ephesia gracilis Rathke</i> , . . . .	X	X	—	X	—	X	—
<i>E. peripatus (Clap.)</i> , . . . .	X	X	—	—	—	X	—
<i>Sphaerodorum Claparedii Greeff</i> , . . . .	X	—	—	—	—	X	—
<i>S. minutum (Web. &amp; Ben.)</i> , . . . .	X	X	—	—	—	X	—
GLYCERIDAE.							
<i>Glycera lapidum Quatr.</i> , . . . .	—	X	—	—	—	—	—
<i>G. Ehlersi Arwid.</i> , . . . .	—	X	—	—	—	—	—
<i>G. siphonostoma (D. Chsaje)</i> , . . . .	X	X	—	—	—	X	—
<i>G. alba Blainville</i> , . . . .	X	X	X	X	—	X	—
<i>Goniada maculata Oersted</i> , . . . .	—	X	—	X	—	—	Killary Harbour.
<i>Glycinde Nordmanni (Malm.)</i> , . . . .	—	X	—	—	—	—	—

TABLE OF SPECIES—continued.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bolin Harbour.	Ballynakill Harbour.	Other Stations.
ARICIIDAE.							
<i>Aricia Cuvieri</i> Aud. & Edw., . . . . .	—	—	—	×	—	—	Killary Harbour.
<i>A. Latreillii</i> Aud. & Edw. . . . .	×	—	—	—	—	×	—
<i>Scoloplos armiger</i> (Müller), . . . . .	×	×	—	×	—	—	—
PARAONIDAE.							
<i>Aricidea Jeffreysii</i> (M <sup>l</sup> Intosh), . . . . .	—	×	—	—	—	×	—
<i>Paraonis lyra</i> sp. n., . . . . .	—	—	—	—	—	×	—
SPIONIDAE.							
<i>Spio martinensis</i> Mesnil, . . . . .	×	—	—	—	—	—	—
<i>S. seticornis</i> Fabr., . . . . .	×	—	—	×	×	—	—
<i>Scolecoplepis vulgaris</i> (Johnston), . . . . .	×	—	×	—	—	—	—
<i>S. fuliginosa</i> (Clap.), . . . . .	×	—	—	—	—	—	—
<i>Laonice cirrata</i> (Sars), . . . . .	—	×	—	×	—	—	—
<i>Nerinides longirostris</i> (Quatr.), . . . . .	×	—	—	—	—	—	—
<i>N. tridentata</i> sp. n., . . . . .	×	—	—	—	—	—	—
<i>Nerine cirratulus</i> (D. Chiaje), . . . . .	×	—	×	—	—	—	—
<i>N. foliosa</i> (Aud. & Edw.), . . . . .	×	—	—	—	—	×	—
<i>Aonides oxycephala</i> (Sars), . . . . .	×	—	×	—	—	×	—
<i>A. paucibranchiata</i> sp. n., . . . . .	—	×	—	—	—	—	—
<i>Prionospio Steenstrupi</i> Malm., . . . . .	×	×	—	—	—	—	—
<i>Spiophanes bombyx</i> (Clap.), . . . . .	×	×	—	—	—	—	—
<i>Polydora ciliata</i> (Johnston), . . . . .	×	—	×	—	—	—	—
<i>P. hoplura</i> Clap., . . . . .	×	—	—	—	×	×	—
<i>P. caeca</i> (Oersted), . . . . .	×	×	×	—	—	—	—
<i>P. flava</i> Clap., . . . . .	×	×	—	—	—	—	—
<i>P. Giardi</i> Mesnil, . . . . .	×	×	—	—	—	—	—
<i>P. Caulleryi</i> Mesnil, . . . . .	—	×	—	—	—	—	—
<i>P. quadrilobata</i> Jacobi, . . . . .	×	—	—	—	—	—	—
<i>Magelona papillicornis</i> Müller, . . . . .	×	×	—	—	—	×	—
<i>M. rosea</i> Moore, . . . . .	—	—	—	—	—	—	Killary Harbour.
DISOMIDAE.							
<i>Poecilochaetus serpens</i> Allen, . . . . .	×	×	—	—	—	×	—

TABLE OF SPECIES—continued.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
CHAETOPTERIDÆ.							
<i>Chaetopterus variopedatus Renier,</i>	×	×	—	—	×	×	—
AMMOCHARIDÆ.							
<i>Owenia fusiformis D. Ch.,</i>	×	×	—	×	—	—	Killary Harbour.
<i>Myriochele Heeri Malmgren,</i>	—	×	—	—	—	—	—
CIRRATULIDÆ.							
<i>Cirratulus tentaculatus (Mont.),</i>	×	—	×	—	×	—	—
<i>C. norvegicus (Quatr.),</i>	—	×	—	—	—	—	—
<i>C. cirratus (Müller),</i>	×	×	×	—	—	—	—
<i>C. Macintoshi nom. nov.,</i>	—	—	—	×	×	—	Killary Harbour.
<i>Chaetozone viridis (Lang.),</i>	×	×	—	—	×	—	—
<i>C. alata sp. n.,</i>	×	—	—	—	—	×	—
<i>C. killariensis sp. n.,</i>	—	—	—	—	—	—	Killary Harbour.
<i>C. zetlandica M'Intosh,</i>	×	—	—	—	—	×	—
<i>C. setosa Malmgren.,</i>	×	×	—	—	—	×	—
<i>Dodecaceria concharum Oersted,</i>	×	×	×	—	—	—	—
<i>Macrochaeta clavicornis (Sars),</i>	×	×	—	×	—	×	—
TEREBELLIDÆ.							
<i>Proclea Graffi (Lang.),</i>	—	×	—	—	—	—	—
<i>Amphitrite affinis Malmgren,</i>	—	×	—	—	—	—	—
<i>A. Johnstoni (Malmgren),</i>	×	—	—	—	×	×	—
<i>A. gracilis (Grube),</i>	×	×	—	—	—	×	—
<i>Lepraea lapidaria (L.),</i>	—	×	—	—	—	—	—
<i>Scione maculata (Dalyell),</i>	×	×	—	—	—	—	—
<i>Nicolea venustula (Montagu),</i>	×	×	—	—	—	×	—
<i>Lanice conchilega (Pallas),</i>	×	×	—	×	—	×	—
<i>Pista cristata (Müller),</i>	—	—	—	×	—	—	—
<i>Polymnia nebulosa (Montagu),</i>	×	×	—	×	—	×	—
<i>P. nesidensis (D. Ch.),</i>	×	—	—	×	—	×	—
<i>Thelepus setosus (Quatr.),</i>	×	×	—	×	—	—	—
<i>T. cincinnatus (Fabr.),</i>	×	×	—	×	—	—	Killary Harbour.

TABLE OF SPECIES—continued.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
<i>Thelepidides collaris</i> <i>gen. et sp. nov.</i> ,	—	—	—	×	—	—	—
<i>Polycirrus caliendrum</i> <i>Clap.</i> ,	×	×	—	×	—	×	—
<i>P. Smitti</i> ( <i>Malmgren</i> ),	×	—	—	—	—	—	—
<i>P. haematodes</i> ( <i>Clap.</i> ),	×	×	—	×	—	×	—
<i>P. denticulatus</i> <i>de St.-Jos.</i> ,	×	—	—	—	—	×	—
<i>Terebellides Stroemi</i> <i>Sars.</i> ,	×	—	—	×	—	×	Killary Harbour.
<i>Trichobanchus glacialis</i> <i>Malmgren</i> ,	—	—	—	×	—	×	Killary Harbour.
AMPHARETIDAE.							
<i>Ampharete Grubei</i> <i>Malmgren</i> ,	×	×	—	—	—	—	—
AMPHICTENIDAE.							
<i>Pectinaria auricoma</i> ( <i>Müller</i> ),	×	×	—	×	—	—	—
<i>P. belgica</i> ( <i>Fallas</i> ),	—	—	—	—	—	—	Killary Harbour.
<i>Lagis Koreni</i> <i>Malmgren</i> ,	×	—	—	—	—	×	—
CAPITELLIDAE.							
<i>Capitella capitata</i> ( <i>Fabr.</i> ),	×	×	×	—	×	—	—
<i>Notomastus latericeus</i> <i>Sars.</i> ,	×	×	—	×	—	×	Killary Harbour.
OPHELIIDAE.							
<i>Travisia Forbesi</i> <i>Johnston</i> ,	×	—	—	—	—	—	—
<i>Ophelia limacina</i> ( <i>Rathke</i> ),	×	×	—	—	—	—	—
<i>Ammotrypane aulogaster</i> <i>Rathke</i> ,	—	×	—	×	—	×	—
<i>Armandia flagellifera</i> <i>sp. n.</i> ,	—	—	—	—	—	×	—
<i>Polyophthalmus pictus</i> ( <i>Duj.</i> ),	×	×	—	×	×	×	Achill Sound.
MALDANIDAE.							
<i>Micromaldane ornithochaeta</i> <i>Mesni</i> ,	—	×	—	—	—	—	—
<i>Nicomache maculata</i> <i>Arwd.</i> ,	×	—	—	—	—	—	—
<i>Caesicirrus neglectus</i> <i>Arwd.</i> ,	×	—	—	×	—	×	—
<i>Petaloproctus terricola</i> <i>Quat.</i> ,	×	—	—	—	—	—	—
<i>Heteroclymene robusta</i> <i>Arwd.</i> ,	—	—	—	—	—	×	—
ARENICOLIDAE.							
<i>Arenicola marina</i> ( <i>L.</i> ),	×	—	×	—	—	×	—
<i>A. ecaudata</i> <i>Johnston</i> ,	×	—	×	—	—	×	—
<i>A. branchialis</i> <i>Aud. &amp; Edw.</i> ,	×	—	—	—	—	×	—

TABLE OF SPECIES—continued.

SPECIES.	Blackrod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bohin Harbour.	Ballynakill Harbour.	Other Stations.
SCALIBREGMIDAE.							
<i>Scalibregma inflatum</i> Rathke,	×	×	—	×	—	×	—
<i>Sclerocheilus minutus</i> Grube,	×	×	—	—	—	—	—
<i>Asclerocheilus intermedius</i> de St.-Jos.,	×	—	—	—	—	×	—
CHLORHAEMIDAE.							
<i>Stylaroides plumosa</i> (Müller),	×	×	—	×	—	×	—
<i>S. glauca</i> (Malmgren),	—	×	—	—	—	×	—
<i>Flabelligera affinis</i> Sars,	×	×	×	—	×	×	—
SABELLIDAE.							
<i>Sabella paronina</i> Sars,	×	×	—	×	—	×	—
<i>Potamilla reniformis</i> (Müller),	×	×	—	—	—	—	—
<i>P. Torelli</i> Malmgren,	×	×	×	×	—	×	—
<i>Branchiomma vesiculosum</i> (Mont.),	×	—	—	—	—	×	—
<i>Dasychone bombyx</i> Dalzell,	×	×	—	×	—	×	—
<i>Laonome Krøyeri</i> Malmgren,	—	—	—	×	—	—	—
<i>Jasmineira elegans</i> de St.-Jos.,	×	×	—	×	—	×	—
<i>J. caudata</i> Langerhans,	—	×	—	—	—	—	—
<i>Fabricia sabella</i> (Ehren.),	×	—	×	—	—	—	—
<i>Oria Armandi</i> (Clap.),	×	×	—	—	—	—	—
<i>Chone Duneri</i> Malmgren,	—	×	—	—	—	—	—
<i>C. filicaudata</i> sp. n.,	—	—	—	×	—	×	—
<i>Euchone rubrocincta</i> (Sars),	—	—	—	—	—	×	—
<i>E. rosea</i> Langerhans,	—	—	—	—	—	×	—
<i>Myxicola infundibulum</i> (Zenker),	—	—	—	—	—	×	—
SERPULIDAE.							
<i>Serpula vermicularis</i> L.,	×	×	—	—	—	—	—
<i>Pomatoceros triquetus</i> L.,	×	×	×	×	—	×	—
<i>Hydroides norvegica</i> Gunn.,	×	×	—	×	—	—	—
<i>Filograna implexa</i> Berkeley,	—	×	—	—	—	—	—



TABLE OF SPECIES—continued.

SPECIES.	Blacksod Bay.	Clew Bay.	Clare Island.	Newport Bay and Westport Bay.	Bofin Harbour.	Ballynakill Harbour.	Other Stations.
<i>Protula tubularia</i> (Mont.), . . . . .	—	—	—	×	—	×	Killary Harbour.
<i>Spirorbis spirorbis</i> (L.), . . . . .	×	×	×	—	—	×	—
<i>S. pusilloides</i> Bush, . . . . .	×	—	×	—	—	—	—
<i>S. medius</i> Fixell, . . . . .	×	—	—	—	—	—	—
HERMELLIDAE.							
<i>Sabellaria spinulosa</i> Leuck., . . . . .	×	×	—	×	—	—	—
MYZOSTOMARIA.							
<i>Myzostoma cirriferum</i> Leuck., . . . . .	—	—	—	—	—	×	—
Total, 253 species and 2 varieties, . . . . .	170	166 + 1 var.	36	80	35	112 + 1 var.	

Disregarding the Archannelida and Myzostoma, we find that the total number of species of Polychaeta is 249, and 2 varieties, distributed as follows:—Blacksod Bay, 169 species; 'Clew Bay,' 164 species and 1 variety; Clare Island, 36 species; Newport and Westport Bays, 80 species; Bofin Harbour, 35 species; Ballynakill Harbour, 111 species and 1 variety; Killary Harbour, 22 species. The number of species confined to any one of these sub-areas is as follows:—Blacksod Bay, 20 species, or 11·8 per cent.; 'Clew Bay,' 40 species, or 24·1 per cent.; Clare Island, 1 species, or 2·8 per cent.; Newport and Westport Bays, 3 species, or 3·75 per cent.; Bofin Harbour, 1 species, or 2·8 per cent.; Ballynakill Harbour, 11 species, or 9·9 per cent.; Killary Harbour, 3 species, or 13·6 per cent. It thus appears that 'Clew Bay' yields both the greatest number and the greatest proportion of peculiar forms, whilst Clare Island and Bofin Harbour contain the smallest proportion. The sheltered bays show greater resemblance to each other than any one of them does to 'Clew Bay,' as shown by the following figures, each sub-area being compared to Blacksod Bay, the latter sub-area containing the greatest number of species. The figures show the number of species the sub-area has in common with Blacksod Bay. 'Clew Bay,' 110 species, or 66·3 per cent.; Clare Island, 35 species, or

97·2 per cent. ; Newport and Westport Bays, 63 species, or 78·7 per cent. ; Bofin Harbour, 29 species, or 80 per cent. ; Ballynakill Harbour, 89 species, or 80 per cent. ; Killary Harbour, 14 species, or 63·6 per cent. Westport and Newport Bays and Ballynakill have 51 species in common. Thus the fauna of Blacksod Bay shows greater resemblances to each of the other sub-areas than these do to each other. This is probably due to the high average suitability of the shores of Blacksod for maintaining a rich fauna, and the absence there of any large tracts of abnormal ground such as would only shelter a small and peculiar fauna.

The species peculiar to 'Clew Bay' consist principally either of those forms living in 10–30 fathoms on clean sand, such as *Achloë astericola*, *Sthenelais limicola*, *Lumbriconereis impatiens*, *Onuphis britannica*, *Hyalinoecia sicula*, &c., or of small forms living on the "Polygordius ground."

Notwithstanding the small numbers of species which are restricted to any one sub-area, the number which occur in all the sub-areas is surprisingly small, consisting, in fact, of only one, *Nereis Dumerilii*. 24 species occur in five out of the six sub-areas, and 40 species are common to the four sub-areas in which the most work was done, namely, Blacksod Bay, Clew Bay, Newport and Westport Bays, and Ballynakill Harbour.

A consideration of the geographical distribution of the Polychaeta is reserved for Part 67 of this series.

#### SUMMARY OF RESULTS.

Of the Archiannelida, two species of Polygordius, both probably widely spread on suitable ground, are added to the British fauna. The list of Polychaeta comprises 249 species and 2 varieties. This is by far the largest list of Polychaeta yet published from any limited area. The largest list hitherto published is that of the Baron de Saint-Joseph, who found 210 species at Dinard on the north-west coast of France. The fauna of this coast shows great resemblances to that of our west coast. At St. Vaast-la-Hougue, a favourite collecting-ground for the French naturalists, 165 species have been found. In the report on the fauna of the Plymouth district, published in 1904 by the Marine Biological Association, 144 species are listed. At Wood's Hole, Massachusetts, where the United States Bureau of Fisheries has a permanent Marine Laboratory, the report on the survey of the district, published last year, includes 135 species of Polychaeta.

The large number of species found in Clew Bay is accounted for partly by the richness of the fauna on our west coasts, and partly by the large amount of time and care which was devoted to collecting them.

It is impossible at present to institute comparisons of any value between

the Polychaete fauna of the east and west coasts of Ireland, for the reason that the east coast fauna has not yet been investigated with anything like the same degree of thoroughness as that of the west coast.

Two new genera, *Praegeria* and *Thelepides*, sixteen new species, and three new varieties are described, viz. :—

Exogone hebes, <i>var. hibernica var. nov.</i>	Mystides (Mesomystides) elongata
Sphaerosyllis bulbosa <i>sp. n.</i>	<i>sp. n.</i>
Pionosyllis serrata <i>sp. n.</i>	Paraonis lyra <i>sp. n.</i>
Streptosyllis Websteri <i>sp. n.</i>	Nerinides tridentata <i>sp. n.</i>
S. bidentata <i>sp. n.</i>	Aonides paucibranchiata <i>sp. n.</i>
Opisthodonta pterchaeta <i>sp. n.</i>	Chaetozoa alata <i>sp. n.</i>
Castalia fusca <i>var. hibernica var. nov.</i>	C. killariensis <i>sp. n.</i>
C. fusca <i>var.</i>	Thelepides collaris <i>gen. et sp. nov.</i>
Pholoë tuberculata <i>sp. n.</i>	Armandia flagellifera <i>sp. n.</i>
Praegeria remota <i>gen. et sp. nov.</i>	Chone filicaudata <i>sp. n.</i>

The generic name *Anaitis* has been changed to *Paranaitis*, and *Cirratulus norvegicus* McIntosh, has been changed to *C. Macintoshi*, nom. nov., the two original names having already been used for other forms.

The following thirty-six species have not previously been recorded from the British Marine Area :—

Sphaerosyllis erinaceus.	Polydora Giardi.
Syllis (Typosyllis) vittata.	Magelona rosea.
Syllis (Ehlersia) ferrugina.	Myriochele Heeri.
Autolytus brachycephala.	Macrochaeta clavicornis.
Autolytus punctatus.	Cirratulus norvegicus.
Microphthalmus Sczelkowi.	Cirratulus Macintoshi.
Oxydromus propinquus.	Proclea Graffi.
Chrysopetalum debile.	Amphitrite affinis.
Lacydonia miranda.	Polycirrus denticulatus.
Eulalia pusilla.	Micromaldane ornithochaeta.
Mystides bidentata.	Petaloproctus terricola.
Mystides borealis.	Asclerocheilus intermedius.
Mystides limbata.	Jasmineira caudata.
Marphysa fallax.	Chone Dueri.
Sphaerodorum Claparedii.	Euchone rubrocincta.
Sphaerodorum minutum.	Euchone rosea.
Aricidea Jeffreysii.	Spirorbis pusilloides.
Nerinides longirostris.	Spirorbis medius.

In addition, seventy-seven other species are here recorded from Irish waters for the first time.

The collections described in the present paper, including the types of the new species, have been deposited in the Irish National Museum.

## SYSTEMATIC PART.

Order **ARCHIANNELIDA.****Nerilla antennata** O. Schmidt.

1912. *Nerilla antennata* Goodrich, p. 397.

This species was found frequently in Blacksod Bay, living in weeds on the shore. It was also found in the sand of a *Zostera* bed, and dredged in 2 fms.

This species was until recently included amongst the Polychaeta. After an elaborate investigation of its anatomy, Goodrich concluded that the alleged resemblances to the Syllidae are merely superficial, and that the proper place for this species is with the Archiannelida, in which group it occupies a very central position.

*Habitat.*—BLACKSOD BAY—Found on the shore on 6 occasions. Dredged in 2 fms.

*Distribution.*—Dublin Bay; Plymouth; Faroë; Helgoland; Kiel; France; Naples.

**Polygordius lacteus** Schneider.

1887. *Polygordius lacteus* + *P. neapolitanus*. Fraipont, pp. 86, 89. 1907. *P. ponticus*. Salensky, p. 103. 1906. *P. lacteus*. Hempelmann, p. 527.

This species of *Polygordius* is very abundant in certain parts of Clew Bay, where the bottom consists of fine gravel, or of sand and shells. It occurs on similar ground in Dingle Bay.

Hempelmann has shown (1906) that *P. lacteus* of the North Sea is identical with *P. neapolitanus* of the Mediterranean, and adds that probably all the described European forms—with the exception of *P. appendiculatus* and *P. triestinus*, which are clearly distinct—will be shown on further examination to belong to the same species. This seems extremely likely, as the diagnostic characters used are vague, and probably erroneous.

*Polygordius* was dredged on 5 occasions in Clew Bay, on a bottom of gravel or shelly sand. Mature specimens were found in August.

*Habitat.*—CLEW BAY—Dredged on 5 occasions in 16–24 fms.

*Distribution.*—North Sea; Mediterranean; Black Sea.

**Polygordius appendiculatus** Fraipont.

1887. *Polygordius appendiculatus*. Fraipont, p. 88.

Numerous specimens of this species were dredged on two occasions in Clew Bay, in 24–27 fms. on a bottom of sand and shells. They were accompanied by numerous specimens of *P. lacteus* Schneider. From the latter species they are easily distinguished by the shorter and thinner body.

and by the characteristic pair of anal appendages. This species has not been found previously in British waters.

*Habitat.*—CLEW BAY—Dredged on 2 occasions, in 24–27 fms., south-west of Clare Island.

*Distribution.*—Helgoland ; Mediterranean (Villefranche, Naples, Messina).

Order **POLYCHAETA.**

Family **SYLLIDAE.**

**Exogone gemmifera** Pagenstecher.

1908. *E.g.* McIntosh, p. 151.

Mature specimens were found from May to October, sometimes swimming on the surface.

*Habitat.*—BLACKSOD BAY—Common in Laminaria roots. Dredged in 1 fathom. CLEW BAY—Dredged in Inishlyre Harbour on three occasions, in 2–5 fms. Dredged in the bay on five occasions, in 9–28 fms. BALLYNAKILL HARBOUR—Dredged on 11 occasions, in 2–8 fms. BOFIN HARBOUR—Dredged on 4 occasions.

*Distribution.*—British Isles ; France ; Madeira ; Mediterranean.

**Exogone hebes**, var. *hibernica*, var. nov.

Pl. I, figs. 1A–H.

1884. *Paedophylax hebes*. Webster and Benedict, p. 716. 1887. *P. h.* Webster and Benedict, p. 721.

The specimens from the west coast of Ireland show several small differences from the description and figures of Webster and Benedict. However, the points of agreement are so numerous that it seems preferable, for reasons given below, not to create a new species, but to give a full description and figures, with which the American specimens may be compared.

The largest specimen is 7 mm. long, and consists of 31 setigerous segments. The body is widest near the middle, and tapers gradually towards each end. It is creamy white in colour, without any pigment.

The head (figs. 1A, 1B) is separated from the palps and buccal segment by faintly marked grooves, and the length exceeds the width. It bears three tentacles, a long median subulate one, and two small laterals. The latter are about  $\frac{1}{3}$ th as long as the median tentacle. There are three pairs of eyes situated outside the lateral tentacles. In the type specimen, from Galway Bay, the eyes are very small, especially the anterior pair, and are arranged

in a triangle. The specimens from Clew Bay have also small eyes, but one from Lough Swilly has very large eyes, and the pigment on each side is continuous. The arrangement is, however, the same. On the outer side of the eyes are conspicuous ciliated nuchal organs. The palps are large and conical, completely fused on the dorsal side, but showing a shallow median groove on the ventral surface. The brain is elongated and bilobed.

The buccal segment is as large as the head, and has a pair of small bulbous tentacles tipped with stiff cilia. The first setigerous segment is normal, and the second is, as usual, without dorsal cirri.

The anal segment (fig. 1c) has two slender cirri and a median papilla.

The feet are very similar throughout the length of the body. The setigerous lobe (figs. 1D, 1E) is unequally bilobed, the dorsal portion containing the aciculum being much the smaller, and having a rounded papilla near the tip. The dorsal cirri are small and bulbous, with stiff cilia at the tip. The ventral cirri are cylindrical and much larger than the dorsal cirri. Each foot contains 4-10 compound setae in a fan-shaped series, with the tips pointing upwards. The shaft (1F, *b*) is slightly curved, swollen, and bevelled at the tip. The terminal pieces vary very little in size, the longer tips being in the centre of the series. They are coarsely toothed on the basal portion; and some distance below the tip is a broad tooth which gives them a bifid appearance. The tips of the setae are rather shorter in the two anterior segments than in those behind. There is a single spine ending in a swollen smooth tip (fig. 1F, *c*). In the type specimen a simple dorsal seta appears in the seventh foot and is joined in the posterior seven segments by a similar ventral seta. These setae are curved and pointed, with a conspicuous tooth below the tip (fig. 1F, *a*). The ventral seta is slightly thinner than the dorsal one. The disposition of these simple setae varies considerably. In a specimen from Clew Bay the dorsal seta is present in all the feet, and the ventral seta commences in the 10th foot. A similar arrangement is found in a specimen from Blacksod Bay.

The proboscis (fig. 1A) extends from the 2nd to the 5th setigerous segment. It is covered with dark pigment, except for a narrow strip in the 4th segment. The anterior part of the proventriculus is long and narrow, occupying nearly two segments, and has 25 rows of glands. There is a constriction between it and the next portion, which is muscular, without glands. Into its posterior end open two small ciliated sacs (fig. 1H). The proboscis has 10 soft papillae in front, and a conical tooth (fig. 1A, 1G). The specimen from Galway Bay is a female, with two eggs in each segment from the 10th to the 22nd, and was collected in May. Through the kindness of the authorities of the U. S. National Museum, I was able to examine several

specimens of *Paedophylax hebes*, named by Webster and Benedict. Unfortunately the specimens had been mounted in Canada balsam, so it was difficult to make out the minute structure of the setae. There is very close agreement in the structure of the head and tentacles, feet, setae, and alimentary canal. The compound setae, very imperfectly figured by Webster and Benedict, resemble those shown in fig. 1F, *b*. The chief differences between the Irish and American specimens are in the shape of the simple setae and the length of the various divisions of the alimentary canal. In the American specimens, a dorsal simple seta appears in the 10th–12th foot. It is, as figured by Webster and Benedict (1884, Pl. III, fig. 35), a strong, almost straight seta with a simple pointed tip. In a few of the posterior segments there is also a simple ventral seta with a bifid tip (*tom. cit.*, Pl. III, fig. 36). The Irish specimens differ in that all the simple setae are of this latter type, with bifid tips (fig. 1F, *a*). As stated above, their arrangement is subject to considerable variation. As regards the anterior end of the alimentary canal, there is very close agreement in the shape and proportions of the various parts, the American specimens, like the Irish, having a layer of dark pigment round the proboscis. The stomach in the American specimens is however, proportionally longer than in the Irish specimens, though there is some variation in this respect.

It seems advisable under the circumstances to recognize the differences between the two forms by regarding the Irish specimens as a variety of the American species.

I have found this species in Blacksod Bay, Clew Bay, Lough Swilly, Galway Bay, and in 78 fms. off the coast of Co. Kerry.

*Habitat.*—BLACKSOD BAY—A single specimen in the sand of a *Zostera* bed on the south shore of Elly Bay. CLEW BAY—Dredged in 24 fms., on a bottom of sand and shells. Dredged in Killary Hbr., in 7 fms.

*Distribution.*—Provincetown, Mass. ; Eastport, Maine.

#### ***Sphaerosyllis hystrix* Claparède.**

1908. *S. h.* McIntosh, p. 156.

Mature specimens were found from May to October, and were occasionally taken in the surface tow-net. Swimming bristles occur from the 10th or 11th setigerous segment to the tail. Some females had two eggs in each segment, others four ; and the eggs occupy the eighth to nineteenth setigerous segments. The packets of rhabdites commence in the fourth setigerous segment. A simple pointed seta is present dorsally in nearly all the feet, and this is joined in the posterior segments by a sinilar ventral seta.

*Habitat.*—BLACKSOD BAY—In weeds from the shore. Dredged on four occasions, in 1–5 fms. CLEW BAY—Dredged in 4 fms. in Inishlyre Harbour. Dredged in 9 fms., in *Laminaria* roots. Trawled in 13–16 fms., in *Laminaria* roots. BALLYNAKILL HARBOUR—Dredged on nine occasions, in 2–8 fms. BOFIN HARBOUR—Dredged in 1 fathom.

*Distribution.*—British Isles; France; North Sea?; Mediterranean; Black Sea.

***Sphaerosyllis erinaceus* Claparède.**

1886. *Sphaerosyllis erinaceus*. de Saint-Joseph, p. 207.

A single pelagic specimen of this species was taken at night in the surface tow-net in Ballynakill Harbour, in July. The genital products had been shed, and it was impossible to ascertain the sex of the specimen. Capillary setae begin on the 8th setigerous segment, and occur on 11 segments, being absent on the last setigerous segment. A simple dorsal curved seta is present in all the feet. The muscles specially developed for swimming are very large, and composed of extremely fine fibres. The anterior pair of eyes are mere pigment-specks, the middle pair are large, with lenses, whilst the posterior pair are intermediate in size, also with lenses. The palps are much smaller than those of *Sphaerosyllis hystrix*. Other characters which distinguish it from the latter species are the slender anal cirri, the absence of the capsule of rhabdites above each foot, the longer terminal pieces of the setae, and the longer proventriculus. There is also a striking difference in the spines which support the feet. In *S. hystrix* the spine at the tip is curved at right angles to the shaft like a golf-club. In the present species it is blunt or slightly swollen at the tip, but not bent.

*Habitat.*—Ballynakill Harbour. Surface tow-net at night.

*Distribution.*—Pas de Calais, Dinard, St. Vaast.

***Sphaerosyllis bulbosa* sp. n.**

Pls. I–II, figs. 2A–G.

Numerous specimens of this species have been taken at various points on the west coast of Ireland.

The body in preserved specimens is pale brown or creamy white. It is 5–6 mm. long, composed of 48 setigerous segments. The body is widest in the anterior third, and tapers gradually towards each end. No papillae are found on the body except on the parapodia and on the anal segment.

The head (fig. 2A) is oblong, with rounded corners, the width being double



the length. It has 4 large eyes, with reddish-brown pigment, provided with lenses.

The tentacles, tentacular cirri, and dorsal cirri resemble those of *Sphaerosyllis hystrix*, being flask-shaped with a globular base and cylindrical distal portion. The palps are long and broad, completely fused, with a faint dorsal furrow, and a broad and conspicuous ventral groove. Between the head and buccal segment in the lateral region are the conspicuous ciliated nuchal organs (fig. 2c). The buccal segment is quite distinctly separated from the head, though narrower than the subsequent segments. The anal segment (fig. 2B) bears a number of small papillae, and two long cylindrical cirri, with slightly swollen bases.

The parapodia are all similar. The dorsal cirri of the second setigerous segment are missing, as in all species of the genus *Exogone*. The setigerous lobe is short and bluntly rounded (fig. 2D), the dorsal cirri are flask-shaped, the ventral cirri small and cylindrical. The setae in each segment are very similar. In the dorsal region of the foot there is a stout simple seta (fig. 2E, *b*) slightly curved at the tip. It is usually present in all the feet, and is thicker in the middle of the body (fig. 2F, *b*). In the anterior segments it narrows suddenly, and is slightly hispid at the tip. In the terminal segments it is rather different in shape (fig. 2G), with a bolder curvature and gradually pointed tip. In a variable number of the posterior segments, in some cases only 4, in others as many as 20 segments, there is added a similar ventral simple seta. The compound setae are few in number, usually 4 in each foot, and have slightly curved shafts, bevelled at the tip, with a distinct shoulder (fig. 2E, *a*). The terminal pieces are all short, approximately equal in length, with a simple tip, and serrate edge. In the posterior segments, the tip of the shaft is more spinous than in the anterior segments (fig. 2F, *a*), and the serrate edge of the terminal pieces seems to have been worn away. The spines (figs. 2E, 2F, *c*) are stout, with a bulbous tip, terminated by a small papilla, differing greatly from the bent tip in *Sphaerosyllis hystrix*. The proboscis (fig. 2A) stretches through four segments. It has a bluntly rounded tooth in front, and a crown of soft papillae. The proventriculus occupies two segments, and has 14 rows of glands. Two small diverticula are attached to the front end of the intestine.

This species is characterized by the absence of papillae on the body, the large palps, the short terminal pieces of the setae, the structure of the simple setae and spines, and the well-developed buccal segment. It is closely allied to *Sphaerosyllis Claparèdei* Ehlers (Borstenwürmer, p. 252); but in the latter species the buccal segment is completely fused with the head, and there are no papillae on the feet or anal segment, besides other small differences.

I have also found this species in Dingle Bay.

*Habitat.*—CLEW BAY—Dredged in large numbers on three occasions, in 24–27 fms.

***Grubea clavata* (Claparède).**

1910. *G. c.* McIntosh, p. 235.

Mature males, full of sperm, and with swimming bristles, were found from May to September.

*Habitat.*—BLACKSOD BAY—Common in weeds from rock-pools, in sand of *Zostera* beds, and in *Laminaria* roots. Found on eight occasions. Dredged on seven occasions, in 1–5 fathoms. CLEW BAY—Taken in the trawl in 13–15 fms., 2½ miles east of Clare Island. Dredged in 4 fms., in Inishlyre Harbour. BALLYNAKILL HARBOUR—Dredged on seven occasions in 2–8 fathoms.

*Distribution.*—Co. Dublin: Torquay; France; Madeira; Mediterranean.

***Grubea pusilla* (Dujardin).**

1886. *G. p.* de St.-Joseph, p. 203.

A mature male of this species was found in March. In May, specimens with embryos attached were found.

*Habitat.*—BLACKSOD BAY—Found on the shore in weeds, on three occasions. Dredged in 1–2 fms., in *Laminaria* roots. CLEW BAY—In *Laminaria* roots trawled in 13–16 fms. Trawled in 3 fms., off the mouth of the harbour, Clare Isd. On south shore of Clare Isd., in *Lithothamnion*.

*Distribution.*—Malahide, Co. Dublin: France; Madeira; Mediterranean.

***Pionosyllis lamelligera* de Saint-Joseph.**

1886. *P. l.* de Saint-Joseph, p. 163.

This species is fairly abundant in Blacksod Bay and Clew Bay, especially in *Laminaria* roots. It is easily recognized by the dark black pigment stripes on the anterior segments, which remain for some time in preserved specimens. In the parapodia of the posterior segments there is a thick simple bifid seta ventrally, and a slender curved faintly bifid seta dorsally. Mature specimens were found in March.

*Habitat.*—BLACKSOD BAY—Found on nine occasions, always in *Laminaria* roots. Dredged in 1 fathom. CLEW BAY—Dredged on seven occasions, in 7–26 fms. BOFIN HARBOUR—Taken in 1–2½ fms.

*Distribution.*—Torquay; north coast of France.

***Pionosyllis serrata* sp n.**

Pls. III-IV, figs 5A-E.

The type of this new species was found on the shore of Blacksod Bay. A number of other specimens were also obtained in Bofin and Ballynakill Harbours.

The worms are small, 2.5-3 mm. in length, consisting of 27 setigerous segments. The preserved specimens are colourless. The parapodia project for a considerable distance, and in length almost equal the width of the trunk. The total width, not counting the setae, is .65 mm. at the broadest part, which is in the 10th segment. Behind this the body gradually grows narrower.

The head (fig. 5A) is rounded in front, straight behind. It has six eyes. The anterior pair are mere pigment spots, lying inside the bases of the lateral antennae. The middle pair are large and have the lenses directed forward. The posterior pair are nearer together and have the lenses pointing backwards. The median antenna rises from the dorsal side of the head, just in front of the eyes. The lateral antennae are shorter, and arise from the front margin of the head. The palps are placed ventrally and fused together at the base.

The buccal segment bears a pair of tentacular cirri on each side, the dorsal pair being the longer. The antennae and cirri, as well as all the dorsal cirri, are smooth and cylindrical, with no trace of the moniliform condition. They are jointed at the base. The buccal segment is not visible on the dorsal surface, being covered by the first setigerous segment. The dorsal cirri of the first setigerous segment are the longest appendages of the whole body, being .5 mm. in length. The setigerous lobes of this segment project forwards alongside the head. In the anterior and posterior segments the ventral cirri project beyond the setigerous lobes, but in the middle feet they are equal in length or slightly shorter.

The anal segment (fig. 5B) is rounded, without a median papilla, and bears two slender cylindrical cirri.

The anterior parapodia are provided with two aciculae and a fan-shaped series of 14 setae. The typical parapodium (fig. 5D) has a bluntly pointed setigerous lobe bearing a small dorsal papilla at the tip, so that it seems slightly bifid when seen from above. The ventral cirrus is broad and subulate.

There is a fan-shaped series of 16 setae with the tips facing upwards. The dorsal setae differ both in length and minute structure from the ventral setae. The tips of the shafts are swollen and bevelled, with a series of

conspicuous spines. In the dorsal setae the terminal pieces (fig. 5E, *b*) are long and bifid at the tip, with four or five long slender teeth near the proximal end. In this latter respect they greatly resemble the setae of the Hesionid *Castalia fusca* (Johnston). The upper tooth of the tip is boldly hooked, the lower tooth almost vertical. The ventral setae (fig. 5E, *c*) are short, not bifid at the tip, but simply hooked, and the margin is smooth or very faintly and indistinctly toothed. Of the 16 setae in each foot, 5-7 of the dorsal ones are bifid, the remainder being simple. The intermediate setae show signs of transition as regards both the bifid tips and the serrate margin.

There is a single stout aciculum in each foot, except in the anterior segment, where there are two, rapidly tapering towards the end, and terminating in a bulbous tip (fig. 5E, *a*).

In the six posterior segments there is a single long very slender simple seta in the dorsal part of the foot.

The proboscis (fig. 5C) is very short and broad, .21 mm. in length, occupying only two segments of the body. It is brown in colour with a smoothly rounded anterior margin, and with a large tooth on the dorsal side near the front. The proventriculus occupies three segments. It is .33 mm. in length, with 20 rows of glands. Mature specimens containing eggs and sperm, but without capillary setae, were found in September, in Bofin Harbour.

This species is very closely related to *Pionosyllis pulligera* (Krohn). The latter, which has been examined by Krohn, Claparède, Viguier, de Saint-Joseph, and Pierantoni, has not yet been satisfactorily described and figured; but it appears to differ from the present form in the following points:—

(1) The buccal segment is quite distinct, and is visible on the dorsal side, whereas in *P. serrata* it is covered by the first setigerous segment. (2) The proventriculus in *P. pulligera* occupies two segments, in *P. serrata* three segments. (3) The setae are very different in appearance. The spine also does not resemble the characteristic figure given by Viguier (1884, Pl. V., fig. 53). (4) In *P. pulligera* the lateral antennae are relatively much shorter than in *P. serrata*.

*Habitat.*—BLACKSOD BAY—A single specimen on the shore. BOFIN HARBOUR—Taken on three occasions, in 1-4 fms. BALLYNAKILL HARBOUR—Taken on two occasions, in 2-8 fms. 1½ miles off Cleggan Head, in mid-water tow-net at 7 fms. 5 miles N.W. by N. of Inishturk, in surface tow-net at night.

**Streptosyllis** Webster and Benedict.

This genus was created by Webster and Benedict (1884, p. 711), for a species, *S. arenae*, found at Provincetown, Mass.

The same observers described a second species, *S. varians* (1887, p. 718), from Eastport, Maine. The genus was defined in 1884, from observations on only a single species, as follows:—

“Antennae, three; tentacular cirri, four; dorsal cirri, partly smooth, partly articulated; oesophagus unarmed, with a circle of papillae at its anterior end; stomach passing directly into the intestines; setae of two kinds, simple and compound, both kinds covered by a membrane externally (stem of compound setae terminating in four teeth or lobes); palpi united for most of their length, turned downward so as not to be visible from above.”

In 1895 de Saint-Joseph (p. 192) found a pelagic individual belonging to this genus, and referred it to the *S. varians* of Webster and Benedict. There seems little doubt, however, that his specimen belongs to a distinct species as it exhibits several notable distinctions, the chief being (1) the palps are ventral, and invisible from the dorsal side, whereas those of *S. varians* are exceptionally prominent, and project beyond the front of the head; (2) capillary setae commence on the 12th segment, in *S. varians* on the 21st; (3) the proboscis occupies segments 1-4, the proventriculus the 5th to the 8th segments, whilst in *S. varians*, the proboscis occupies 6 segments, and the proventriculus 8 segments. These differences are sufficient to justify the creation of a new species for the French specimen; but, as explained below (p. 27), it may be identical with *S. Websteri* sp. n., to which it is evidently closely allied.

The large thick spines are present only in segments 1-5, in *S. varians* W. and B., in segments 1-23.<sup>1</sup>

It is now possible to define the genus *Streptosyllis* with greater accuracy:—

Syllidae with palps fused at the base, filiform at the tip; tentacular cirri two pairs; cirri smooth or very indistinctly moniliform; pharynx unarmed; feet in a variable number of anterior segments with thicker spines, shorter and thicker setae, with shorter terminal pieces, than in the subsequent segments; simple seta dorsally; tips of the shafts of the setae dividing into several teeth or lobes; ventral cirri long in posterior segments; reproduction direct, with pelagic stage.

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<sup>1</sup> I have examined the types of this species now in the U.S. National Museum and in Union College.

The known species may be separated as follows :—

Compound setae with winged tips = *S. arenae* Webster and Benedict.

Compound setae without winged tips = *a*.

*a* { Thick spines present in 23 anterior segments = *S. varians* Webster  
and Benedict.

{ Thick spines present in 5-6 anterior segments = *b*.

*b* { Thick spines in setigerous segments 2-5 = *c*.

{ Thick spines in setigerous segments 2-6 = *S. bidentata* sp. n.

*c* { Spine in 1st setigerous segment very thick = *S. "variens"* de St.-Joseph.

{ Spine in 1st setigerous segment slender = *S. Websteri* sp. n.

The genus *Syllides* is very close to *Streptosyllis*, differing only in the apparent absence of any differentiation between the anterior and posterior parapodia. In *Syllides Verrilli* Moore (1907, p. 448), the end of the shaft of the seta approaches the condition characteristic of *Streptosyllis*.

#### ***Streptosyllis Websteri* sp. n.**

Pl. II, figs. 3A-F.

This species, which is named after one of the American naturalists who created the genus *Streptosyllis*, was taken on several occasions in the harbours of Bofin and Ballynakill. All the specimens were sexually mature, provided with swimming setae, and were taken in the tow-net, usually at the surface, at night. No specimens belonging to this species have been yet found in the bottom fauna, and consequently their habitat is not known.

The worms are 3.5-5 mm. long, consisting of 32-49 setigerous segments.

The head (fig. 3A) is broader behind than in front, with four large circular reddish-brown eyes provided with lenses. The median antenna is missing. The lateral antennae, rising from the front of the head, are smooth and cylindrical, slightly narrowed at the base. The palps are small and filiform, ventral in position. Between the head and the buccal segment on each side are the ciliated nuchal organs. The buccal segment bears on each side a pair of smooth tentacular cirri, longer than the lateral tentacles, but shorter than the anterior dorsal cirri. All the cirri are filled with rounded faintly yellow granules. The anal segment (fig. 3B) bears two short lateral cirri, and a long median one.

The feet are prominent. The anterior region of the body consists of 5 setigerous segments, as in the "*S. varians*" of de Saint-Joseph, but differs from that species in that the spine in the first segment is thin, resembling that in the posterior segments. In segments 2-5 the spine is very large and thick (fig. 3C).

The third foot (fig. 3C) has a blunt setigerous lobe, pierced at the dorsal angle by a thick spine, 7-10 compound setae, of which 1 or 2 have long tips and 6-8 have short tips. A single simple seta is present in the dorsal region of the foot. The dorsal cirrus is long, the ventral cirrus short and thick. The 16th foot (fig. 3D) has proportionally a much smaller setigerous lobe, with a simple dorsal seta, slender spine, and six compound setae with long tips. The ventral cirrus is considerably longer than in the anterior segments.

The simple seta is present in all segments. In the anterior segments, it is slightly curved, serrate near the tip, and the latter is not winged (fig. 3E, *a*). Further behind (fig. 3F, *a*), a delicate wing envelops the tip of the seta. The setae in segments 1-5 are much shorter and thicker than those in the other segments. One or two of them have slender serrate tips with bluntly rounded points (fig. 3E, *b*). The remaining setae, 6 or 8 in number, have short, thick terminal pieces (fig. 3E, *c*). All these compound setae have swollen ends to the shafts, which are produced into a number of short rounded lobes.

Behind the 5th segment the setae are much thinner. The terminal pieces differ only slightly in size (fig. 3F, *b, c*), and are serrate, with simple rounded tips. The end of the shaft is serrate along one edge, and is produced into 4 sharp lobes. The simple seta is toothed along the convex side, and the tip has a delicate wing (fig. 3F, *a*). The spine is slender, with a bulbous tip (fig. 3F, *c*), 1 or 2 in each foot.

Capillary setae commence in the 11th setigerous segment, and are present in all the following segments except one or two at the posterior end. The length of the capillary setae exceeds the width of the body.

The ventral cirri are much longer in the posterior segments than in the anterior.

The proboscis (fig. 3A) is straight and broad, dark reddish-brown in colour, occupying 3-4 segments, and is unarmed.

The proventriculus occupies 4-5 segments, and has about 50 rows of glands.

All the specimens obtained were mature males, with the body-cavity full of sperm. They were taken in April, September, and October.

This species seems to be most closely allied to the *Streptosyllis varians* of de Saint-Joseph. It resembles this species in having 5 setigerous segments in the anterior region, and in having simple tips to the compound setae. It differs in having a slender spine in the first setigerous segment, in the shape of the terminal pieces of the anterior setae, in the presence of the simple dorsal setae in all segments, in having 3 anal cirri, and in other details.

Further research, however, may show that the two species are identical. As stated above, the *Streptosyllis varians* of de Saint-Joseph seems to be different from that of Webster and Benedict.

*Habitat.*—BALLYNAKILL HARBOUR—Bottom tow-net, in 2-6 fms. BOFIN HARBOUR—Taken on two occasions in the tow-net, soundings 1-4 fms.

***Streptosyllis bidentata* sp. n.**

Pl. III, figs 4A-F.

A number of fragmentary specimens of this new species were dredged in 24 fathoms in Clew Bay, on a bottom of sand and shells, associated with a very peculiar microfauna.

The longest specimen is 2.5 mm., composed of 23 segments. It is complete posteriorly, except for the fact that the anal segment is damaged. This specimen is an immature female, with developing eggs in the body-cavity. Another specimen, with the posterior part missing, had 31 setigerous segments.

The body is widest in the region of the proventriculus, tapering very slightly towards the head, much more so towards the tail.

Most of the appendages are missing, but those which remain are smooth and cylindrical, with no trace of moniliform articulations.

The head (fig. 4A) is broad, and the width greatly exceeds the length. There are four large reddish-brown eyes, with lenses. The appendages of the head are missing, but the base of the medium tentacle is seen between the anterior pair of eyes. The palps lie on the ventral surface (fig. 4B), and are invisible from above. Their basal portions are closely fused with the ventral side of the head, and they terminate in slender papillae. Between the head and the buccal segment are the ciliated nuchal organs. The buccal segment is quite distinct from the head, and bears two pairs of smooth cirri. There is a patch of cilia on the dorsum above each foot (fig. 4A). The anal region in all the specimens is more or less imperfect; but there seem to be a pair of short lateral cirri and a short slender median cirrus. The feet are prominent, and the anterior six segments differ from those which succeed them. The first setigerous segment contains a simple dorsal seta, 8 compound setae, of which 7 have short tips and one a long tip, and a slender spine with a swollen tip. The 2nd to 6th feet have each a simple dorsal seta, 5-8 compound setae, of which 3-6 have short tips and 2 long tips, and one or two very thick spines with large swollen tips. Apart from these differences in detail the setae of the 6 anterior segments are similar, and those of the third segment may be described as typical of the others.

The setigerous lobe (fig. 4C) is blunt, and is supported by one or two very



thick spines with swollen truncated tips (fig. 4E, *a*). The dorsal simple seta is curved at the distal end, where it terminates in a point which is delicately winged, and serrated on the convex side (fig. 4E, *b*). The compound setae are short and thick, the swollen tips of the shafts ending in 3 or 4 blunt teeth. The terminal pieces are distinctly bifid at the tip, 7 being short and 2 long (fig. 4E, *c* and *d*). The edge of the long tips is coarsely serrated. In the succeeding segments the distinction between the setae with short and long terminal pieces disappears, and there is a gradual transition from the long dorsal to the short ventral tips. Taking the 16th foot as typical of this region (fig. 4D), it is seen that the setigerous lobe is more elongate, the spine is very slender (fig. 4F, *a*), resembling that of the first segment, and less than half as thick as the spines in segments 2-6. The dorsal simple seta is similar, except that the delicate wing at the tip is cup-shaped; but this may be due to abrasion (fig. 4F, *b*). The compound setae are much longer and thinner (fig. 4F, *c* and *d*), with distinctly bifid terminal pieces and serrated edges, the length of the terminal pieces decreasing from above downwards. In the last 3 or 4 segments there is in addition a very slender simple seta in the ventral part of the foot. In the dorsal region of the middle and posterior feet there are two very slender spines (fig. 4D). These may be the forerunners of the swimming setae which develop at maturity.

The dorsal cirri of all the feet are long and cylindrical, with no indications of the moniliform condition. The ventral cirri are also very long, increasing in size from in front backwards. They are placed towards the extremity of the setigerous lobes, and extend outwards beyond the setae. The great length of the ventral cirri seems to be a character of the genus *Streptosyllis*.

The pharynx (fig. 4A) is short, straight, and broad, without a tooth, extending through 3 segments. It has 8 papillae in front. The proventriculus is massive, extending through 6 segments, and has 48 rows of glands.

None of the specimens are mature; but an immature female has eggs beginning in the 12th segment.

Webster and Benedict do not state the number of segments in the anterior region of the body. The present species differs from *S. arenae* in many respects, especially in the shape of the setae, which have simple winged tips. *S. varians* differs from the present species in the length of the proboscis and proventriculus, in having some of the dorsal cirri moniliform, in the larger palps, and in the minute structure of the setae, and in the much greater number of anterior segments with thick spines. From *S. Websteri* this species differs in having six segments in the anterior region, as against five, and in the structure of the setae.

*Habitat.*—CLEW BAY—Dredged in 24 fms., on a bottom of sand and shells.

**Opisthodonta** Langerhans.

This genus was created by Langerhans (1879, p. 547) to include a species found at Madeira, with separate palps, smooth unjointed cirri, and a single tooth in the posterior part of the pharynx. It differed from the genus *Pionosyllis* in the position of the tooth in the pharynx. Malaquin (1893, p. 69) maintained the genus, and stated in a foot-note that he had examined a species belonging to this genus from the Mediterranean, at Banyuls-sur-Mer, which differed from that of Langerhans. So far as I know, it has not yet been described. The species from Clew Bay differs considerably in the structure of the spines and setae from *O. morena* Langerhans, and for the present no generic characters can be based on these characters till the Madeira species has been more fully described. It was an immature specimen; but the Clew Bay specimen confirms the opinion one would derive from the systematic relations of the genus, that reproduction is direct, the worms at maturity developing swimming setae and becoming pelagic.

**Opisthodonta pterochaeta** sp. n.Pl. IV, figs. 6A-G.<sup>1</sup>

The anterior end only of a single specimen was available for this description. It belongs to a mature male, with swimming setae developed, and was taken in October in the mid-water tow-net at 9 fathoms, in soundings of 18 fathoms, one mile north of Cleggan Head.

This fragment is 6 mm. long, and consists of 49 setigerous segments. At its widest part, it is 7 mm. wide; and it tapers considerably towards the anterior end. The head (Pl. IV, fig. 6B) is rounded in front, with a straight posterior margin. It bears four large reddish-brown eyes, with lenses. The median tentacle, which is missing, rises between the anterior eyes. The lateral tentacles rise near the front of the head. All these appendages and the other cirri of the body are smooth and cylindrical, with no trace of articulations. The palps are of medium size, free distally, but united at the base, with rounded angles. The buccal segment is distinct dorsally, though slightly narrower than the subsequent segments, and bears two pairs of tentacular cirri. Of these the ventral pair are rather longer than the lateral tentacles, whilst the dorsal pair are twice as long.

The pharynx (Pl. IV, fig. 6A) is very long, 1.4 mm. in length, dark-brown in colour, and stretching through 16 segments. Just behind its middle point

<sup>1</sup> The figures for this species and for *Microphthalmus Sczelzowi*, which by error have both been numbered 6, may be distinguished by the number of the plate.

it bears a sharp lateral tooth (Pl. IV, figs. 6A, 6E). The proventriculus is long and cylindrical, equal in length to the pharynx, and occupying 11 segments. It has about 45 rows of glands, which are joined by wavy lines. Behind it passes into the broad intestine, which has two diverticula in front, closely pressed against the posterior part of the proventriculus.

The anterior parapodia (Pl. IV, fig. 6C) have bluntly rounded, bifid setigerous lobes. The dorsal cirrus is long and cylindrical, indistinctly jointed at the base. The ventral cirrus is massive, swollen at the base, and projects beyond the setigerous lobe. The thirteenth setigerous segment contained a fan-shaped series of 18 setae, all very similar in shape. The shafts are slightly curved, swollen and bevelled at the tip, with a distinct shoulder, and a series of spines on the upper edge. The terminal pieces do not differ much in size, those in the middle of the foot being slightly longer than the others. They end in a simple boldly curved tip (Pl. IV, fig. 6F, *b*) and the whole, except the extreme point, is enveloped in a delicate sheath. Fig. 6F, *c* shows one of the terminal pieces in side-view. The spines are large and thick, with peculiarly swollen truncated tips (Pl. IV, figs. 6C, 6F, *a*). The anterior 15 segments have these large spines. They gradually increase in size up to the 10th segment. From the 16th segment onwards they are replaced by slender spines, one in each foot, of a similar shape, except for the fact that the swollen tip gradually becomes less prominent; and in the 23rd segment they are only bluntly pointed (Pl. IV, fig. 6G, *a*). Segments 1-13 have two spines in each foot, and the remaining segments a single spine in each foot. In the 24th segment a simple dorsal seta appears (Pl. IV, fig. 6G, *c*), and is present in the remaining feet. It is curved and winged at the distal end, indistinctly bifid at the tip, and minutely serrate on the convex margin.

Capillary swimming setae commence on the 31st segment, though the feet are modified and dorsal spines present on the 29th foot. In the middle region of the body, the foot (Pl. IV, fig. 6D) is biramous, the dorsal branch having a bunch of long capillary setae embedded in a shallow sac in the foot, and a slender spine with a bluntly rounded tip. The dorsal and ventral cirri resemble those in the anterior feet, but are smaller in proportion. The ventral division of the foot bears a single dorsal simple winged seta, 4 or 5 compound setae, and a simple ventral seta (Pl. IV, fig. 6G, *d*) differing from the dorsal one in the absence of the wing and serrations. The spine is similar to that of the dorsal division of the foot. The compound setae resemble closely those in the anterior segments, though the terminal hook is more boldly defined.

This species agrees with *Opisthodonta morena* Langerhans, in the position of the tooth in the pharynx, and the smooth tentacles and cirri, but in other

respects differs widely. The setae are of quite a different type. The structure of the simple winged setae and the thick spines of the anterior segments show close relationship to the genus *Streptosyllis*, which has, however, an unarmed proboscis.

*Habitat.*—About 1 mile N.N.E. of Cleggan Head, Co. Galway. Taken in the mid-water tow-net at 9 fathoms, soundings 18 fms.

***Eusyllis tubifex* (Gosse).**

1867. *Eusyllis Blomstrandi*. Malmgren, p. 40. 1886. *E. B.* de St.-Joseph p. 171. 1908. *E. t.* + *E. B.* McIntosh, pp. 174, 176.

This species occurs in immense numbers amongst weeds and on *Laminaria* roots. It may be found in rock-pools in the upper littoral zone. The delicate tubes in which it lives are often found on the blades and stems of *Laminaria* in vast numbers.

Mature forms of this species were found from March to May. In the males, the swimming setae begin on the 17th setigerous segment.

In the feet of the posterior segments, there is a simple seta both dorsally and ventrally, the latter being bifid.

I have been unable to distinguish between *E. tubifex* and *E. Blomstrandi*. Elwes records *E. tubifex* as common on the south coast of England, whilst de St.-Joseph found *E. Blomstrandi* on the north coast of France. The only investigator recording both species is McIntosh (tom. cit.); and his descriptions and figures afford no evidence that the two species are distinct. A specimen in the Irish National Museum, labelled *Eusyllis Blomstrandi* by McIntosh, differs in no way from the common form.

*Habitat.*—BLACKSOD BAY—Taken on the shore on eleven occasions.

Dredged on five occasions in 3–6 fathoms. CLEW BAY—

Dredged on twenty-three occasions, in 3–28 fathoms.

BALLYNAKILL HARBOUR—Dredged on seven occasions, in

2–9 fms. BOFIN HARBOUR—Taken in the surface tow-net.

*Distribution.*—British Isles; Spitzbergen; Nova Zembla; North Sea; France; Madeira; east coast of Canada; Mediterranean.

***Odontosyllis gibba* Claparède.**

1908. *O. g.* McIntosh, p. 183.

This species is extremely abundant throughout the district, and seems to have no preference for any particular habitat. When irritated it shows a brilliant green phosphorescence, which seems to be located in the parapodia. It ranges up to half tide-mark.

*Habitat.*—BLACKSOD BAY—Shore, under stones, and in Laminaria roots, on nine occasions. Dredged on six occasions in 1-8 fathoms. CLEW BAY—Dredged on nine occasions in 2-24 fathoms. BALLYNAKILL HARBOUR—Dredged on twenty-five occasions. BOFIN HARBOUR—Dredged on seven occasions.

*Distribution.*—British Isles; France; Madeira; Mediterranean.

**Odontosyllis ctenostoma** Claparède.

1908. *O. c.* McIntosh, p. 182.

Very abundant throughout the area, living under stones and in Laminaria roots. Mature specimens were found in August and September, with swimming setae in the 24th-42nd feet.

*Habitat.*—BLACKSOD BAY—Found on shore, on twenty occasions. Dredged in 1 fathom. CLEW BAY—Dredged on two occasions, in 4-7 fms. BALLYNAKILL HARBOUR—Dredged on two occasions in 1-8 fms. BOFIN HARBOUR—Dredged on three occasions.

*Distribution.*—Co. Dublin; south coast of England; France; Madeira; Mediterranean.

**Trypanosyllis zebra** (Grube).

1908. *T. z.* McIntosh, p. 169.

Free-swimming Tetraglene buds were taken in the surface tow-net at Bofin Harbour in May and September. In some specimens the 2nd segment has a bunch of short swimming setae. De St.-Joseph (1886, p. 183) states that these setae commence on the 3rd segment.

*Habitat.*—BLACKSOD BAY—On shore, under stones, on 9 occasions. CLEW BAY—Dredged on 4 occasions, in 7-16 fms., usually in Laminaria roots. BOFIN HARBOUR—Taken on 4 occasions, in the surface tow-net.

*Distribution.*—South coast of England; Channel Isles; France; Madeira; Mediterranean.

**Trypanosyllis coeliaca** Claparède.

1886. *T. c.* de St.-Joseph, p. 184. 1910. *T. c.* McIntosh, p. 240.

This species is very rare in the district, only two individuals being obtained.

*Habitat.*—CLEW BAY—Found on two occasions in Laminaria roots; dredged in 9-16 fms.

*Distribution.*—Torquay; France; Madeira; western Mediterranean.

**Eurysyllis paradoxa** (Claparède).

1910. *E. p.* McIntosh, p. 241.

This species seems to be widely spread on the Irish coast, though it has not previously been recorded.

*Habitat.*—BLACKSOD BAY—Taken on shore on 4 occasions, in Laminaria roots. CLEW BAY—Taken in surface tow-net in Killary Harbour. Dredged in 9–11 fms., in Laminaria roots.

*Distribution.*—Torquay; France; Kattegat; Madeira; Mediterranean.

**Syllis (Typosyllis) armillaris** (Müller).

1908. *S. a.* McIntosh, p. 188. 1886. *Syllis (Typosyllis) alternosetosa*. de St.-Joseph, p. 150. 1910. *Pionosyllis alternosetosa*. McIntosh, p. 238. 1913. *S. a.* McIntosh, p. 83.

McIntosh has recently expressed the opinion that these two species are identical (1913, p. 83). I have examined specimens of the so-called *S. alternosetosa* from Plymouth, Torquay, and the deeper parts of the English Channel, and finally de St.-Joseph's types in the Paris Museum, and I am able to confirm McIntosh's opinion.

This species is one of the most abundant on the Irish coasts.

*Habitat.*—BLACKSOD BAY—On the shore under stones and in Laminaria roots, on 19 occasions. Dredged on 6 occasions, in 1–6 fms. CLEW BAY—Shores of Clare Island. Dredged on 11 occasions, in 5–28 fms. BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution.*—British Isles; Arctic seas; Scandinavia; North Sea; Behring's Sea; Madeira; France.

**Syllis (Typosyllis) hyalina** Grube.

1908. *Pionosyllis hyalina*. McIntosh, p. 166.

This species is very closely related to *Syllis prolifera* Krohn, the only points which distinguish it being the shorter cirri, and the presence of simple pointed setae in the dorsal and ventral regions of the posterior feet, the corresponding setae in *S. prolifera* being bifid. These distinctions are not of much weight, as a variety of *S. prolifera* is of frequent occurrence, which has very short cirri, with few articulations.

*Habitat.*—BLACKSOD BAY—Dredged in 4–6 fms.

*Distribution.*—Co. Dublin; Plymouth; Norway; Madeira; Mediterranean.

**Syllis (Typosyllis) prolifera** Krohn.

1908. *Pionosyllis prolifera*. McIntosh, p. 161.

This species is very abundant throughout the district. Stolons with male buds attached were found in Clew Bay in May, and Chaetosyllis buds were taken at the surface on several occasions in June and August at Ballynakill and Bofin.

*Habitat*.—BLACKSOD BAY—Common on shore, and in Laminaria roots.

Taken on ten occasions. Dredged on five occasions, in

1–8 fms. CLEW BAY—Shore of Clare Isd., at Portariff.

Dredged on eight occasions, in 4–17 fms. BALLYNAKILL

HARBOUR—Taken on five occasions, in 0–8 fms. BOFIN

HARBOUR—Taken in surface tow-net.

*Distribution*.—Great Britain; Spitzbergen; Madeira; France; Mediterranean; South Africa.

**Syllis (Typosyllis) Krohnii** Ehlers.

1908. *S. K.* McIntosh, p. 192.

This is one of the rarest of the Syllidae in our district, only 3 specimens having been obtained.

*Habitat*.—BLACKSOD BAY—One specimen in weeds from shore of Carrigeen-

more. CLEW BAY—Dredged in 7 fms. BALLYNAKILL

HARBOUR—Dredged in 1–3 fms.

*Distribution*.—Great Britain; France; Madeira; Canaries; Mediterranean.

**Syllis (Typosyllis) vittata** Grube.

1864. *Syllis aurita*. Claparède, p. 539. 1874. *Syllis vittata*. Maren-

zeller, p. 35. 1875. *Syllis aurita*. Marion and Bobretzky, p. 17.

1908. *Syllis Buskii*. McIntosh, p. 206.

A large number of specimens of this species were dredged at one station in Clew Bay. The characteristic purple or brown transverse bands on the dorsum are only faintly indicated in the preserved specimens. In the structure of the elongate palps, cirri, setae, etc., they agree closely with the descriptions of *S. vittata* and *S. aurita*, which are now regarded as the same species. There is nothing to distinguish *Syllis Buskii* of McIntosh from this species, though no information is given as to the colour. The oesophagus and proventriculus are very long, the former extending to the 13th segment, the latter to the 19th, agreeing with Marenzeller's description. The proventriculus had 45 rows of glands. In small specimens the bifid nature of the setae can be plainly seen, especially in the posterior segments; but

in fully grown animals the slender lower tooth is absent, as Marenzeller figures it, or only slightly indicated, as McIntosh found it. In the posterior feet there are a very large bluntly rounded spine, a simple dorsal seta, and a curved bifid ventral seta. The first segment is narrow, and slightly overlaps the head, as was pointed out by Marion and Bobretzky. The anal cirri have 20 joints, and there is a slender smooth median cirrus between them. The dorsal cirri are alternately long and short. This species is very close to *S. variegata* Grube, but differs in the colour pattern, the structure of the setae, and several other points.

*Habitat.*—CLEW BAY—Dredged in 24 fms.

*Distribution.*—Guernsey and Herm; Azores; north coast of Mediterranean from Port Vendres to Trieste.

***Syllis (Typosyllis) variegata* Grube.**

1875. *Syllis variegata*. Marenzeller, p. 19.

This species is easily recognized by the characteristic colouring on the dorsum of the anterior segments. The colour tends to fade in preserved specimens. It is very closely allied to *Syllis prolifera*, but not identical with it, as McIntosh seems to think (1908, p. 161). The chief differences are—(1) the colour pattern is quite different; (2) the tips of the setae are not so boldly bifid, and the edge is more serrate; (3) the spines in the posterior feet are very thick, and bluntly pointed, especially in small or young specimens.

The dorsal cirri are alternately long and short. In the posterior 20 feet there is a simple dorsal seta which is slightly bifid, and hispid near the tip. This is joined in the last 12 segments by a smooth boldly bifid simple ventral seta.

A female pelagic bud of this species was taken in the tow-net, in mid-water, in October. It is of the "Chaetosyllis" type. The head is small, with a pair of short, smooth tentacles, and there are no eyes. The 1st segment is normal. The 2nd to the 27th segments are provided with tufts of long swimming setae. There are 35 setigerous segments altogether. The ventral cirrus is very much elongated, especially in the posterior segments, the spine is extremely large, and the dorsal cirri are less distinctly articulated than in the asexual stock. The body is full of eggs, except in the 1st and posterior 8 segments.

*Habitat.*—CLEW BAY—Dredged on two occasions, in 13–24 fms.  $1\frac{1}{2}$  mile off Cleggan Head, in the middle tow-net at 7 fms., a female bud.

*Distribution.*—English Channel; France; Madeira; Azores; Mediterranean; Red Sea.



**Syllis (Ehlersia) cornuta** Rathke.

1908. *S. c.* McIntosh, p. 200.

This species usually lives in empty shells, which it shares with hermit crabs or Gephyrea like *Phascolion strombi* or *Aspidosiphon Mülleri*. I also found one sharing a tube with *Pectinaria auricoma*.

Mature specimens were found in August. In September a posterior part of the body of a specimen was taken in the surface tow-net in Bofin Harbour, which may represent a bud of this species. There is no sign of cephalization, except that the 1st setigerous segment has no swimming setae, but only a spine in the dorsal region of the foot. The alimentary canal is degenerate, and the muscular system well-developed.

In the 11 posterior segments there is a simple bifid seta present in both the dorsal and ventral region of each foot.

The setae with short tips are distinctly bifid, and those with elongate tips are longer and slenderer than is usual in *S. cornuta*. The setae, as a whole, show more resemblance to those of *Ehlersia ferrugina*, Langerhans (vide p. 38), than to *S. cornuta*, but the dorsal cirri are distinctly moniliform. The changes which take place in the setae on attaining maturity have not yet been adequately studied. On the whole, I think this bud belongs to *S. cornuta*. Similar buds without heads have been noted in *Syllis (Haptosyllis) spongicola* Grube, and *Syllis (Ehlersia) rosea* Langerhans.

*Habitat*.—CLEW BAY—Dredged on 4 occasions in 10–24 fms. BOFIN HARBOUR—Bud in surface tow-net. Dredged in 15–16 fms., in shell of *Trivia europaea* with *Phascolion strombi*.

*Distribution*.—Great Britain; Spitzbergen; Scandinavia; France; Madeira; Mediterranean; South Africa.

**Syllis (Ehlersia) simplex** Langerhans.

1879. *Ehlersia (Syllis) simplex*. Langerhans, p. 538. 1881. *E. s.* Langerhans, p. 104. 1886. *Syllis (Ehlersia) aesthetica*. de St.-Joseph, p. 156. 1908. *Syllis Cunninghami*. McIntosh, p. 195.

This species is characterized by the presence in certain of the segments of one or two dorsal setae much thicker and stronger than the rest. The tips of the setae are simple, and the edge is conspicuously spinous. The terminal pieces of the thicker setae are frequently absent. This form seems to have been first described by Langerhans, who found it at Madeira and the Canaries in 1879 and 1881. In 1886 de St.-Joseph described it as a new species, without comparing it to *Ehlersia simplex*. De St.-Joseph's specimen was larger than those of Langerhans, and the cirri had more segments, but in the structure

and position of the thick setae the two forms agree closely. In 1908 McIntosh described *Syllis Cunninghami*, a species characterized by the presence in each foot of two setae thicker than the rest. He did not mention the two species already described, characterized by this peculiar arrangement, and his description is very inadequate, but there seems no reason to doubt that his species is identical with *Ehlersia simplex* and *Syllis aethetica*.

*Habitat*.—CLEW BAY—A single specimen in Lithothamnion on the south shore of Clare Island.

*Distribution*.—Guernsey; Dinard; Madeira; Canaries.

#### *Syllis (Ehlersia) ferrugina* (Langerhans).

1881. *Ehlersia ferrugina*. Langerhans, p. 104.

A single specimen of this worm was found in Laminaria roots in Blacksod Bay. It agrees with the description of Langerhans in the following points:—(1) The number of joints in the tentacles and anterior cirri; (2) the dorsal cirri alternate in length, and behind the first few segments they are smooth, and not moniliform; (3) the feet contain two kinds of setae, some having short distinctly bidentate tips, others very long slender pointed tips. The chief difference lies in the fact that the distinction between the two kinds of setae in the anterior segments of Langerhans' specimens is not by any means so marked as it is in segments further behind. In the Blacksod specimen the distinction between the two kinds of setae is equally marked in all the feet. The anterior cirri are also not so distinctly moniliform. It is at present difficult to say whether these differences have specific value; and until further specimens are available, it seems better to regard the Blacksod form as a variety of Langerhans' species, which has only been found in the Canaries.

The present specimen, of which only the anterior 27 segments were obtained, is a mature female and was found in March. On the 26th segment there is a long bunch of swimming setae. There is no sign that a bud is forming; and it is possible that the species reproduces directly. If this is the case, it probably belongs to the genus *Pionosyllis*, with which it has great affinities, and the smooth dorsal cirri lend strong support to this opinion. The setae closely resemble those of *Pionosyllis lamelligera* de St.-Joseph, from which species, however, it differs in the absence of lamellate ventral cirri on the first setigerous segment, the structure of the spines, etc. It differs from *Syllis cornuta* in having smooth dorsal cirri and in the structure of the setae. It is possible that the acephalous bud described under *Syllis cornuta* (p. 37) may belong to the present species.

*Habitat.*—BLACKSOD BAY—A single specimen in Laminaria roots from the north side of Feorinyeeo Bay.

*Distribution.*—Canary Islands.

**Syllis (Syllis) gracilis** Grube.

1908. *S. g.* McIntosh, p. 203.

A female bud of this species was found in September in Blacksod Bay.

A specimen was found in Blacksod Bay which, from a portion of the mid-body having only the two thick bifurcate setae in the parapodia, had regenerated a new head and tail.

*Habitat.*—BLACKSOD BAY—Found on shore on 11 occasions, usually under stones. CLEW BAY—Common on the south and east shores of Clare Island, under stones and in Lithothamnion. This is essentially a littoral form in the district.

*Distribution.*—British Isles; France; Madeira; Canaries; Azores; Mediterranean; Black Sea; Red Sea; Persian Gulf; Ceylon; West Indies; Virginia.

**Syllis (Haplosyllis) spongicola** Grube.

1908. *S. s.* McIntosh, p. 197.

In Blacksod Bay, this species is very common in certain sponges, especially *Spongelia fragilis* Montagu.

In the posterior segments there is a black pigment spot between the dorsal cirrus and the setigerous lobe of each foot.

*Habitat.*—BLACKSOD BAY—Common on shore, living in sponges. CLEW BAY—Dredged on two occasions in 25–28 fms., living in Halichondria.

*Distribution.*—South coast of England; France; Madeira; Canaries; Mediterranean; Black Sea; Ceylon.

**Autolytus longeferiens** de Saint-Joseph.

1886. *Autolytus longeferiens*. de Saint-Joseph, p. 217. 1908. *A. l.* Elwes, p. 202. 1910. *A. l.* McIntosh, p. 245. 1892. ? *Autolytus verrilli*. Marenzeller, p. 416.

Elwes (tom. cit.) pointed out that his specimens differed from those of de Saint-Joseph in having only two small teeth between each of the large ones. In the Irish specimens there are sometimes 2, sometimes 3, small teeth, even in the same specimen. The proboscis is very long and twisted,

but it does not attain the enormous length of 18-20 mm., as de Saint-Joseph states. Elwes gives 2 mm. in one place, and 18-20 mm. in another. In the Irish specimens the length did not exceed 4 mm.

The species described by Marenzeller (tom. cit.) as *Autolytus verrilli* (the *Stephanosyllis ornata* of Verrill, and the *Autolytus Alexandri* of Malmgren) seems to be closely allied to, if not identical with, this species. The proboscis, which has a single loop, is crowned with 9 large teeth, each pair being separated by 2 small teeth, in the latter respect greatly resembling some of the Irish specimens. In other respects the two species agree. For instance, the epaulettes behind the head, which Marenzeller describes, though not mentioned by de Saint-Joseph or McIntosh, are present in the Irish specimens.

If Marenzeller is right in identifying his species with the *A. Alexandri* of Malmgren, then this is the correct name for the species, otherwise the name of de Saint-Joseph has priority.

*Habitat.*—BLACKSOD BAY—In Laminaria roots on the shore. CLEW BAY—  
Dredged in Inishlyre Harbour in 4 fms.

*Distribution.*—British Isles (Dublin Bay, Torquay); France; ? New England; ? Spitzbergen; ? Greenland.

#### *Autolytus rubropunctatus* (Grube).

1860. *Sylline rubropunctata*. Grube, p. 87. 1875. *Autolytus* (*Proceraca*) *ornatus*. Marion and Bobretzky, p. 44. 1879. *P. r.* Langerhans, p. 579. 1886. *A. o.* de St.-Joseph, p. 220. ? 1908. *Sylline rubropunctata*. McIntosh, p. 186.

It is difficult to understand what species McIntosh had under examination when he drew up the description of *Sylline rubropunctata* (tom. cit.). The coloured illustration and the description of the colour pattern agree exactly with *Autolytus rubropunctatus* (= *A. ornatus*); but he states that a ventral cirrus is present on each foot, and figures the setae with simple tips. In the true *A. rubropunctatus* the ventral cirrus is undoubtedly absent and the setae are bifid, as described by other observers, and as I have found in numerous Irish specimens. Moreover, McIntosh states that his species is the same as that found by Grube, Marion and Bobretzky, Langerhans, Malaquin, and de Saint-Joseph. It seems probable that McIntosh has confused two distinct species when drawing up his description.

*Habitat.*—CLEW BAY—Dredged in 7-10 fms. BALLYNAKILL HARBOUR—  
Dredged on two occasions, in 2-8 fms.

*Distribution.*—Plymouth; France; Madeira; Mediterranean,

***Autolytus pictus* (Ehlers).**

1908. *Autolytus pictus*. McIntosh, p. 211.

This species is very common on the shore, sometimes under stones, but more frequently in weeds and *Laminaria* roots. It is also commonly taken in the dredge.

*Habitat*.—BLACKSOD BAY—Found on the shore on six occasions. Dredged on two occasions in 2-8 fms. CLEW BAY—Dredged on six occasions in 4-16 fms.

*Distribution*.—British Isles; France; White Sea; Madeira; Mediterranean.

***Autolytus macrophthalma* (Marenzeller).**

1875. *Proceraea macrophthalma*. Marenzeller, p. 37. 1879. *P. m.* Langerhans, p. 579. 1886. *A. m.* de St.-Joseph, p. 226.

A number of specimens found in Clew Bay are referred to this species on account of the structure of the proboscis and the exceptionally large eyes. It is practically impossible, except by the latter character, to separate this species from *A. luxurians*, also described by Marenzeller. The latter species has been regarded by several workers as identical with *A. aurantiacus* (Claparède). The unusual length of the antennae and anterior cirri in *A. luxurians* is not a distinctive character, as living specimens from Clew Bay had cirri nearly 5 mm. long, whilst Marenzeller gives 2.4 mm. as the length for *A. luxurians*. The structure of the crown of teeth and of the setae is similar in both species, and the only character which seems to distinguish them is that *A. luxurians* has small reddish-brown eyes, whilst those of *A. macrophthalma* are large and red.

*Habitat*.—CLEW BAY—Dredged on 3 occasions, in 7-26 fms.

*Distribution*.—Torquay; north coast of France; Madeira; Adriatic.

***Autolytus brachycephala* (Marenzeller).**

Pl. V, fig. 10.

1874. *Proceraea brachycephala*. Marenzeller, p. 54. 1879. *P. b.* Langerhans, p. 580.

The specimens which I refer with some doubt to this species show considerable differences from those described by Marenzeller, and to a lesser degree from those of Langerhans. The tentacular cirri and the cirri of the 2nd segment are much longer. There is a conspicuous pair of epaulettes behind the head, which are not noted by Marenzeller or Langerhans. As

regards the double row of glands on the dorsum of each segment, the alternation in length of the dorsal cirri, the shape of the head and eyes, the Irish specimens agree with those already described. Marenzeller states that the opening of the proboscis is crowned with 30 teeth, of which 8-10 are somewhat larger than the others, each large one alternating with 2 or 3 smaller ones. Langerhans gives 30 teeth to the proboscis, 3 of which are very much larger than the rest. In the Irish specimens there are 30 teeth, of which 4 are very much larger than the rest. Between each pair of large teeth there are 6 or 7 smaller ones. Two of the small teeth overlap each large one (fig. 10). In the structure of the teeth, therefore, the Irish specimens agree fairly closely with those found by Langerhans at Madeira, and differ considerably from Marenzeller's specimens from the Adriatic.

It is possible that the Irish specimens represent a distinct species, or that they are identical with the Madeira species, but distinct from the one found in the Adriatic. An examination and comparison of specimens from the three localities would be necessary to decide this point, and for the present they may remain as a variety of *A. brachycephala*.

*Habitat*.—BLACKSOD BAY—Dredged in 4-6 fms. CLEW BAY—Dredged in 18 fms.

*Distribution*.—Madeira; Adriatic.

#### ***Autolytus ehbiensis* de Saint-Joseph.**

1886. *Autolytus ehbiensis*. De St.-Joseph, p. 228.

Specimens with male buds were found in September. This species is fairly common in dredged material, or on the shore in *Laminaria* roots.

*Habitat*. — BLACKSOD BAY — Found on the shore on 3 occasions. Dredged on 8 occasions, in 1-8 fms. CLEW BAY—Dredged on 5 occasions, in 2-28 fms. BALLYNAKILL HARBOUR — Dredged on 2 occasions, in 1½-4 fms. BOFIN HARBOUR—On bottom of a boat.

*Distribution*.—Dublin Bay; Torquay; north coast of France.

#### ***Autolytus punctatus* de Saint-Joseph.**

1886. *Autolytus punctatus*. De St.-Joseph, p. 233.

This species is comparatively rare, and has only been found elsewhere on the north coast of France.

*Habitat*.—BLACKSOD BAY—In *Laminaria* roots from the shore.

*Distribution*.—North coast of France,

**Autolytus Edwarsi** de Saint-Joseph.

1886. *Autolytus Edwarsi*. De St.-Joseph, p. 235.

This species was found with chains of buds at all seasons of the year. It is very common in *Laminaria* roots.

*Habitat*.—BLACKSOD BAY—Found on the shore on 6 occasions. Dredged on 4 occasions in 1–5 fms. CLEW BAY—Dredged on 8 occasions in 4–19 fms. BALLYNAKILL HARBOUR—Dredged on 3 occasions in 4–8 fms.

*Distribution*.—Malahide, Co. Dublin; north of France.

**Autolytus prolifer** (O. F. Müller).

1908. *Autolytus prolifer*. McIntosh, p. 215.

From the number of records of this species, especially of the pelagic sexual stages, one would think it is one of the most abundant forms round our coasts. Nevertheless during the course of the Clare Island Survey only two individuals were found which could be definitely referred to this species, out of many hundreds of specimens belonging to the genus, and the asexual form is undoubtedly very rare as compared with other species of the genus. The pelagic buds of the various species greatly resemble each other, have not been clearly described, and are difficult to name with precision, and hence I believe the greater number of the records of *Autolytus prolifer* are unreliable, and refer to the pelagic stages of other species of the genus.

*Habitat*.—CLEW BAY—Dredged in 10 fms., in *Laminaria* roots. In addition, many pelagic buds were obtained in various parts of the district, which correspond to the description of this species.

*Distribution*.—British Isles; Arctic; Scandinavia; North Sea; France; Madeira; Mediterranean; South Africa.

**Autolytides inermis** (de St.-Joseph).

1886. *Autolytides inermis*. De St.-Joseph, p. 237. 1910. *Autolytus inermis*. McIntosh, p. 247.

*Habitat*.—BLACKSOD BAY—Found once on the shore, in *Laminaria* roots. Dredged once in 6–8 fms.

*Distribution*.—Torquay; Dinard.

**Amblyosyllis lineata** Grube.

1908. *Amblyosyllis lineata*. McIntosh, p. 225.

Mature specimens of this species were found in March, May, June, and September.

It is common on the shore at Blacksod Bay, living under stones and in *Laminaria* roots.

*Habitat.*—BLACKSOD BAY—Found on the shore on 11 occasions. Dredged in 1 fathom. CLEW BAY—East shore of Clare Island. Dredged on two occasions in 13–19 fms. BALLYNAKILL HARBOUR—Dredged on 6 occasions in 1–8 fms. BOFIN HARBOUR—Dredged twice, in 1–2 fms. Dredged off Cleggan Head in 15 fathoms.

*Distribution.*—Great Britain; France; Mediterranean.

#### ***Myrianida pinnigera* (Montagu).**

1908. *Myrianida pinnigera*. McIntosh, p. 229.

Specimens with chains of buds were found in January and March.

*Habitat.*—BALLYNAKILL HARBOUR—Found once on the shore. Dredged twice in 4–8 fathoms.

*Distribution.*—British Isles; France; Madeira; Naples.

#### Family **HESIONIDAE.**

##### ***Microphthalmus* Meczniow 1865.**

This genus was created by Meczniow (1865, p. 334) for a small Hesionid found at Helgoland, and named *M. Sczelkowi*. It is closely related to the genus *Podarke* through the possession of three pairs of tentacular cirri on each side, five unjointed tentacles, and a rudimentary dorsal branch to the parapodia. It is distinguished from that genus by having only a single pair of rudimentary eyes, without lenses, and by the remarkable flattened posterior extension of the anal segment. The tentacles and cirri are smooth, and show no trace of articulation. The shape of the setae and the papillae on the proboscis are not characteristic of this genus, as Meczniow thought.

Webster and Benedict (1887, p. 713) described a species from Eastport, Maine, and from Provincetown, Mass., under the name *Podarke aberrans*, which appears to belong to the genus *Microphthalmus*. It has the characteristic anal plate, and the small rudimentary single pair of eyes. Its distinctive characters will be considered below (*vide* p. 46). Bobretzky (1880, p. 139) mentions two hermaphrodite species belonging to this genus, *M. fragilis* and *M. similis*, from the Black Sea; but except for his account of the reproductive organs, I have been unable to find any particulars of these species.

In reviewing the family Hesionidae, neither Grube, McIntosh, nor Gravier mentions the genus *Microphthalmus*.



**Microphthalmus Szcelkowi** Meeznikow.

Pl. V, figs. 6A–E.<sup>1</sup>

1865. *Microphthalmus Szcelkowi*. Meeznikow, p, 334, taf. xxiv, figs. 10–12.

Three specimens of this species were found under stones on the shores of Blacksod Bay. Reproductive elements were not present in any of them.

The largest specimen is 6 mm. long, composed of 40 setigerous segments. The other two are smaller, 2·2 mm. and 2·8 mm. long, with 23 and 25 setigerous segments respectively.

The body is widest in the anterior third, tapering slightly towards the head, considerably towards the tail. The lateral regions are flattened, leaving a prominent dorsal ridge, from the front of which rises the median antenna (Pl. V, fig. 6A). This dorsal ridge may be the result of contraction. There is considerable brown pigment on the dorsum, especially in the lateral region, forming four ill-defined transverse bands in each segment.

The head (Pl. V, fig. 6A) is rounded in front, where it is slightly indented. The posterior margin is rounded at the sides, and concave in the middle. In the posterior region of the head is a single pair of small black kidney-shaped eyes, without lenses. In front of the head are four slender tapering tentacles, the dorsal pair slightly longer than the ventral pair, all without basal articulation. In the posterior indentation of the head rises the median tentacle, which equals the dorsal tentacles in length.

There are three pairs of tentacular cirri on each side. The segments bearing them are distinct from each other, and from the head. The tentacular cirri are somewhat swollen in the basal portion, tapering distally. The anterior pair are almost equal in size, and are shorter than the second pair, which again are almost equal. The dorsal cirrus of the third segment is the longest appendage of the body, and is twice as long as the ventral one. The feet are all similar in structure, and the fourteenth may be described as typical (Pl. V, fig. 6D). The dorsal cirrus is broad at the base, tapering to a fine tip, and is twice as long as the ventral cirrus. The dorsal division of the foot is rudimentary, consisting of a slender spine, and a single small seta with a peculiar spinous tip (Pl. V, fig. 6E, *a*). The ventral division of the foot is prominent, with a single large spine, and a fan-shaped series of about 10 setae. The setae in the middle of the foot have the longest tips, those in the ventral region the shortest, whilst the dorsal setae are intermediate. The shafts of the setae are gently curved, with bevelled, slightly bifid tips (Pl. V, fig. 6E, *b*, *c*). The terminal pieces are minutely serrate, bifid at the tip. Beneath the lower tooth is a long slender tooth parallel to the tip.

<sup>1</sup> The figures for this species and for *Opisthodonta pterochaeta*, which by error have both been numbered 6, may be distinguished by the number of the plate.

The peculiar dorsal seta is obviously homologous to the lyrate seta present in the dorsal region of the feet of some members of this family.

The anal segment (Pl. V, figs. 6B, 6C) consists anteriorly of a thickened, deeply pigmented ring, which is produced backwards into a flat hood-shaped plate concave below, rounded behind, with the edge entire. The anus lies dorsally at the posterior median margin of the thickened ridge, which also carries two long slender anal cirri dorsally.

The opening of the proboscis is surrounded by a number of papillae. Unripe eggs were found in the parapodia of one specimen collected in September.

*M. Sczelkowiei* was described in 1865 by Meczniokow, who found it at Helgoland. His description and figures are very incomplete, and in some respects erroneous, and the species does not seem to have been found since. In the shape of the tentacular cirri, feet, and anal plate, the Irish specimens agree with Meczniokow's description. The most noteworthy difference lies in the position of the median tentacle, which, in the figure given by Meczniokow, rises in front of the eyes, whilst in the Irish specimens it is behind the eyes. The peculiar dorsal seta, wrongly described and figured by Meczniokow as compound, is differently shaped and has fewer teeth in the Irish specimens. The figure of the compound setae given by Meczniokow is too imperfect to have any value. These differences are slight, and may be due to errors of observation on the part of Meczniokow, and until specimens from the original locality are re-examined it seems preferable not to create a new specific name.

The *Podarke aberrans* of Webster and Benedict (1887, p. 713) belongs to the genus *Micropthalmus*. I have re-examined the original types from the United States National Museum and the Union College. In the shape of the body, head, and feet, and the position of the median antenna, this species agrees closely with the Irish specimens. The only distinction of any value lies in the shape of the setae in the dorsal lobe of the foot. According to Webster and Benedict "the dorsal setae are short, stout, simple, six to eight in each bundle." This statement does not apply to any of the specimens of *Podarke aberrans* which I examined.

The setae normally occurring in the dorsal division are shown in Pl. V, fig. 7. There is a slender pointed aciculum, a stout curved smooth seta ending in a sharp point, and a similar curved seta with the terminal portion fringed with fine teeth.

This latter seta was quite overlooked by Webster and Benedict. The dorsal division of this species differs from that of the Irish specimens in the presence of the curved smooth seta, and in the shape of pectinate seta, which

has numerous slender teeth, whereas in the Irish specimens there are only 5-6 very long teeth.

The compound setae, which were figured with fine-pointed tips, are really bifid, resembling those of *M. Sezelkowi*.

*Habitat*.—BLACKSOD BAY—Three specimens found under a stone on the north shore of Feorinyeo Bay.

*Distribution*.—Helgoland.

***Magalia perarmata* Marion and Bobretzky.**

1908. *Magalia perarmata*. McIntosh, p. 136.

This species is common in dredged material, but is rarely found on the shore. It is very frequently found in *Laminaria* roots dredged in shallow water.

*Habitat*.—BLACKSOD BAY—Found once on the shore. Dredged twice, in 2-5½ fms. CLEW BAY—Dredged on six occasions, in 5-26 fms. BALLYNAKILL HARBOUR—Dredged on seven occasions, in 1-8 fms.

*Distribution*.—Dublin Bay; south-west coast of England; north coast of France; Madeira; Mediterranean.

***Oxydromus propinquus* (Marion and Bobretzky).**

1875. *Gyptis propinqua*. Marion and Bobretzky, p. 51.

This pretty and active little species was found only in Ballynakill Harbour. It swims rapidly and gracefully through the water, and comes to a dead stop, and even swims backwards, if its progress is opposed.

*Habitat*.—BALLYNAKILL HARBOUR—Taken twice in the surface tow-net, and twice on the bottom, in 2-8 fms.

*Distribution*.—North coast of France; western Mediterranean.

***Ophiodromus flexuosus* (Delle Chiaje).**

Pl. V, fig. 9.

1908. *Ophiodromus flexuosus*. McIntosh, p. 117.

This species is comparatively rare in the district.

There is one peculiarity in the structure of the setae of this species which has either been overlooked by previous observers, or is peculiar to the Irish specimens. On the ventral side of the dorsal bundle of capillary setae are a number of lyrate setae (fig. 9), such as are found in several other species of the family Hesionidae. One stem of the foot is much stronger and longer than the other, and terminates in a small rounded knob. The inferior tooth is slender and finely pointed. The stem below the fork is bordered along one side with fine teeth for a considerable distance.

This species is closely related to the genus Podarke, differing only in the greater development of the dorsal lobe of the foot.

Mature specimens were found in January.

*Habitat*.—BLACKSOD BAY—Dredged in 6–8 fms. BALLYNAKILL HARBOUR—  
Dredged on 2 occasions, in 2–12 fms.

*Distribution*.—British Isles; Scandinavia; North Sea; France; Spain; Mediterranean.

**Castalia punctata** (O. F. Müller).

1908. *Castalia punctata*. McIntosh, p. 121.

This species is common on the shore, living under stones, and in Laminaria roots.

*Habitat*.—BLACKSOD BAY—Found on the shore on 4 occasions. Dredged on 2 occasions in  $4\frac{1}{2}$ – $5\frac{1}{2}$  fms. CLEW BAY—Dredged on 7 occasions, in  $5\frac{1}{2}$ –19 fms. BALLYNAKILL HARBOUR—Dredged in 1–3 fms. Dredged 2 miles S.W. of Shark Head, in 33 fms.

*Distribution*.—British Isles; Scandinavia; Western Baltic; Iceland; Azores; Gulf of Gascony.

**Castalia fusca** (Johnston), typ.

1908. *Castalia fusca*. McIntosh, p. 127. 1862. *Castalia aurantiaca*. Sars, p. 90. 1896. *Castalia aurantiaca*. Michaelsen, p. 61.

This species is very common on the shore, living under stones and in Laminaria roots. It is also frequently taken in the dredge, in shallow water.

In this species the terminal pieces of the setae are provided with very long coarse teeth, giving them a characteristic appearance, and the tip is simply hooked, not bifid.

Mature specimens were found in May.

The *Castalia aurantiaca* described by Sars (tom. cit.), as recorded by several Scandinavian observers, seems to be this species. I have examined specimens thus named by Michaelsen from Kiel (tom. cit.), and they are typical examples of *Castalia fusca*. Two well-marked varieties of this species are described below, which may eventually prove to be distinct species.

*Habitat*.—BLACKSOD BAY—Found on the shore on 17 occasions. Dredged on 3 occasions, in 1–6 fms. CLEW BAY—Shores of Clare Island, in Lithothamnion. Dredged on 4 occasions in various parts of the Bay, in 5–17 fms. BALLYNAKILL HARBOUR—Dredged on 2 occasions, in 1–8 fms. Found once on the shore.

*Distribution*.—British Isles; Scandinavia; Western Baltic; France; Madeira; Mediterranean.

*Castalia fusca* var. *hibernica* var. nov.

Pl. V, fig. 8.

In a remarkable haul of the dredge in Clew Bay (Station W. 84), in 24 fms., a number of specimens were secured which, whilst agreeing generally with *Castalia fusca*, yet show a number of definite differences. Of these the chief are: (1) the eyes are red, those of *C. fusca* being black; (2) the very characteristic coarse teeth on the terminal pieces of the setae of *C. fusca* are not found in this form; (3) the setae are shorter and thicker, the terminal pieces tend to be bifid at the tip, especially in the dorsal part of the foot, and in the posterior segments. Setae with simple and bifid points are shown in fig. 8. The bevelled end of the shaft of the seta is bifid. The simple tips are not formed from the bifid ones by abrasion, as they are sometimes found with a wing over the simple tip. In all other characters this form seems to agree very closely with *C. fusca*. The habitat of the two forms is very different, however, and further research may prove that they are quite distinct species. This form has since been found in Dingle Bay, in 20 fathoms, associated with a fauna very similar to that found with it in Clew Bay.

The specimens, which were found in May, were mature.

*Habitat*.—CLEW BAY—Dredged in 24 fms., on a bottom of sand and shells.

*Castalia fusca* var.

Another curious variety of this species was found in Ballynakill Harbour. The setae resemble those of the variety *hibernica*, but are longer; the tips of the shafts are pointed, not bifid; the terminal pieces are longer, with fine teeth; and the bifid nature of the tips is more obvious, and occurs in a much greater proportion of the setae than in the previous variety. The characteristic coarse teeth on the setae of the type form are absent in this variety also.

This variety resembles the *Kefersteinia cirrata* (Keferstein) of de Saint-Joseph (1888, p. 324) in the following remarkable features:—In a number of the segments in the middle of the body, usually the 11th to the 21st, there occurs in the dorsal division of each foot a large curved aciculum, as figured and described by de Saint-Joseph. These setae are present in all the specimens which constitute the present variety. They have been noticed only by de Saint-Joseph and by Fauvel (1913, p. 57), and their significance is quite unknown. The specimens were not mature, so their function can hardly be sexual. The *Kefersteinia cirrata* of various authors is a synonym of *Castalia fusca*; but the form described by de Saint-Joseph seems to belong rather to the present variety, which, if its features are constant, will require a new name.

I have never yet found specimens having setae with bifid terminal pieces, and at the same time the coarse serrations characteristic of *Castalia fusca*.

*Habitat*.—BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution*.—Dinard; Monaco.

Family **AMPHINOMIDAE**.

**Euphrosyne foliosa** Aud. and Edw.

1900. *Euphrosyne foliosa*. McIntosh, p. 234.

This species is rare in the district.

*Habitat*.—CLEW BAY—Dredged on 2 occasions, in 5–16 fms. BALLYNAKILL HARBOUR—Dredged on 3 occasions in 2–8 fms.

*Distribution*.—British Isles; France; Mediterranean.

Family **APHRODITIDAE**.

**Aphrodite aculeata** L.

1900. *Aphrodite aculeata*. McIntosh, p. 247.

This species is usually dredged on sand which contains a slight admixture of mud. It is almost absent from Clew Bay, where the sand is usually hard and clean. In the deeper waters of Blacksod Bay it is sufficiently abundant to give a characteristic aspect to the fauna. The bottom here consists of muddy sand and shells.

*Habitat*.—BLACKSOD BAY—Dredged on 8 occasions in 4–9 fms. CLEW BAY—Off Inishgowla, in 7–10 fms. East of Clare Island, in 18 fms. BALLYNAKILL HARBOUR—Found once on the shore. Dredged on 3 occasions in 6–12 fms.

*Distribution*.—North Atlantic shores; Mediterranean; Red Sea.

**Lepidonotus squamatus** (L.).

1900. *Lepidonotus squamatus*. McIntosh, p. 274.

This species is very common on the shore, under stones and in *Laminaria* roots. It is very commonly dredged down to 30 fms., throughout the area.

*Habitat*.—BLACKSOD BAY—Taken on the shore on 21 occasions. Dredged on 6 occasions in 3–8 fms. CLEW BAY—East shore of Clare Island. Taken in the dredge on 14 occasions in different parts of the bay, in 4–28 fms. BALLYNAKILL HARBOUR—Found 3 times on the shore. Dredged 3 times in 1–8 fms.

*Distribution*.—Shores of North Atlantic; Arctic; Japan.

**Lepidonotus clava** (Montagu).

1900. *Lepidonotus clava*. McIntosh, p. 280.

This species is common on the shore, especially in Lithothamnion and Laminaria roots. It is seldom taken in the dredge.

*Habitat.*—BLACKSOD BAY—Taken on the shore on 19 occasions. CLEW BAY—East and south shores of Clare Island. Dredged in 9–11 fms., east of Clare Island. BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution.*—Ireland; west of Scotland; south coast of England; France; Spain; Madeira; Canaries; Mediterranean; Japan; South Africa.

**Gattyana cirrosa** (Pallas).

1900. *Gattyana cirrosa*. McIntosh, p. 285.

This species is almost always found sharing the tube of Chaetopterus. It is never very common.

*Habitat.*—BLACKSOD BAY—Found twice on the shore, and dredged in  $4\frac{3}{4}$  fms. CLEW BAY—Dredged on 5 occasions in 4–20 fms.

*Distribution.*—Shores of North Atlantic; Arctic.

**Lagisca floccosa** (Savigny).

1900. *Lagisca floccosa*. McIntosh, p. 298.

Extremely common on the shore, under stones, and in Laminaria roots.

*Habitat.*—BLACKSOD BAY—Taken on the shore on 20 occasions. Not taken in the dredge. CLEW BAY—East and south shores of Clare Island. Dredged on 5 occasions in 4–28 fms. BALLYNAKILL HARBOUR—Dredged on 2 occasions in 6–8 fms. CLEGGAN BAY—Dredged in 5–10 fms.

*Distribution.*—Shores of North Atlantic; Greenland; Madeira.

**Lagisca Elizabethae** McIntosh.

1900. *Lagisca Elizabethae*. McIntosh, p. 303. 1891. *Polynoë* (*Lagisca*) *extenuata*. Hornell, p. 233. 1910. *Lagisca extenuata*. Elwes, p. 59.

This species is very common on the shore and in shallow water, especially in Laminaria roots. It is easily recognizable from its colouration and the structure of the scales. There seems not much doubt that the *Polynoë extenuata* of Hornell belongs to this species. It agrees with it in the structure of the setae and of the scales. *Lagisca extenuata* (Grube) seems to be a deep-water form in the British area. The *Lagisca extenuata* of Major Elwes is certainly this form, as I had the opportunity of examining specimens.

*Habitat.*—BLACKSOD BAY—Found on the shore on 10 occasions. Dredged on 4 occasions in 1–6 fms. CLEW BAY—Shores of Clare Island, in Lithothamnion. Dredged on 8 occasions, in 2–29 fms.

*Distribution*.—Dublin Bay; St. Andrews; Port Erin; Puffin Island; Colwyn Bay; Torquay.

**Harmothoe imbricata (L.).**

1900. *Harmothoe imbricata*. McIntosh, p. 314.

This species is probably the most abundant Polychaete in the littoral and shallow-water regions. It is found everywhere except in sand, and seems to have greater powers of dispersal and adaptation than any other species.

Mature specimens, with masses of eggs and sperm under the elytra, were found in March.

*Habitat*.—BLACKSOD BAY—Found on the shore on 27 occasions. Dredged on 11 occasions, in 1–8 fms. CLEW BAY—East shore of Clare Island. Dredged on 5 occasions in 2–17 fms. BALLYNAKILL HARBOUR—Found 3 times on the shore. Dredged on 5 occasions in 1–8 fms. CLEGGAN BAY—Dredged in 5–10 fms.

*Distribution*.—Shores of North Atlantic; Arctic; Japan; Adriatic.

**Harmothoe spinifera (Ehlers).**

1900. *Harmothoe spinifera*. McIntosh, p. 327.

Found under stones and in *Laminaria* roots.

*Habitat*.—BLACKSOD BAY—Found on the shore on 7 occasions. CLEW BAY—Dredged on 3 occasions in the bay, in 9–19 fms. In Killary Harbour on mud, in 17½ fms.

*Distribution*.—British Isles; France; Spain; Madeira; Azores; Mediterranean.

**Harmothoe zetlandica McIntosh.**

1900. *Harmothoe zetlandica*. McIntosh, p. 330.

In a large specimen, 15 mm. long, the elytra do not cover the whole of the dorsal surface. They are faintly mottled and very tenacious.

*Habitat*.—CLEW BAY—Dredged on 4 occasions in 11–24 fms.

*Distribution*.—Shetlands.

**Harmothoe lunulata (Delle Chiaje).**

1900. *Harmothoe lunulata*. McIntosh, p. 342. 1912. *H. l.* Cuénot, p. 102. 1900. ? *Malmgrenia andreae*. McIntosh, p. 382.

A number of specimens belonging to this species were found living in sand in Blacksod Bay. They are very darkly pigmented, with the characteristic pattern on the elytra. It is probable that these specimens were commensal with *Synapta inhaerens*, which was also common in the same sand. Cuénot



has recently found it in the galleries of *Synapta digitata* and *S. galliennei* (= *S. inhaerens*) at Arcachon (tom. cit.). He is of the opinion that the *Harmothoe synaptae* of de Saint-Joseph (1906, p. 147) is the same species. Some of the specimens from Blacksod Bay were very large, up to 35 mm. long. The tips of the upper ventral setae are bluntly rounded, probably by abrasion with the sand. The specimens dredged in Clew Bay have the ventral setae acutely pointed, are smaller, and with very little pigment. The colour pattern on the elytra varies considerably, and must not be regarded as affording a reliable diagnostic character.

There seems to be very little to distinguish the *Malmgrenia andreapolis* of McIntosh from this species. The resemblance in the colour pattern and structure is very striking, and the head and feet are very similar. The setae resemble those of the Blacksod specimens found in sand, in which the points have been abraded by friction.

*Habitat*.—BLACKSOD BAY—Found living in sand on the shore on six occasions. CLEW BAY—Dredged on two occasions, in 16–19 fms. BALLYNAKILL HARBOUR—Dredged in 1–2 fms.

*Distribution*.—British Isles; France; Spain; Mediterranean; Azores.

***Harmothoe setosissima* (Savigny).**

1900. *Harmothoe setosissima*. McIntosh, p. 345.

*Habitat*.—CLEW BAY—Dredged off Mulranny in 13 fms. BOFIN HARBOUR—One large specimen obtained.

*Distribution*.—British Isles; North Sea; France; Spain; Mediterranean.

***Evarne impar* (Johnston).**

1900. *Evarne impar*. McIntosh, p. 353.

This species is fairly common on the shore of Blacksod Bay, and in shallow water.

*Habitat*.—BLACKSOD BAY—Found on the shore on two occasions. Dredged on six occasions, in 3–6 fms. CLEW BAY—Dredged on four occasions, in 13–26 fms. BALLYNAKILL HARBOUR—Dredged on six occasions, in 1–9 fm. CLEGGAN BAY—Dredged in 6–10 fms.

*Distribution*.—British Isles; Scandinavia; North Sea; France; Spain; Azores; east coast of North America.

***Scalisetosus communis* (Delle Chiaje).**

Pl. V, fig. 11.

1900. *Scalisetosus communis*. McIntosh, p. 372.

This species is comparatively rare. Mature females were found in August and November. The dorsum is mottled with dark brown in a regular and complex pattern, and there are two spots of brown on each foot. The body has 32 setigerous segments.

The specimen dredged in Cleggan Bay differed from the type in several respects. The scales had, in addition to the usual small globular papillae, a number of large egg-shaped papillae scattered over the surface (Pl. V, fig. 11). At the top of each of these was a smaller papilla, probably sensory in function. The tips of the dorsal bristles were not bifid, as in the type, but pointed like a spear.

*Habitat.*—BLACKSOD BAY—Two specimens obtained, one on the shore, the other dredged in  $4\frac{3}{4}$  fms. CLEW BAY—Dredged on two occasions, east of Clare Island, in 7–16 fms. Dredged in Killary Harbour in 7 fms., on mud. CLEGGAN BAY—Dredged in 5–10 fms.

*Distribution.*—British Isles; North Sea; France; Spain; Madeira; Mediterranean.

**Scalisetosus assimilis** McIntosh.

1900. *Scalisetosus assimilis*. McIntosh, p. 377.

This species was frequently found in Clew Bay, coiled round the peristome of *Echinus esculentus*, or crawling about the spines, in both of which positions it is very inconspicuous. It is almost transparent, with two dark bands along the dorsum, and paler pigment between them. The anterior pair of elytra have an inner border of red-brown colour. The mid-dorsal line is green in specimens preserved in formalin. Mature specimens were found in August.

*Habitat.*—CLEW BAY—Obtained on seven occasions, in 5–15 fms.

*Distribution.*—British Isles; France; Spain.

**Halosydna gelatinosa** (M. Sars).

1900. *Halosydna gelatinosa*. McIntosh, p. 384.

*Habitat.*—BLACKSOD BAY—Found on the shore on sixteen occasions. CLEW BAY—Annagh Islands. Off Clare Island, in 2–4 fms., a young specimen with eleven pairs of elytra, in August. BALLYNAKILL HARBOUR—Found four times on the shore. Dredged in 3–5 fms. BOFIN HARBOUR—Found once on the shore.

*Distribution.*—British Isles; Norway; France; Spain; Madeira; west Morocco.

**Polynoe scolopendrina** Savigny.

1900. *Polynoe scolopendrina*. McIntosh, p. 389.

This species is usually found in the tubes of various Terebellid worms such as *Thelepus setosus*, *T. cincinnatus*, *Polymnia nebulosa*, etc.

*Habitat*.—BLACKSOD BAY—Found on the shore on nine occasions. Dredged on five occasions in 4–8 fms. CLEW BAY—Dredged in Inishlyre Harbour in 4 fms.; off Inishgowla in 9 fms., on sandy mud. Found on the shore at Achill Sound. BALLYNAKILL HARBOUR—Found on the shore on six occasions. Dredged once in 2 fms. BOFIN HARBOUR—Found once on the shore.

*Distribution*.—British Isles; Norway; France; Mediterranean.

**Achloë astericola** (Delle Chiaje).

1900. *Achloë astericola*. McIntosh, p. 397.

This species lives in the ambulacral grooves of the starfish *Astropecten irregularis*, a species very common in Clew Bay on sandy ground. Mature specimens were found in August.

*Habitat*.—CLEW BAY—Dredged on thirteen occasions in 11–22 fms.

*Distribution*.—Ireland; England; France; Mediterranean.

**Sthenelais boa** (Johnston).

1900. *Sthenelais boa*. McIntosh, p. 408.

This species is common in the sand under stones on the shore, in muddy sand and gravel, and in the sand of *Zostera* beds. It is also dredged most frequently on muddy sand.

*Habitat*.—BLACKSOD BAY—Found on the shore on seventeen occasions. Dredged on two occasions in 3–5 fms. CLEW BAY—Dredged off Inishgowla (twice) in 1–9 fms.; Inishlyre Harbour (twice) in 4–5 fms.; between Dorinish and Inishimmel. BALLYNAKILL HARBOUR—Found twice on the shore. Dredged in 2 fms. BOFIN HARBOUR—Found once on the shore.

*Distribution*.—Shores of Europe; Madeira; Mediterranean; South Africa; Japan.

**Sthenelais zetlandica** McIntosh.

Pl. VI, figs. 13A, B.

1900. *Sthenelais zetlandica*. McIntosh, p. 414.

The anterior end of a specimen of this species, consisting of 50 segments, was dredged in Clew Bay in 18 fathoms. As McIntosh drew up the description from a fragment from which the head was missing, the present specimen enables the account of this species to be completed. I was able to examine the original fragment, and there is no doubt as to the specific identity of the two specimens.

The head (Pl. VI, fig. 13A) is oval, and bears two pairs of kidney-shaped eyes. The median tentacle is jointed at the base, and on each side of it is a short rounded lobe, the cephalic ctenidium. The palps are long and tapering, about eight times as long as the median tentacle.

The parapodia of the first segment (fig. 13B) project in front of the head. On the dorsal side, near the base, is a small rounded lobe (*a*), the dorsal ctenidium of the first foot. On the inner margin of the base of the first foot is the lateral tentacle (*b*), broad at the base, and tapering to a point. The setigerous lobe also bears long slender dorsal and ventral cirri (*c*, *d*). Between these, on the outer side of the setae, is a delicate membrane (*e*), the buccal ctenidium ("cuilleron céphalique" of Pruvot and Racovitza). The setae are grouped in two bundles, but there is only a single spine. They are simple, slender, and serrate. There are no compound setae in the first foot. The relations of these various structures are shown in fig. 13B, in which the first foot is seen from the outer side.

Behind the head, on the dorsal side, the two anterior segments are prominent in the median region, and project laterally as a pair of short blunt papillae.

The second pair of feet project laterally in front of the head. Some of the ventral setae are very long and slender, and the terminal pieces have 7-9 joints. In the succeeding feet these setae gradually grow shorter, and in the 5th foot have the normal number of two or three joints.

The dorsal simple setae are minutely bifid at the tip, a point which McIntosh overlooked.

The ventral cirri on the second pair of feet are larger than those on the following segments, and are nearer to the median line of the body. The ventral surface of the body is thickly covered with small globular papillae, except in the median line beneath the nerve-cords.

This species is closely related to the *S. minor* of Pruvot and Racovitza. It differs in having papillae on the ventral surface, and short clavate cilia on the margin of the elytra, those in *S. minor* being long and tapering. There is also considerable difference in the size of the body, and the proportions of the various structures comprising the anterior end.

*Habitat.*—CLEW BAY—Dredged in 18 fms.

*Distribution.*—Off the Shetland Islands; off Port Erin, Isle of Man.

#### ***Sthenelais limicola* Ehlers.**

1900. *Sthenelais limicola*. McIntosh, p. 417.

This species was not found between tide-marks, nor does it occur in Blacksod Bay. It is characteristic of a sandy bottom in shallow water.

*Habitat.*—CLEW BAY—Dredged on eleven occasions in various parts of the bay, in 4–26 fms.

*Distribution.*—British Isles; Norway; east North America; France; Mediterranean.

**Sigalion Mathildae** Aud. and Edw.

1900. *Sigalion Mathildae*. McIntosh, p. 427.

This species is frequent but not abundant in clean sand in Blacksod Bay.

*Habitat.*—BLACKSOD BAY—Found on the shore on 11 occasions. CLEW BAY—Dredged on three occasions in 5–20 fms.

*Distribution.*—British Isles; North Sea; France; Mediterranean.

**Pholoë minuta** (Fabricius).

1900. *Pholoë minuta*. McIntosh, p. 437.

Very abundant under stones on the shore, in Lithothamnion, and in Laminaria roots.

*Habitat.*—BLACKSOD BAY—Found on the shore on 17 occasions. Dredged on 6 occasions in 1–8 fms. CLEW BAY—East and south shores of Clare Island. Taken on 7 occasions in 2–26 fathoms. BALLYNAKILL HARBOUR—Dredged on 7 occasions in 1–8 fms.

*Distribution.*—North Atlantic shores; Arctic.

**Pholoë tuberculata** sp. n.

Pl. VI, figs. 14 A-L.

A number of specimens of *Pholoë* from several localities differ in many characters from the common *P. minuta*, and appear to belong to an undescribed species.

The largest specimen is 21 mm. long, composed of 68 setigerous segments. The body throughout is of very uniform width, tapering rapidly at each end. The Blacksod specimens are greyish-brown in colour, whilst one from Portstewart is flesh-coloured.

The head (Pl. VI, figs. 14 A, B) is rounded at the back and sides, deeply indented in front. There are two pairs of large black eyes, the pair on each side being connate. The median tentacle is placed in the anterior indentation of the head. It is short, smooth, and conical, seated on a broad rounded base which bears several small papillae. The palps are massive, smooth, tapering to a point, and contain a great deal of opaque white pigment, especially towards the distal end. The tentacular cirri are well in front of

the head. They are smooth and subulate, without papillae, but with numerous palpoils. The massive base on which they rest bears a few cylindrical papillae. On the ventral side of the head, beneath the median tentacle, is a large facial tubercle (figs. 14 A, B, *f*, fig. 14 C), seated on a rounded base.

The whole of the ventral surface of the body and parapodia is covered with small globular thick-walled papillae, those in the mid-ventral line being the smallest. The lower lip of the mouth is thickly set with cylindrical papillae. The anal segment is button-shaped, and carries two long slender anal cirri.

There are 56 pairs of elytra, placed in the normal manner on segments 2, 4, 5, 7, 9, 11 . . . 23, 24, 25, etc. The elytra cover most of the dorsum, leaving only a narrow median space in the anterior region. In the Blacksod specimens there is a large amount of opaque white pigment on the elytra, especially round the outer margin, but in the Portstewart specimens this pigment is absent, and the scales are translucent, with well-marked hilum and indistinct areolation.

The first pair of elytra (fig. 14 D) are rounded, smaller than the rest, with a few papillae on the upper surface near the edge, and about 32 on the border. The papillae are short, cylindrical, often with swollen tips.

On the succeeding segments the elytra (fig. 14 E) are larger, irregularly oval in shape, without papillae on the upper surface, and with about 18-25 papillae on the margin. The papillae are moniliform, with swollen tips, and with a granular core.

The scales on the posterior segments are of a more transversely elongate oval shape, with fewer papillae.

The first foot resembles the others except for the fact that the ventral cirrus is much larger and is fixed nearer to the median line (fig. 14 B). It rises from a conspicuously swollen base, which is thickly covered with papillae except on the inner side.

The 15th foot (fig. 14 F) is distinctly bifid, with a large spine in each branch. The dorsal lobe forms a flattened hood-like expansion over the ventral lobe, and is continued laterally along the sides of the ventral lobe towards the ventral cirrus. In this lateral region it bears a series of 6 long cylindrical papillae. Fig. 14 G shows the dorsal lobe as it appears when viewed from above. The setae are of two kinds. On each side there is a bunch of long slender serrate setae (fig. 14 L, *b*) which emerge on the ventral side of the dorsal lobe. Along the margin there is a series of short bent setae (fig. 14 L, *a*) which taper abruptly to a fine point, and have a number of teeth near the bend. These setae emerge on the dorsal side of the dorsal

lobe. This arrangement of the dorsal setae differs considerably from that found in *Pholoë minuta*. In the latter species the long dorsal setae are not collected into two lateral bunches, nor definitely distinguished from the shorter median setae, and there is a gradual transition from the one kind to the other. Moreover all the setae emerge on the upper side of the dorsal lobe.

The ventral lobe of the foot is thickly covered with papillae, which are small and globular on the lateral and ventral regions, long and cylindrical towards the tip of the foot (fig. 14 H). These long papillae form a fringe on each side of the setae. The ventral cirrus is smooth and slender, with a few globular papillae on its swollen base. The ventral lobe bears 8 compound setae. In the 15th segment these setae (fig. 14 K) have thicker stems, shorter and thicker terminal pieces than in the 1st foot (fig. 14 I). The upper setae in each foot are thicker than the lower ones. The end of the shaft is bevelled and hispid, and has a series of spines on its upper margin. The terminal piece is curved at the tip, and coarsely serrate along the edge.

The 60th foot is similar in shape, with 7 ventral setae. The lateral fringe of the dorsal lobe bears only 4 long papillae on each side.

Mature specimens were found in October.

The most remarkable character of this species is the presence of the large facial tubercle. This structure is usually indistinct or absent in species belonging to the family Aphroditidae, and is best marked in the sub-family Hermioninae (family Aphroditidae of McIntosh), and the genus *Iphione*. Quatrefages (1865, vol. i, p. 187), however, in his generic diagnosis of the genus *Pholoë*, states that a facial tubercle is present, but does not say in which species it is found, and it appears to be absent in *P. minuta* and *P. synophthalmica*.

Other characters distinguishing this species from *P. minuta* are (1) absence of papillae on the tentacular cirri, (2) more numerous papillae on the feet and ventral surface, (3) papillae on the elytra shorter, and only in one row, (4) the arrangement of the setae in the dorsal bundles, (5) shape of the ventral setae, which have stronger teeth, and shorter tips in the anterior bundles.

From *P. synophthalmica* this species differs in the presence of the facial tubercle, the absence of papillae on the tentacular cirri, the shape of the anterior ventral setae, etc. From *P. dorsipapillata* Marenzeller, it is distinguished by the absence of papillae on the dorsum, the structure of the elytra and setae, etc.

*Habitat.*—BLACKSOD BAY—Found on the shore on 4 occasions. CLEW BAY—Dredged in 9–11 fms., in *Laminaria* roots.

Family **PALMYRIDAE.****Chrysopetalum debile** (Grube).

1855. *Palmyra debilis*. Grube, p. 90. 1864. *Palmyra* (*Palmyropsis*) *Evelinae*. Claparède, p. 586. 1864. *Chrysopetalum fragile*. Ehlers, p. 81. 1906. *Chrysopetalum debile*. De St.-Joseph, p. 198. ? 1897. *Chrysopetalum occidentale*. Johnson, p. 161.

No member of the family Palmyridae has yet been recorded from the shores of the British Isles. A single specimen dredged in 24 fms. in Clew Bay belongs to the species *Chrysopetalum debile* (Grube), hitherto known from the north coast of the Mediterranean, the Gulf of Gascony, and Madeira. A closely allied, if not identical, species is *C. occidentale* Johnson, from California.

This specimen was one of the most unexpected of the remarkable group of species of Polychaeta taken at Station W. 84, on a bottom of sand and shells.

There is nothing to add to the previous accounts of this animal.

*Habitat.*—CLEW BAY—One specimen dredged in 24 fms., on a bottom of sand and shells.

*Distribution.*—Mediterranean; Madeira; ? California.

Family **PISIONIDAE.**

The genus *Pisone*, with the single species *P. Oerstedii*, was created by Grube in 1857<sup>1</sup> for the reception of a peculiar Polychaete worm collected by Kroyer at Valparaiso. He placed it in the family Phyllodocidae, which at that period included the Hesionidae, and regarded it as a transitional form between the Phyllodocidae and the Glyceridae.

Levinsen<sup>2</sup> created a new family, the Pisionidae, for its reception, without defining it.

In 1901 Ehlers<sup>3</sup> gave a full description of *P. Oerstedii*, and a new species *P. contracta*, the latter species, however, not being very clearly differentiated from the former. As regards the affinities of the family, Ehlers expresses the opinion that *Pisone* is related to various families of errant Polychaeta, such as the Aphroditidae, Nephthydidae, Hesionidae, Syllidae, and Glyceridae.

In the course of the Clare Island Survey, a number of specimens were dredged in several parts of Clew Bay, and also in Dingle Bay, which are

<sup>1</sup> *Annulata Oerstediana*. Vid. Meddel. naturh. For. Kjobenhavn, Aar. 1857, p. 174.

<sup>2</sup> Kara-Havets Ledorme. Kjobenhavn, 1886. Dijnpha-Togtes zoologisk-botaniske Udbytte, p. 292.

<sup>3</sup> Die Polychaeten des magellanischen und chilenischen Strandes. Berlin, 1901, p. 60.



evidently closely related to *Pisione*, but show differences of generic value. The members of the family Pisionidae previously known were confined to the shores of Chile and Peru.

***Praegeria remota* gen. et sp. nov.**

Pls. VII-VIII, figs. 15A-K.

No complete mature specimens of this species have been found, and consequently the dimensions of the fully grown animal cannot be stated. Moreover, by far the greater number of specimens, and especially the larger ones, are represented by fragments. A small but complete specimen measured 7 mm., and was composed of 40 setigerous segments. A larger, but incomplete specimen had 55 segments. The body is colourless or flesh-coloured, long and narrow, tapering considerably towards the tail, but very little towards the head. The segments in the middle of the body are almost as long as broad, with elongate feet projecting laterally. The body terminates behind in a button-shaped anal segment, with two long slender anal cirri 1.25 mm. long (fig. 15E).

In this species the head is so completely fused with the anterior segments of the trunk that it has lost its organic individuality. The brain can be seen as a pair of elongate lobes (fig. 15A) united in front, and stretching into the fourth setigerous segment. Just behind its middle line are two pairs of black eyes, the pair on each side being connate, with the lenses pointing in opposite directions. At the back of the brain are two additional spots of pigment. All these eyes rest directly on the brain, and cannot be considered as indicating the position of the head. In front of the brain, and probably representing the head, is a flattened four-sided lobe, pointing forward. This is surrounded on its anterior sides by the swollen bases of the buccal parapodia; but it seems to project a little dorsally. The massive bases of the buccal parapodia are fused in front of the head; but the union is marked by dorsal and ventral grooves (figs. 15B, C). Each contains a large spine, which is swollen in the middle and expanded at the tip, where it is bevelled, and in some specimens has a few blunt spines. The inner end of each spine is situated near the base of the first setigerous foot. The massive base is prolonged dorsally into a slender tapering cirrus, and beneath the base of this is a small flask-shaped cirrus. These two structures probably represent the dorsal and ventral cirri of the buccal parapodium. To the ventral surface of the buccal parapodia are attached the basal portions of a pair of long slender cirri, which are about three times as long as the dorsal buccal cirri. Their bases are enclosed by conspicuous sheaths of tissue (figs. 15C, D) through which they pass towards the ventral surface of the head above the mouth.

Ehlers (tom. cit., p. 62) is of the opinion that these structures correspond to the buccal cirri of the Polynoidae. It seems to me more probable that they are appendages of the head, homologous to the palps of the Polynoidae or Nereidae. These structures are shown in side-view in fig. 15D. The mouth appears on the ventral surface as a transverse slit, guarded behind by a crenulate lower lip. All the cirri of the body are tipped with palpcocils.

The ventral cirrus of the first setigerous foot is slender and elongate as in *Pisone*; but the dorsal cirrus of the second foot is normally shaped, whilst that of *Pisone* is long and slender.

The fifth foot is shown in fig. 15 I. The setigerous lobe is elongate, with two lobes or papillae at the tip. The dorsal and ventral cirri are spherical, attached by narrow bases, and with terminal papillae carrying palpcocils. There are two spines with curved tips, the upper one representing the reduced dorsal division of the foot. There are five setae, four of which are compound, whilst the upper one is simple. The compound setae (fig. 15G, *a*) have slightly curved shafts, which are deeply bifid at the tip, and carry a lateral projection for the articulation of the terminal piece. The latter is short and simply pointed, with a row of fine teeth. The dorsal simple seta (fig. 15G, *b*), which is present in all the feet, is thicker than the compound setae. It is expanded and bevelled at the tip, where it has a row of spines. Further behind, in the 10th, 11th, or 12th foot, a second simple seta appears beneath the dorsal one, from which it differs in having a smooth tip (fig. 15H). In the posterior segments the number of setae is reduced to four, and they are shorter and thicker than those on the anterior feet. The dorsal simple seta (fig. 15K, *a*) has lost its spines on the tip, whilst the second simple seta (fig. 15K, *b*) has a smooth, tapering tip, with no trace of expansion.

The eversible proboscis (figs. 15A, 15F) carries 14 conical papillae. The two lateral papillae on each side carry in addition a small papilla on their outer margins. Behind the papillae are the jaws. They are of a deep amber colour at the tip. Each jaw is crescent-shaped, with irregular projections, which vary in shape in different individuals.

Behind the jaws is a muscular stomach, which occupies 3-4 segments.

Females with immature ova were found in May.

This species is undoubtedly very closely related to the genus *Pisone*. Apart, however, from numerous minor differences, such as size, shape of the feet and setae, and relative proportions of the anterior appendages, there are a number of characters which justify the generic separation of this species from the two forms described by Ehlers. In the first place, the head is greatly reduced, and is apparently represented only by the four-sided prominence just behind the anterior dorsal end of the body. The eyes have

lost their connexion with the head, and are directly seated on the brain, in a very backward position. Secondly, the dorsal cirrus of the second setigerous segment, which in *Pisione* is elongate and functions as a tentacular cirrus, in the Irish species is unmodified. Thirdly, the genital papillae, so prominent in the posterior segments of *Pisione*, are absent in the Irish specimens.

The provisional diagnosis of the new genus would be as follows :—

***Praegeria*<sup>1</sup> gen. nov.**

*Pisionidae* with greatly reduced head; ventral cirrus of first setigerous segment elongate, and functioning as a tentacular cirrus; dorsal cirrus of second setigerous segment globular, as on the following segments; genital papillae absent; anterior parapodia with one, posterior parapodia with two simple setae.

The geographically isolated position of this form is indicated by the specific name *remota*. Ehlers expressed the opinion that the simple setae in the feet of *Pisione* might be only compound setae which had accidentally lost the terminal pieces, but the spinous structure of the bevelled tip in *Praegeria* shows that they are true simple setae. This is confirmed by the smooth tapering tip of the simple seta which appears in the posterior feet, and which differs widely from the shaft of the compound setae.

As regards the affinities of the *Pisionidae*, I agree with Ehlers in the opinion that they approach most nearly to the *Aphroditidae*. They resemble the sub-family *Sigalioninae* in the reduction of the head and its appendages, the forward position of the buccal segment, the shape of the compound setae, and the presence of jaws. I am of the opinion that the elongate ventral anterior cirri of the *Pisionidae* are homologous to the palps of the *Sigalioninae*, that the slender dorsal and globular median cirri, together with the swollen bases which contain the prominent spines, constitute the parapodia and cirri of the buccal segment, the whole being homologous to the segment bearing tentacular cirri in *Pholoë*, and the first setigerous segment in *Sthenelais*. The first setigerous segment in the *Pisionidae* would then be homologous to the first setigerous segment in *Pholoë* and to the second in *Sthenelais*. In all three cases the ventral cirrus of this segment is elongate and functions as a tentacular cirrus, a remarkable resemblance, which is best explained by the theory of close relationship. In the *Pisionidae*, the foot has been greatly reduced, and the former existence of the dorsal division is only witnessed by the presence of a single spine. The compound setae, however, closely resemble those of *Pholoë*. The affinities with the families *Nephtydidæ*, *Hesionidae*, and *Syllidae*, which Ehlers discusses, seem to be far more problematical and dubious.

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<sup>1</sup> This genus is named after R. Lloyd Praeger, to whom are due the initiation and organization of the Clare Island Survey.

The geographical range of this species, so widely separated from its allies on the west coast of South America, will probably be widely extended on the west European coast. It is a small species, living on a bottom of sand and shells, or gravel, and would escape capture in the dredge, unless special precautions were taken. The Clew Bay specimens were taken in a fine-meshed tow-net attached to the back of the dredge, whilst those found in Dingle Bay were obtained by carefully washing fine gravel.

It is noteworthy that the Oligochaete *Grania maricola* Southern, which was obtained on the same ground as *Praegeria remota*, has its nearest ally in South Georgia, an island of South America.

*Habitat*.—CLEW BAY—Dredged on two occasions, in 24–27 fms., on a bottom of sand and shells. Also dredged in Dingle Bay, in 19–20 fms., on a bottom of fine gravel and sand.

#### Family PHYLLODOCIDAE.

##### *Lacydonia miranda* Mar. et Bobr.

1875. *L. m.* Marion and Bobretzky, p. 57.      1887. *L. m.* de St.-Joseph, p. 314.

Twelve specimens of this peculiar Phyllocid were dredged in Clew Bay, on a bottom of sand and shells. I have nothing to add to the descriptions quoted above.

*Habitat*.—CLEW BAY—Dredged in 24 fathoms on a bottom of sand and shells.

*Distribution*.—Dinard; Mediterranean (Marseilles, Saint-Raphael).

##### *Notophyllum foliosum* (Sars).

1908. *Notophyllum foliosum*. McIntosh, p. 46.

*Habitat*.—CLEW BAY—Dredged on three occasions, in 16–28 fms.

*Distribution*.—British Isles; Scandinavian coasts; Gulf of Gascony; Marseilles; Adriatic.

##### *Eulalia bilineata* (Johnston).

1908. *Eulalia bilineata*. McIntosh, p. 50.

This species is very common in Laminaria roots, and in dredged material. Mature specimens were found in May and September.

*Habitat*.—BLACKSOD BAY—Found on the shore on eleven occasions. Dredged on six occasions in 1–8 fms. CLEW BAY—Dredged on ten occasions in various parts of the bay, in 4–28 fms. BALLYNAKILL HARBOUR—Dredged on five occasions, in 1–8 fms.

*Distribution*.—British Isles; Scandinavia; Baltic; Canaries.

**Eulalia punctifera** Grube.

1908. *Eulalia nebulosa*. McIntosh, p. 53.

This species is very rare in the district, only three specimens having been found. It was first described under the name *Phyllodoce (Eulalia) punctifera* by Grube, in 1860, and the specific name *nebulosa* was not published till 1867, by Parfitt, though it had been used in ms. by Montagu in 1808 (fide McIntosh, 1908, p. 53). Consequently the name given by Grube, which has been used by all modern writers except McIntosh, has precedence.

*Habitat*.—BLACKSOD BAY—A single specimen found under a stone on the shore on the north side of Feorinyeeo Bay. BALLYNAKILL HARBOUR—Two specimens found on the shore.

*Distribution*.—West of Ireland; south-west of England; Dogger Bank; France; Monaco; Adriatic.

**Eulalia viridis** (Müller).

1908. *Eulalia viridis*. McIntosh, p. 55.

This species is extremely common throughout the district, both in the littoral and shallow-water regions.

In addition to the type form, the *Eulalia ornata* of de Saint-Joseph (1888, p. 291) and the *Eulalia aurea* of Gravier (1897, p. 309) were frequently found in Blacksod Bay. McIntosh regards these two species as colour varieties of *E. viridis*. At any rate the colour pattern is definite and constant, and entitles these two forms to rank as distinct varieties of *E. viridis*. Another variety, with dark-green body and reddish-brown cirri, was also found in Blacksod Bay.

*Habitat*.—BLACKSOD BAY—Found on the shore on 16 occasions. Dredged in 1 fm. CLEW BAY—Common on the shores of Clare Island. Dredged on 6 occasions, in 5–17 fms. BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution*.—Widely spread on shores of North Atlantic, Arctic, and Mediterranean; South Africa; Japan.

**Eulalia tripunctata** McIntosh.

1908. *Eulalia tripunctata*. McIntosh, p. 63.

*Habitat*.—BLACKSOD BAY—A specimen found in Laminaria roots from Barranagh. Dredged in Elly Bay in 1 fm. CLEW BAY—Dredged in 9 fms. on a bottom of sandy mud.

*Distribution*.—St. Andrews; Plymouth; Channel Islands; France (Dinard).

**Eulalia macroceros** Grube.

1908. *Eulalia (Pterocirrus) macroceros*. McIntosh, p. 60.

*Habitat*.—CLEW BAY—Dredged on 2 occasions, in 5–28 fms., on a stony bottom.

*Distribution*.—Plymouth; Channel Islands; France; Mediterranean; Black Sea; ?Ceylon.

**Eulalia pusilla** Oersted.

1888. *Eulalia pusilla*. De Saint-Joseph, p. 287.

This minute species has not previously been recorded from the British Isles, but it appears to be fairly common on the Irish coast, especially in Laminaria roots.

*Habitat*.—BLACKSOD BAY—In Laminaria roots on the shore. Dredged also in 1 fm. BALLYNAKILL HARBOUR—Dredged in 2–4 fms.

*Distribution*.—France; entrance to the Baltic.

**Eumida sanguinea** (Oersted).

1908. *Eumida sanguinea*. McIntosh, p. 66.

This is one of the commonest Polychaetes round the Irish coast. It is found on the shore under stones, in Lithothamnion, and in Laminaria roots, and is very frequently dredged in shallow water. Mature specimens were found in May.

This species varies very much in colour. One well-marked variety has broad green bands alternating with narrow white ones on the dorsum. Another common form is brown in colour. A large specimen was dredged in Westport Bay, green in colour, with 29 papillae on the end of the proboscis.

*Habitat*.—BLACKSOD BAY—Found on the shore on 18 occasions. Dredged on 13 occasions, in 1–8 fms. CLEW BAY—Shores of Annagh Island. Dredged in all parts of the bay, on 14 occasions, in 4–20 fms. BALLYNAKILL HARBOUR—Found on the shore on 2 occasions. Dredged on 6 occasions, in 1–8 fms.

*Distribution*.—British Isles; shores of Europe; Arctic; Mediterranean; Black Sea; ?Virginia; Persian Gulf; Japan; New Zealand.

**Paranaitis** nom. nov.

Syn. *Anaitis* Malmgren et auct.

This generic name was first used by Duponchel<sup>1</sup> in 1844 for a group of Geometrid moths, and was only used by Malmgren in 1865. Consequently

<sup>1</sup> Duponchel. Catalogue méthodique des Lépidoptères d'Europe. Paris, 1844.

the name cannot stand for a genus of the Phyllococidae, and I suggest *Paranaitis* instead.

***Paranaitis Wahlbergi* (Malmgren).**

Pl. VIII, fig. 16.

1865. *Anaitis Wahlbergi*. Malmgren, p. 94. 1867. *A. kosteriensis*.  
Malmgren, p. 142. 1908. *A. k.* McIntosh, p. 72. 1909. *A. W.*  
Ditlevsen, p. 12.

A single specimen of this species was dredged in 18½ fms., in Clew Bay. The living animal was pale yellow in colour, with bright red bands across the back and on the cirri, especially marked in the region of the 6th–8th segments. Thus the colour pattern is very similar to that found in *Paranaitis rosea* and *P. Jeffreyssi*. The preserved animals lose the red pigment, and are pale yellow in colour.

As no accurate figures of the setae of this species have yet been published, I have drawn carefully the end of the shaft of the seta (fig. 16) to show its peculiar character. The tip is bevelled, and the main fang is deeply bifid. Sometimes the teeth are equal in size, sometimes one is slightly longer than the other. Below the main tooth, the tip of the shaft has a number of conspicuous spines.

The anal cirri are small and globose, as Malmgren figures them. The tentacular cirri have filiform tips. The first segment is prominent, and projects slightly over the head. The latter has two large eyes, with lenses.

*Habitat*.—CLEW BAY—Dredged in 18½ fms.

*Distribution*.—Donegal Bay; Sweden; Iceland; Spitzbergen; Nova Zembla; Kara Sea; Skagerrak; Kattegat.

***Paranaitis Jeffreyssi* (McIntosh).**

1908. *Anaitis Jeffreyssi*. McIntosh, p. 73.

This species has previously been found only in Valencia Harbour, and was apparently described from a single preserved specimen. I have examined a number of living specimens, and am able to supplement the description given by McIntosh.

The head is white, and the back is coloured with alternating bands of white and greenish-brown. The first and second setigerous segments are almost covered with broad dark bands of the same greenish-brown colour, which is also present on the dorsal cirri. Thus all three Irish species of this genus agree in having pigment specially concentrated on some of the anterior segments.

In preserved specimens the greenish-brown pigment is still visible,

forming bands on each side of the intersegmental grooves. It is specially pronounced in the middle and sides of the segments, so as to present the appearance of three longitudinal bands. The setae are more swollen at the tip of the shaft than McIntosh shows in his figure.

The specimens are about 15 mm. long, composed of 70 segments, but are apparently not fully grown.

*Habitat.*—BLACKSOD BAY—Dredged in 2-3 fms. CLEW BAY—Dredged on two occasions, in 5-22 fms. BALLYNAKILL HARBOUR—Dredged. Depth not known. BOFIN HARBOUR—Dredged in 1-3 fms.

*Distribution.*—Valencia Harbour.

#### ***Phyllodoce lamelligera* (Gmelin).**

1908. *Phyllodoce lamelligera*. McIntosh, p. 76.

This species is common under stones on the shore. It is rarely taken in the dredge.

*Habitat.*—BLACKSOD BAY—Found on the shore on nineteen occasions. CLEW BAY—Shores of Clare Island and Annagh Island. Dredged in Inishlyre Harbour in 4 fms., on mud. BALLYNAKILL HARBOUR—Common on the shore.

*Distribution.*—British Isles; France; Mediterranean; Japan.

#### ***Phyllodoce Paretii* (Blainville).**

1908. *Phyllodoce Paretii*. McIntosh, p. 82.

This is one of the most beautiful animals on our west coast. It is found usually under stones.

*Habitat.*—BLACKSOD BAY—Taken on the shore on twenty occasions. CLEW BAY—Dredged in  $5\frac{1}{2}$ -11 fms., near Mulranny.

*Distribution.*—South of England; Channel Islands; France; Mediterranean.

#### ***Phyllodoce groenlandica* Oersted.**

1908. *Phyllodoce groenlandica*. McIntosh, p. 86.

This species was found either in sand or in mud. It varies considerably, and is often difficult to distinguish from *P. maculata* and *P. lamelligera*, especially the form of the latter, which has the basal part of the proboscis provided with 12 regular rows of papillae.

*Habitat.*—BLACKSOD BAY—Single specimen in sand between tide-marks in Elly Bay. CLEW BAY—Dredged on 5 occasions, in 10-19 fathoms.



*Distribution.*—British Isles; France; North Sea; Scandinavia; Arctic Seas; eastern shores of North America; Japan.

**Phyllodoce maculata (L.).**

1908. *Phyllodoce maculata*. McIntosh, p. 89.

This species is common under stones on the shore, in Laminaria roots, and occasionally in sand. Mature specimens were found in March.

*Habitat.*—BLACKSOD BAY—Found on the shore on 18 occasions. Dredged on 10 occasions, in 1–8 fms. CLEW BAY—Dredged in Inishlyre Harbour, Killary Harbour, and various parts of the bay on 6 occasions, in 4–20 fms. BALLYNAKILL HARBOUR—Found once on the shore. Dredged on 5 occasions, in 1–8 fms. BOFIN HARBOUR—Dredged in 1–4 fms.

*Distribution.*—British Isles; France; North Sea; Faroë; Iceland; Arctic seas.

**Phyllodoce rubiginosa de Saint-Joseph.**

1888. *Phyllodoce rubiginosa*. De St.-Joseph, p. 282. 1908. *P. r.*  
McIntosh, p. 92. 1908. *Genetyllis hibernica*. McIntosh, p. 97.

This species is fairly common on the shore at Blacksod Bay, living under stones and in Laminaria roots. It is also frequently dredged on the west coast of Ireland down to about 30 fathoms, as in Clew Bay. I have found a number of specimens in Blacksod Bay which agree exactly with the description given by McIntosh for *Genetyllis hibernica*. The single specimen from which this species was first described was found on the coast of Galway Bay in 1868, and it has not since been recorded. The living specimens are deep yellow in colour, the cirri being especially dark. In preserved specimens the whole body changes to a cinnamon colour, the colour of the cirri, as before, being specially pronounced. This agrees exactly with the description of McIntosh. On comparing the figures of the feet and setae which he gives for *P. rubiginosa* and *G. hibernica*, it is impossible to see the slightest specific difference, the resemblance between the shape and position of the ventral cirri being very striking. A close comparison of the arrangement of the tentacular cirri of typical members of each form shows that they agree exactly. The head is small, with very large eyes, and the tentacles and tentacular cirri are short, thick, and subulate. The buccal segment, which is very indistinct and almost completely fused with the following segment, has a single cirrus on each side. The second segment has on each side two cirri and a small setigerous lobe with setae. The third segment has on each side a dorsal tentacular cirrus, a setigerous lobe with setae, and a normal

ventral cirrus. This is the typical arrangement for the sub-genus *Carobia* of the genus *Phyllodoce*, as defined by de Saint-Joseph (1888, p. 273), and differs from the genus *Genetyllis* as understood by McIntosh, which has two pairs of cirri on the buccal segment, and two pairs with setae on the second segment. Moreover, McIntosh says that his specimen of *G. hibernica* has a bluish tint on the dorsum, and has both surfaces iridescent, which agrees exactly with some specimens of *P. rubiginosa* which have been kept for some time in spirit. There is considerable variation in colour, even in the deeply pigmented specimens of *P. rubiginosa*, and the colour changes greatly when they are preserved.

*Habitat*.—BLACKSOD BAY—Found on the shore on 9 occasions. Dredged on two occasions, in 1–8 fms. CLEW BAY—Dredged on 5 occasions, in 9–27 fms. BALLYNAKILL HARBOUR—Dredged on two occasions, in 4–8 fms.

*Distribution*.—British Isles (coast of Galway, Plymouth); France.

#### ***Phyllodoce Lizziae* (McIntosh).**

1908. *Mystides Lizziae*. McIntosh, p. 110.

The genus *Mystides* is characterized by the presence of three pairs of tentacular cirri. In his description of this species McIntosh says:—"Three tentacular cirri occur on each side (on the first, second, and third segments)." The figure of the head, however (pl. Iviii, fig. 11), shows four pairs of tentacular cirri. A specimen from Berehaven, now in the Irish National Museum, was referred by McIntosh to this species, and quite distinctly it shows four pairs of cirri. The individual from Ballynakill Harbour agrees exactly with the one from Berehaven, and with McIntosh's figures, and has four pairs of cirri. I can only conclude that McIntosh made an error in observation, which was corrected by his artist. The species seems to be a typical representative of the genus *Phyllodoce*, agreeing with the sub-genus *Carobia* in the distribution of its tentacular cirri, of which one pair is on the first segment, two pairs with a spine and several setae on the second segment, and one pair with a small setigerous lobe and normal ventral cirrus on the third segment. The buccal segment forms a prominent collar round the posterior margin of the head, interrupted in the median dorsal region by the posterior portion of the head, which in this region bears a small median tentacle. The Berehaven specimen is 62 mm. long, with 135 segments; the one from Ballynakill is 24 mm. long, with 85 segments. Both specimens have regenerated tails, and the smaller one has a pair of slender cylindrical anal cirri. The dorsum and feet are marked with purple pigment, and there is a patch of the same pigment at the base of each foot on the

ventral side. The feet and setae agree closely with McIntosh's description and figures, except that the second tooth on the tip of the shaft of the setae is somewhat larger.

*Habitat.*—BALLYNAKILL HARBOUR—Dredged in 6–8 fathoms.

*Distribution.*—Berehaven; St. Andrews; off Cape Sagres.

***Mystides (Protomystides) bidentata* Langerhans.**

Pl. VIII, figs. 17 A, B.

1879 A. *M. b.* Langerhans, p. 310. 1888. *M. b.* de St.-Joseph, p. 308.

A large number of specimens of this species were obtained in a haul of the dredge in 24 fathoms in Clew Bay. They are greenish-yellow in colour, and vary in length from 5–25 mm. On the ventral surface there is a dark-brown pigment spot at the base of each foot.

The head in preserved specimens is not so long and slender as de St.-Joseph figures it. The tentacular cirri agree in arrangement with the figures of Langerhans and de St.-Joseph, but in a few of the specimens they are much longer. They have their greatest thickness at the base, and taper to a point. The segments are well marked. The feet are provided with ovate cirri, and the setigerous region is bifid, with about 8–10 setae. The ventral setae are considerably thicker than the median setae, and the terminal blades are much shorter (Pl. VIII, fig. 17 B). The dorsal setae are intermediate in these respects. The setae are slightly curved and the dilated and bevelled tip of the shaft bears two unequal claws, between which the terminal blade is fixed. In addition to the two large claws, the tip of the shaft bears a number of small spines. The terminal blade, of very variable length, tapers to a fine point, and is minutely serrate. The anal segment bears two slender cirri, swollen at the base, and tapering to a point. Between them is a long slender papilla.

A mature male, provided with swimming setae, was dredged in 16 fathoms near Bofin Harbour in June, 1899. It was 23 mm. long, and had 190 segments. The body was filled with sperm, giving it a creamy brown colour. The swimming setae are present on segments 40–157. Fig. 17 A represents a foot from the middle of the body. De St.-Joseph dredged a mature female at Dinard (1906, p. 227, foot-note) filled with green eggs, and with slender swimming setae, beginning on the 66th segment.

The generic distinctions in the family Phyllodoceidae seem to me to be somewhat arbitrary. In the present species, the ventral cirri of the second segment are much above the normal size, and should be considered as tentacular cirri. The latter structures will then have the arrangement characteristic of the genus *Phyllodoce*, sub-genus *Carobia*,

*Habitat.*—Mature male dredged in 15–16 fathoms near Bofin Harbour in June. Dredged in large numbers in Clew Bay, in 24 fathoms on a bottom of sand and shells.

*Distribution.*—Dinard; Madeira; Mediterranean (Saint-Raphael).

***Mystides (Mesomystides) limbata* de Saint-Joseph.**

Pl. VIII, fig. 18 A, B.

1888. *Mystides (Mesomystides) limbata*. De St.-Joseph, p. 310.

This species was dredged in Inishlyre Harbour and in Clew Bay. It is at once distinguished by the fan-shaped array of spines at the end of the shaft of the seta (fig. 18 B). Another distinguishing character is the winged expansion of the ventral tentacular cirrus on the second segment, though this character is much more obvious in living than in preserved specimens. The typical foot (fig. 18 A) has oval dorsal and ventral cirri and a bifid setigerous lobe with 6–9 setae. The latter are curved, and the tip of the shaft bears a single strong tooth with a fan-shaped series of spines on each side. The terminal blade is coarsely serrate and obliquely striated. The anal segment bears a pair of fusiform cirri. The proboscis has nine papillae at the tip, and is covered with large conical papillae.

De Saint-Joseph states that both mature males and females are provided with capillary swimming bristles, and this adaptation seems to be characteristic of all members of this genus. I have found a mature female with capillary setae in Galway Bay. Its proboscis was extended, and terminated in a ring of about 10 papillae. It had 44 segments, and capillary setae from the 14th to the 30th segment. De Saint-Joseph's specimens had 93 segments and capillary setae from the 35th to the 85th segment.

*Habitat.*—CLEW BAY—Dredged in 24 fathoms, on a bottom of sand and shells. Also in Inishlyre Harbour, in 2–4 fms., on a bottom of Lithothamnion.

*Distribution.*—France (Dinard, Brest).

***Mystides (Mesomystides) borealis* Théel.**

Pl. VIII, figs. 19 A–D.

1879. *Mystides borealis*. Théel, p. 35, Pl. II, figs. 29–32. 1879 A. *Mystides cacca*. Langerhans, p. 310, Taf. XVI, fig. 42. 1887. *Mystides viridis*. Webster & Benedict, p. 712, figs. 10–12. 1913. *M. c.* Fauvel, p. 53.

A single specimen of this species was found, together with a large number of other remarkable Polychaetes, in Clew Bay, in 24 fathoms (Station W. 84). I have since found two others on similar ground outside Dingle Bay, in 78

fathoms, and these specimens are partly utilized in drawing up the following description. The colour is greenish-yellow in the preserved specimens, and is especially concentrated in the cirri. The largest specimen has 38 segments and is  $5\frac{1}{2}$  mm. long. The smallest is 2 mm. long and also has 38 segments. The head is rounded in front, broader behind, and bears four long slender tentacles (Pl. VIII, figs. 19 A, B). No trace of eyes could be seen in any of the specimens. The mouth is a wide transverse opening on the middle of the ventral side of the head. Between the head and first segment on each side there is a deep ciliated groove, containing the nuchal organs. The first segment bears a single pair of tentacular cirri. On the second segment there are two pairs of cirri, the dorsal pair being somewhat the larger. All the tentacular cirri are seated on short pedicels, have swollen bases, and long filiform tips. The second segment has a well-developed setigerous lobe on each side. The third segment is normal, but has no dorsal cirri. The dorsal and ventral cirri of the following segments are round or broadly oval. The anal segment bears two large oval cirri, between which is a short papilla (fig. 19 c).

The shaft of the setae (fig. 19 D) terminates in a slightly swollen bevelled head and two long equal claws, of which only one is seen in side view. These claws are covered with spines, and between them rises the terminal blade. The latter is long and slender, minutely serrate, and with oblique striations.

This description agrees closely with that of Théel, whose specimen was  $10\frac{1}{2}$  mm. long, with 48 segments. It differs only in the absence of the two large black eyes which Théel found. In the same year that Théel described this species, Langerhans published a description of a Polychaete from Madeira which he called *Mystides caeca*. It differed from the northern form in having no eyes, thus agreeing with the Irish specimens, but this can hardly be considered a valid specific character, as the eyes often disappear in preserved specimens. In other respects the two forms are so much alike that I have no hesitation in regarding them as the same species.

The *Mystides viridis* of Webster & Benedict (1887, p. 712) appears to be this species. The authors state that they had not seen Théel's paper. The shape of the head, tentacles, tentacular cirri, feet, setae, and anal cirri all agree with Théel's species. Eyes were present on the head. The authors do not state whether setae are present on the second segment, and the figures give no information on this point.

*Habitat*.—CLEW BAY—Dredged in 24 fathoms, on a bottom of sand and shells.

*Distribution*.—Nova Zembla; Madeira; Monaco; Eastport, Maine.

***Mystides (Mesomystides) elongata* sp. n.**

Pl. V, fig. 12.

A number of badly preserved specimens were dredged in Clew Bay in 24 fms., accompanied by the remarkable fauna already noted. The same species was afterwards obtained in better condition in 20 fms. in Dingle Bay. The specimens are sometimes yellowish green when preserved, sometimes very dark green. The body is very slender and elongated, the segments being 1-2 times as long as broad, the posterior ones being more elongate than those in the anterior region. The anal region is missing in all the specimens. The largest fragment is 6 mm. long, composed of 80 segments, but the entire animal is probably considerably longer. In the 5th segment the width of the body is .11 mm., or including the setigerous lobes .25 mm. The width gradually increases to the middle of the body. The head (fig. 12A) is twice as long as broad, with rounded anterior margin. In the posterior lateral angles are two eyes composed of transversely elongated patches of brown pigment, without lenses. Rising from the anterior border of the head are 4 long, slender tentacles, the dorsal pair being slightly longer than the ventral pair. The first segment bears a single pair of long slender tapering cirri. The second segment bears two pairs of cirri, a dorsal pair slightly longer than those on the first segment, and a short ventral pair, similar to the ventral cirri of the succeeding segments. No trace of setae or spines could be found on the second segment. The third segment bears on each side a normal setigerous lobe with setae and a ventral cirrus, but the dorsal cirrus is missing in all specimens. The setigerous lobe and ventral cirrus in each segment gradually increase in size up to the fifth segment, where they attain the normal size and shape.

The normal foot (fig. 12B) has a long bluntly pointed setigerous lobe provided with a single spine and four setae. The dorsal cirri are small and fusiform. The ventral cirri are longer than the dorsal cirri, slightly swollen in the proximal half, and attached near the middle of the setigerous lobe. Towards the posterior end the ventral cirrus increases in length, and its point of attachment moves towards the tip of the setigerous lobe (fig. 12C).

The setae of this species are very characteristic. There are four in each foot, of two different types. Three of them have compound tips (fig. 12B, *b, c*). The shaft is thick, curved, and bevelled, but not swollen at the tip, which is bifid. The terminal piece is short, wide at the base, tapering to a fine point, and with very coarse striations, which give it an appearance markedly different from any other British species. The second seta from above differs from the other three (fig. 12B, *a*). The shaft is decidedly thinner, and terminates in a flattened coarsely striated expansion, which is prolonged on one side to a fine

point. The flattened tip obviously represents the terminal piece which has fused with the shaft. The fusion is not so complete in the anterior segments as it is in the posterior.

The muscular stomach occupies segments 11–13.

One of the specimens from Clew Bay, obtained in May, was a mature female, with bluish-green eggs in the body-cavity. The eggs commence in the 29th segment. No capillary setae were present, so that the specimen was probably not quite mature.

This species is characterized by the elongate body, the structure of the feet, and the unusual shape of the setae. It agrees with the sub-genus *Mesomystides* of Czerniavsky in having three pairs of tentacular cirri, one pair on the first segment, and two pairs on the second segment. It differs from other species of this sub-genus, however, in the complete absence of setae and spines from the second segment. This character, together with the peculiar structure of the setae, may eventually necessitate the creation of a new sub-genus; but till other species are known, it may well remain in the sub-genus *Mesomystides*.

*Habitat.*—CLEW BAY—Dredged in 24 fms., on a bottom of sand and shells.

Also found in Dingle Bay, in 20 fms., on a bottom of fine gravel.

#### ***Mysta barbata* Malmgren.**

1908. *Mysta barbata*. McIntosh, p. 108.

A single specimen was dredged in Blacksod Bay. In the structure of its tentacular cirri it exhibited several peculiarities. On the right side there were three cirri instead of two. On the left side the ventral cirrus had a small swelling in the middle, from which projected a normal seta. The ventral cirrus on the right side had a similar swelling, but no seta.

*Habitat.*—BLACKSOD BAY—Dredged in 3 fathoms.

*Distribution.*—Scotland; Arctic seas; Norway; Behring's Straits.

#### ***Eteone picta* Quatrefages.**

1908. *Eteone picta*. McIntosh, p. 100.

Rarely found in weeds on the shore. Common in dredged material.

*Habitat*—BLACKSOD BAY—Found on shore on two occasions. Dredged on two occasions in 1–8 fms. CLEW BAY—Dredged in Inishlyre Harbour, in 5 fms.; near Dorinish; in 10–12 fms., off Old Head. BALLYNAKILL HARBOUR—Dredged on four occasions, in 2–4 fms. BOFIN HARBOUR—Dredged in 1–4 fms.

*Distribution.*—British Isles: North Sea: western Baltic; France; Mediterranean; Black Sea.

***Eteone foliosa* Quatrefages.**

1865. *Eteone foliosa*. Quatrefages, p. 146. 1865. *Eteone pusilla* + *E. spetzbergensis*. Malmgren, p. 102. 1875. *E. caeca*. Ehlers, p. 42. 1888. *E. foliosa*. De St.-Joseph, p. 306. 1895. *E. foliosa*. De St.-Joseph, p. 226. 1896. *E. Malmgreni*. Michaelsen, p. 37. 1908. *E. spetzbergensis* + *E. pusilla*. McIntosh, pp. 104, 106.

To this species I refer a number of large specimens usually found in sand. From *Eteone arctica* it is easily distinguished by its large size, absence of setae on the second segment, and long fusiform anal cirri. Owing to the confusion of species in this genus, it is advisable to give a description of the Irish specimens.

The largest specimens are 130 mm. in length, consisting of 360 segments. For *E. foliosa*, de St. Joseph states that his largest specimen was 200 mm. long, with 353 segments. The body is cream-coloured in life, and the segments are so crowded together that the setigerous lobes and cirri are in close contact. The length of the head is about equal to its width at the posterior margin, which is much wider than the front end. A pair of eyes is always present; but in preserved specimens they are apt to be concealed by the opaque overlying tissues. The tentacles are short and subulate, the ventral pair being placed behind the dorsal. The dorsal tentacular cirri are shorter than the ventral pair. The second segment has no setae or setigerous lobe, and bears only a flattened ventral cirrus on each side, as described by de St.-Joseph for *E. foliosa*. The setigerous lobe in the normal foot is bifid, the ends being rounded. In the anterior segments the dorsal and ventral cirri are in close contact with the setigerous lobe; but in the posterior segments the dorsal cirrus is carried on an elongated broad pedestal, and does not touch the setigerous lobe. The longer diameter of the dorsal and ventral cirri is horizontal, and the distal ends are rounded, but occasionally they taper to a rounded tip. In the typical setae the shaft is slightly dilated at the tip, and terminates in two unequal teeth. The end of the shaft is deeply bifid, and the sides and bases of the two claws are covered with spines. The smaller tooth shows varying degrees of development and is very short in the anterior feet. The various shapes represented by McIntosh (1910, Pl. lxxviii, figs. 16, 16a, 16b, 17) for *E. spetzbergensis* and *E. pusilla* may all be seen in a single foot.

The anal segment bears two long conical cirri, swollen at the base, and tapering gradually to a point.



This species is clearly identical with the *Eteone foliosa* Quat., described by de St.-Joseph (tom. cit.). I have examined specimens in the Paris Museum, named by him, and there is no doubt of the identity. I am unable to distinguish between the *E. pusilla* and *E. spetzbergensis* as described and figured by Malmgren and McIntosh. Both species agree in the shape of the feet, anal cirri, and setae. The *E. caeca* of Ehlers appears to be a young specimen of this species, with which it agrees in the shape of the head, absence of setae on the second segment, and the condition of the feet and setae. No information is given as to the anal cirri; and the absence of eyes in the preserved specimen has no significance. *E. caeca* was obtained near Galway, not far from the district where the present specimens were found.

The correct name for this species seems to be doubtful. Michaelsen (1896, p. 37) has pointed out that the *E. pusilla* of Malmgren differs in several points from the *E. pusilla* of Oersted, and gave the name *E. Malmgreni* to Malmgren's species. The name *E. foliosa* given by Quatrefages in 1865 has, however, clearly a better claim; and as it has been adequately described by de St.-Joseph, I have adopted it here. The only other alternative is the *E. spetzbergensis* of Malmgren, published in 1865, the same year as Quatrefages published his description of *E. foliosa*; and the identity of the two species being still doubtful, *E. foliosa* seems to have the stronger claim.

A specimen in the Irish National Museum, from Norway, labelled *Eteone fucata* Sars, is identical with *E. foliosa*. The species of Sars, however, judging from his description and figures (1873, p. 26, Pl. xv, figs. 1-6), is quite distinct, being closely related to, if not identical with, *Eteone picta* Quat.

Doubtless a number of other species of *Eteone* are synonymous with *E. foliosa*; and a revision of the species found in the North Atlantic, based on the large amount of material now accumulated, is desirable. Too much attention has been paid to small variations in the shape of the head, feet, and setae, and too little attention given to really valuable characters, such as the condition of the second segment, and the shape of the anal cirri. Only in the case of *E. foliosa* and *E. caeca* is any information given as to the presence or absence of setae on the second segment. The various figures given by Malmgren, Théel, McIntosh, and other observers, of what is supposed to be the same species, afford no evidence for thinking that their identifications are reliable or final.

Two small specimens dredged in 5½-11 fms. in Clew Bay, and one specimen dredged in 7-8 fms. in Blacksod Bay, seemed at first to belong to a new species, but further consideration has led me to believe that they

may represent young specimens of the present species. The Clew Bay specimens resemble *E. arctica* in appearance; but they differ from that species in having no setae but only a spine on the second segment, in having slender elongate conical anal cirri, and broader and more foliate dorsal and ventral cirri. The head is longer and more attenuated in front than in the typical form, and the segments are more distinct. The ventral cirrus in the anterior segments is relatively much larger and is attached nearer to the tip of the setigerous lobe. The claw on the end of the shaft of the seta is more prominent.

The Blacksod specimen, which seems somewhat older, tends more towards the type, though the second segment is provided with a spine on each side. The head is wider, the segments closer together, and the dorsal and ventral cirri more foliate.

The presence of the spines in the second segment is the chief character distinguishing these three specimens from *E. foliosa*. It is possible that this is a juvenile character, and that the spine falls out as the worms grow older.

*Habitat*.—BLACKSOD BAY—Found on the shore on five occasions. Dredged on two occasions in 3-8 fms. CLEW BAY—Dredged on four occasions, in 5-26 fms. Dredged in Killary Harbour, in 6-7 fms., on mud.

*Distribution*.—British Isles; France; Scandinavia; Arctic; eastern North America.

#### *Eteone arctica* Malmgren.

1908. *Eteone arctica*. McIntosh, p. 102.

The specimens referred to this species have the following characters. The body is 20-23 mm. in length, composed of about 112 segments. The latter are longer and narrower in proportion than those of *E. pusilla*, and the feet on each side are widely separated from each other. The head tapers in front, and bears two black eyes on its posterior margin. The tentacular cirri are short, the ventral being longer than the dorsal.

The second segment bears a well-developed setigerous lobe, with setae, and a ventral cirrus. The anal segment has two short spatulate cirri, usually of a dark brown colour. The dorsal and ventral cirri are small and ovate, and the dorsal cirrus is not in contact with the setigerous lobe. The principal tooth on the tip of the shaft of the seta is not much larger than the secondary tooth, and the base of each is markedly spinous. Preserved specimens have a variable amount of brown pigment. There seems to be no valid distinction, in the figures given by Malmgren, between this species and *E. Lilljeborgi*, *E. islandica*, *E. Leuckarti*, *E. Sarsi*, and *E. lentigera*, and a further examination of these reputed species is necessary.

*Habitat.*—BLACKSOD BAY—A single specimen, dredged in 3 fms.

*Distribution.*—Great Britain (Southport and St. Andrews); Greenland; Spitzbergen; Siberia; Behring's Strait.

**Eteone depressa** Malmgren.

1865. *Eteone depressa*. Malmgren, p. 103. 1912. *E. d.* McIntosh, p. 119.

A single specimen, found in sand in Blacksod Bay, agrees almost exactly with the species recently described by McIntosh as *Eteone depressa* Malmgren. It is much smaller, however, being only 20 mm. long, with 130 segments, whereas McIntosh's specimen was 80 mm. long. Such slight differences as occur are probably due to difference in age and size. The colouring agrees exactly with McIntosh's description. The head is more sharply marked off from the buccal segment. The dorsal tentacular cirri are shorter than the ventral pair. This species agrees with *E. arctica* in having a well-developed setigerous lobe and setae on the second segment, in the shape of the short spatulate anal cirri, and the form of the setae. The structure of the foot is somewhat different, the dorsal cirrus being broader and more pointed at the tip. These differences are very slight, and I am doubtful whether this form deserves specific rank. The use of this specific title by Malmgren, Théel, McIntosh, Fauvel, and others seems very arbitrary.

A specimen agreeing with the above description was found in sand in Dublin Bay.

*Habitat.*—BLACKSOD BAY—A single specimen in sand.

*Distribution.*—England (Scarborough); Spitzbergen; Greenland; Nova Zembla; Murman Sea.

Family **TOMOPTERIDAE**.

**Tomopteris helgolandica** Greeff.

1911. *Tomopteris helgolandica*. Southern, p. 8.

A full account is given in the above paper of the distribution of this species in Irish waters. It was not found in Blacksod Bay. In Clew Bay it was found on 4 occasions. Within a radius of 15 miles of Inishbofin, including Ballynakill Harbour, it was found on 53 occasions.

This species is widely spread in the Atlantic and Mediterranean, and probably occurs in the Pacific.

Family **NEREIDAE**.

Two species of this family known to occur in Irish waters were not found in the Clare Island area, viz., *N. zonata* Malmgren, a northern species found

in the Irish Sea, and *N. Schmardaei* Quat., a southern species found in Galway Bay.

***Nereis pelagica* L.**

1910. *Nereis pelagica*. McIntosh, p. 267.

This species is very abundant throughout the area, ranging from tide-marks down to 25 fathoms. Heteronereis stages were found in February and March. An unmodified female, with the body-cavity full of eggs, was found in Blacksod Bay in March. Young specimens were found in September. A number of Heteronereids of this species was obtained from the stomach of the Spur Dogfish (*Acanthias vulgaris*) taken off High Island, in February, 1902.

*N. pelagica* is commonly found under stones, in weeds and Laminaria roots, and in the sand of Zostera beds.

*Habitat*.—BLACKSOD BAY—Taken on the shore on 24 occasions. Dredged in 1 fm. CLEW BAY—Common on east and south shores of Clare Island, under stones, in Lithothamnion, etc. Dredged on 11 occasions in the bay, in 5–20 fms. Dredged between Dorinish and Inishimmel. Dredged in 44 fms., 3 miles south-west of High Island. Dredged in 42 fms., 1½ mile north of High Island. BALLYNAKILL HARBOUR—Dredged in 6–9 fms.

*Distribution*.—Shores of Atlantic, Mediterranean, Arctic, and Pacific oceans.

***Nereis cultrifera* Grube.**

1910. *Nereis cultrifera*. McIntosh, p. 280.

This species is commonly found between tide-marks in all parts of the area. It is very seldom taken in the dredge, and I have never found it below 3 fms.

No Heteronereis stages of this species were found, and it is apparently very rare. The only one McIntosh mentions in his Monograph (1910, p. 288) was an Irish specimen. An unmodified female, full of eggs, was found in Blacksod Bay in March.

This species is usually found in the sand under stones, and especially in the sand of Zostera beds.

*Habitat*.—BLACKSOD BAY—Taken on the shore on twenty-one occasions. Dredged in ½–3½ fms. CLEW BAY—East shore of Clare Island. BALLYNAKILL HARBOUR—Dredged in 1 4 fms., on 4 occasions. Found on the shore on 3 occasions. BOFIN HARBOUR—Found on the shore.

*Distribution.*—British Isles; western Europe; Madeira; Canaries; Mediterranean; Black Sea; Red Sea; Persian Gulf; Japan; Philippines.

**Nereis Dumerilii** Aud. and Edw.

1910. *Nereis Dumerilii*. McIntosh, p. 302.

This species is extremely common throughout the area. It is one of the most abundant species round the Irish coast, living between tide-marks and down to about 25 fathoms. I have observed it secrete a transparent tube with great rapidity.

The Heteronereis stage has been taken frequently in the surface tow-net. On the 13th of May, 1902, in Fahy Bay, Mr. G. P. Farran observed a swarm of Heteronereids swimming round the ship at 9.30 a.m. They were all males. Females with the body-cavity full of eggs have been found, some in the Heteronereis condition, whilst others had not undergone metamorphosis. The Heteronereis stage is most frequently found in March to June, but they have been found also in August. A number were found living in tubes attached to Laminaria roots trawled in 16 and 20 fathoms. Heteronereids and young forms were taken in the surface tow-net in Inishlyre Harbour in May.

*Habitat.*—BLACKSOD BAY—Taken on the shore on 15 occasions. Dredged on 21 occasions in  $\frac{1}{3}$ –9 fms. CLEW BAY—Shores of Clare Island, and Annagh Island. Dredged in various parts of the bay on 15 occasions, in 5–21 fms. Dredged in Inishlyre and Killary Harbours. BALLYNAKILL HARBOUR—Dredged on 16 occasions, in 1–9 fms. BOFIN HARBOUR—Dredged on 4 occasions, in 1–4 fms. CLEGGAN BAY—Dredged in 5–10 fms. Dredged  $\frac{1}{2}$  mile off Cleggan Head, in 15 fms.

*Distribution.*—Shores of North Atlantic; Mediterranean; Japan; Persian Gulf.

**Nereis diversicolor** O. F. Müller.

1910. *Nereis diversicolor*. McIntosh, p. 312.

This species occurs locally all round the Irish coast, especially in places where there is a large admixture of fresh water.

*Habitat.*—BLACKSOD BAY—Found on 2 occasions on the north side of Feorinyeeo Bay. CLEW BAY—Common in the muddy flats at the head of the bay, and at Achill Sound.

*Distribution.*—British Isles; Scandinavia; North Sea; Baltic; Japan; Adriatic; east North America.

**Nereis longissima** Johnston.

1910. *Nereis longissima*. McIntosh, p. 325.

The Heteronereis stage of this species was taken in the surface tow-net at night in the month of May, in Inishlyre Harbour. The species is not common.

*Habitat*.—BLACKSOD BAY—A single specimen found in sand on the shore.  
CLEW BAY—Three specimens, two of them Heteronereids, taken in Inishlyre Harbour.

*Distribution*.—British Isles; Greenland; North Sea; Mediterranean.

**Nereis (Nereilepas) fucata** Savigny.

1910. *Nereis fucata*. McIntosh, p. 336.

This species shares empty shells, usually those of *Buccinum undatum*, with the Hermit-crab *Eupagurus Bernhardus*, occupying the upper whorls of the shell.

*Habitat*.—BLACKSOD BAY—Dredged on 8 occasions, in 3–9 fms. CLEW BAY—Dredged in 18 fms., east of Clare Island.

*Distribution*.—British Isles; North Sea; English Channel; Mediterranean; east North America.

Family **NEPHTHYDIDAE**.**Nephtys caeca** (O. F. Müller).

1908. *Nephtys caeca*. McIntosh, p. 8.

This species is common on the shore under stones, in sand, and in *Zostera* beds. The variety *ciliata* (McIntosh, 1908, p. 13) was occasionally found in sand in Blacksod Bay.

*Habitat*.—BLACKSOD BAY—Found on the shore on 12 occasions. Dredged in 2 fms. BALLYNAKILL HARBOUR—Found frequently on the shore. BOFIN HARBOUR—On the shore.

*Distribution*.—British Isles; coasts of Europe; Arctic seas; Puget Sound; Japan; east coast of Canada.

**Nephtys Hombergii** Lamarek.

1908. *Nephtys Hombergii*. McIntosh, p. 17.

This species is common on the shore under stones, in sand, mud, and *Zostera* beds. It is frequently dredged on clean or muddy sand, or in mud. The variety *vasculosa* was dredged several times in Clew Bay.

*Habitat.*—BLACKSOD BAY—Found on the shore on sixteen occasions. Dredged on seven occasions, in 2-9 fms. CLEW BAY—Dredged on sixteen occasions in various parts of the bay, in 4-26 fms. BALLYNAKILL HARBOUR—Dredged in 1-2 fms.

*Distribution.*—British Isles; Atlantic; Arctic; Mediterranean; Black Sea; South Africa.

***Nephtys ciliata* (O. F. Müller).**

1908. *Nephtys ciliata*. McIntosh, p. 23.

This species was always found in sand. Mature specimens were found in March. In this month also some examples were taken in the surface tow-net at night.

*Habitat.*—BLACKSOD BAY—Found on the shore on five occasions. Taken once in the surface tow-net. CLEW BAY—Shore of Clare Island, near the harbour. Dredged on three occasions, in 11-19 fms.

*Distribution.*—Co. Dublin; Scotland; France; North Sea; Scandinavia; Arctic shores; Canada; Behring's Straits; Japan.

***Nephtys hystricis* McIntosh.**

1908. *Nephtys hystricis*. McIntosh, p. 27.

This species was usually found in mud, but occasionally in sand. It was very abundant in the rich mud in Killary Harbour.

*Habitat.*—BLACKSOD BAY—A single specimen found in sand. CLEW BAY—Only found in the mud in Killary, Inishlyre, and Inishgowla Harbours, in 4-18 fms.

*Distribution.*—Ireland; East Atlantic; Norway; Azores; Mediterranean.

***Nephtys cirrosa* Ehlers.**

1908. *Nephtys cirrosa*. McIntosh, p. 36.

This species is easily recognized by the presence of the abruptly bent serrate setae, described and figured by de Saint-Joseph (1894, p. 20, Pl. I, fig. 19). It is usually found in clean sand.

*Habitat.*—BLACKSOD BAY—Found on the shore on six occasions. CLEW BAY—Dredged on three occasions, in 10-26 fms.

*Distribution.*—Ireland; south of England; Channel Islands; France; Norway; east coast of North America; Magellan Straits.

***Nephtys longisetosa* Oersted.**

1908. *Nephtys longisetosa*. McIntosh, p. 29.

This species is rare in the district, being only found on one occasion.

*Habitat.*—CLEW BAY—Dredged in 21 fms.

*Distribution.*—Ireland (Nymph Bank); Scotland; Farøe Channel; North Scandinavia; Arctic; east coast of North America; Magellan Straits.

Family **EUNICIDAE.**

***Ophryotrocha puerilis* Clap. and Mecz.**

1910. *Ophryotrocha puerilis*. McIntosh, p. 364.

This minute species is fairly common in *Laminaria* roots, and in material dredged in shallow water.

*Habitat.*—BLACKSOD BAY.—Found on 2 occasions on the shore in *Laminaria* roots. Dredged on three occasions in 1–8 fms.

CLEW BAY.—Dredged on three occasions in 13–24 fms.

*Distribution.*—Ireland; south coast of England; France; Mediterranean.

***Staurocephalus rubrovittatus* Grube.**

1910. *Staurocephalus rubrovittatus*. McIntosh, p. 353.

This species is fairly common on the shore at Blacksod, and in Clew Bay. It lives under stones and in *Laminaria* roots.

*Habitat.*—BLACKSOD BAY.—Found on the shore on 10 occasions. Dredged in 1 fm. CLEW BAY.—Dredged on 9 occasions in 9–28 fms.

*Distribution.*—South coast of England; France; Finmark; Mediterranean; Black Sea.

***Staurocephalus kefersteini* McIntosh.**

1910. *Staurocephalus kefersteini*. McIntosh, p. 358.

Living specimens of this species are of a bright red colour.

*Habitat.*—BLACKSOD BAY.—Two specimens found on the shore. CLEW BAY.—Two specimens dredged in 24 fms., south of Clare Island, on a bottom of sand and shells. BALLYNAKILL HARBOUR.—Two specimens taken in the surface tow-net.

*Distribution.*—Scotland.

***Staurocephalus pallidus* Langerhans.**

1910. *Staurocephalus pallidus*. McIntosh, p. 363.

This species is rare in the district, only being taken on one occasion.

*Habitat.*—CLEW BAY.—Three specimens dredged in 21 fms., 2 miles north-east of Clare Island, on fine gravel.

*Distribution.*—Plymouth; Dinard; Madeira.



**Lumbriconereis Latreillii** Aud. and Edw.

1910. *Lumbriconereis Latreillii*. McIntosh, p. 376.

This species is fairly common on the shore in Blacksod Bay, living under stones. A specimen 300 mm. long was found living in sand.

*Habitat*.—BLACKSOD BAY.—Found on the shore on 7 occasions. CLEW BAY—Dredged on 8 occasions, in  $4\frac{1}{2}$ –19 fms.

*Distribution*.—British Isles; south of England; Channel Islands; France; North Sea; Mediterranean; Japan.

**Lumbriconereis impatiens** Claparède.

1910. *Lumbriconereis impatiens*. McIntosh, p. 379.

This species is characteristic of a bottom of clean sand, and is very common on the trawling ground in Clew Bay.

According to McIntosh, this species is characterized by the presence of long hooks in the first foot, whilst in *L. fragilis* (Müller) the hooks appear in the 21st foot. In the Irish specimens the first hook appears usually in the 4th or 5th segment, as in specimens from Plymouth. *L. fragilis* has a northern distribution, whilst *L. impatiens* is a southern form ranging to the Mediterranean. I am inclined to think that further research will show that these two forms are identical, the Irish specimens being intermediate both in structure and geographical position. McIntosh states that the spines in both species are black, whilst de Saint-Joseph (1898, p. 281) found those of *L. impatiens* to be yellow. The figures of the dental apparatus of *L. impatiens* given by McIntosh and de Saint-Joseph do not seem to agree at all, the figure of the latter author agreeing better with McIntosh's figures for *L. fragilis*.

*Habitat*.—CLEW BAY—Dredged on 9 occasions, in 5–42 fms.

*Distribution*.—British Isles; France; Naples.

**Lumbriconereis gracilis** Ehlers.

1910. *Lumbriconereis gracilis*. McIntosh, p. 385.

This species is found on a bottom of clean sand, gravel, and rock, or on muddy sand. Mature specimens were found in August.

*Habitat*.—CLEW BAY—Found on 13 occasions in various parts of the bay, in 5–27 fms. BALLYNAKILL HARBOUR—Dredged on 3 occasions, in 1–9 fms.

*Distribution*.—British Isles; off Cape Finisterre; Norway; Madeira; Mediterranean; Adriatic.

**Arabella iricolor** Montagu.

1910. *Arabella iricolor*. McIntosh, p. 395.

This species is fairly common in Blacksod Bay, where it lives under stones on the shore, and especially between the layers of schist. It is also occasionally found in Laminaria roots and in the sand of Zostera beds.

*Habitat*.—BLACKSOD BAY—Found on the shore on 10 occasions.

*Distribution*.—South coast of England; Channel Islands; France; Canaries; Naples; South Africa; Japan; Juan Fernandez; Straits of Magellan; Persian Gulf.

**Notocirrus scoticus** McIntosh.

1910. *Notocirrus scoticus*. McIntosh, p. 400.

A single specimen only of this species was found in Clew Bay, on a bottom of sand.

*Habitat*.—CLEW BAY—Dredged in 16-17 fms., 4 miles east of Clare Island.

*Distribution*.—Hebrides; Irish Sea, off Peel.

**Onuphis britannica** McIntosh.

1910. *Onuphis britannica*. McIntosh, p. 404.

Mature specimens were found in May. This species lives on a bottom of sand or sandy mud.

*Habitat*.—CLEW BAY—Dredged on 10 occasions in various parts of the bay, in 7-19 fms.

*Distribution*.—British Isles; Ceylon? Probably frequently recorded as *Onuphis conchylega* Sars.

**Hyalinoecia sicula** (Quatrefages).

1910. *Hyalinoecia sicula*. McIntosh, p. 417.

This species is a characteristic member of the fauna found on a bottom of sand, muddy sand, or gravel—a fauna which is comparatively rich in species of the Family Eunicidae. It was frequently found in Clew Bay.

In his definition of the genus *Hyalinoecia*, McIntosh (1910, p. 417) states that the body terminates in two long anal cirri, whereas there are four—two long and two short.

*Habitat*.—CLEW BAY—Dredged on eight occasions in 10-21 fms., in various parts of the bay.

*Distribution*.—British Isles; Mediterranean; Gulf of St. Lawrence.

***Marphysa fallax* Marion and Bobretzky.**

Pl. VIII, fig. 20.

1875. *Marphysa fallax*. Marion and Bobretzky, p. 14. 1888. *M. f.*  
de Saint-Joseph, p. 205.

A single specimen of this species was found under a stone on Barranagh, Blacksod Bay. It has been found by Marion and Bobretzky at Marseilles, and by de Saint-Joseph at Dinard. The specimen was 31 mm. long, consisting of 100 setigerous segments. The distinctive colouring was not retained by the preserved specimen. The head is well represented by the figure of Marion and Bobretzky (tom. cit., fig. 1A), but in the Irish specimen the anterior margin of the head is more deeply indented.

The feet gradually increase in size up to the 14th segment, where the first branchial filament appears. The feet differ in certain definite points from the description of Marion and Bobretzky. There is a single branchial filament on 13 feet (14-26); the succeeding 34 feet (27-60) have two filaments. Then follow 20 feet (61-80) with again a single filament, and finally the posterior 20 feet are without branchiae. According to Marion and Bobretzky there are only 3 or 4 anterior segments with a single filament, 19 with two filaments, and then 10 with a single filament. In de Saint-Joseph's specimen, which was a young form, no branchia had more than a single filament. Marion and Bobretzky found that the branchial filaments only slightly exceeded the dorsal cirrus in length, whereas, in the mid-region of the Irish specimen, they are 4-5 times as long. There are three spines in the ventral division of the foot, and one slender spine in the dorsal division.

The compound setae with the bifid tips were found only in a few of the anterior feet, and never more than two in each foot.

Neither Marion and Bobretzky nor de Saint-Joseph say anything about the anal segment of this species. In the Irish specimen this segment is funnel-shaped (fig. 20) with lobed border, and has four pairs of cirri of different sizes on its ventral margin. Further observations on this species will probably clear up any discrepancies between this specimen and those of the previous observers.

*Habitat*.—BLACKSOD BAY—Under a stone on the shore of Barranagh.

*Distribution*.—Dinard; Marseilles.

***Marphysa sanguinea* (Montagu).**

1910, *Marphysa sanguinea*. McIntosh, p. 442.

A single specimen was found on the shore in Ballynakill Harbour.

*Habitat*.—BALLYNAKILL HARBOUR—On the shore.

*Distribution*.—South of England; Channel Islands; France; Mediterranean; eastern North America; South Africa; West Indies.

**Marphysa Belli** (Aud. and Edw.).

1910. *Marphysa Belli*. McIntosh, p. 448.

Two specimens were found on the shore of Bofin Harbour.

*Habitat*.—BOFIN HARBOUR—On the shore.

*Distribution*.—South of England; Channel Islands; France; Mediterranean; eastern North America; West Indies.

**Nematonereis unicornis** (Grube).

1910. *Nematonereis unicornis*. McIntosh, p. 453.

The posterior end of a single specimen was taken in Clew Bay, on a bottom of sand and rock.

*Habitat*.—CLEW BAY—Dredged in 18 fms., east of Clare Island.

*Distribution*.—South coast of England; Channel Islands; France; Mediterranean; Madeira; Canaries; Cape Town?; Cape Verde Islands; Ceylon; Pernambuco.

**Lysidice punctata** (Risso).

1910. *Lysidice punctata*. McIntosh, p. 456.

This species, better known as *L. ninetta*, is common under stones on the shore, and in crevices of the schist, and young specimens are often found in Laminaria roots. On one occasion a specimen was found in the sand of a *Zostera* bed.

*Habitat*.—BLACKSOD BAY—Found on the shore on 15 occasions. CLEW BAY—Dredged on two occasions in 5–11 fms.

*Distribution*.—West of Ireland; south coast of England; Channel Islands; France; Madeira; Canaries; Mediterranean; Black Sea; Red Sea.

Family **SPHAERODORIDAE**.

**Ephesia gracilis** Rathke.

1911. *Ephesia gracilis*. Fauvel, p. 15.

This species is widely spread throughout the district, living rarely in the littoral region, and more commonly in shallow water.

Mature specimens were found from July to October. On three occasions mature specimens were taken in the surface tow-net at night.

*Habitat*.—BLACKSOD BAY—Found once on the shore. Dredged on 8 occasions, in 1–9 fms. CLEW BAY—Dredged on 6 occasions, in 13–26 fms. BALLYNAKILL HARBOUR—Taken in the surface tow-net at midnight.

*Distribution*.—Great Britain; Arctic; Scandinavia; North Sea; France Mediterranean; eastern North America; ? California; South Africa.

***Ephesia peripatus* (Claparède).**

1911. *Ephesia peripatus*. Fauvel, p. 17.

This species is not so common as *E. gracilis*. It is, as a rule, considerably smaller than that species. A mature female, 7.5 mm. long, was taken at midnight, in the surface tow-net, in Ballynakill Harbour. It contained 40 large eggs, resembling those found in the species of *Sphaerodorum*. Mature in July.

*Habitat*.—BLACKSOD BAY—Found twice on the shore, in weeds and Laminaria roots. Dredged in 2 fms. CLEW BAY—Dredged in 24 fms. BALLYNAKILL HARBOUR—Dredged on 2 occasions, in 2–8 fms. Taken once in the surface tow-net at midnight.

*Distribution*.—South of England; France; Kara Straits; Mediterranean.

***Sphaerodorum Claparedii* Greeff.**

1866. *Sphaerodorum Claparedii*. Greeff, p. 338.<sup>1</sup>

A number of specimens were found in Blacksod Bay and Ballynakill Harbour which agree with Greeff's species in having six rows of papillae on the dorsum, and in the structure of the head. A number of differences were noted, which probably result from the imperfect description of Greeff's species. Of these the chief are:—(1) There is a conspicuous median ventral papilla on the anal segment, such as occurs in other species of the genus, but is not mentioned or figured by Greeff. (2) There is a short cylindrical median tentacle in front of the eyes. (3) Greeff states that, in addition to the 6 rows of large papillae on the dorsum, there are four rows on the ventral surface. In the Irish specimens there are no large papillae on the ventral surface, but only the smaller papillae such as are scattered irregularly over the dorsal surface. Of these there are on the ventral surface rows of 4 papillae between the parapodia, alternating with rows of 6 papillae, with other smaller papillae irregularly arranged. (4) The number of segments is much smaller. Greeff says that there are 18 segments, of which 16 are setigerous. I found only 12 setigerous segments, and one mature male specimen had only 8.

There are two reddish-brown eyes on the buccal segment. The spaces between the four inner rows of dorsal papillae are less than the space between the two outer rows on each side. When the stomach is everted, it carries the eyes with it, and they then lie on its dorsal surface.

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<sup>1</sup> A translation of this paper was published in *The Annals and Magazine of Natural History* (3), vol. xx, 1867, p. 1.

Mature specimens were found in April and September.

This species does not appear to have been recorded since Greeff found it at Dieppe, in the oyster-basin of that town, in 1865.

*Habitat.*—BLACKSOD BAY—Found once on the shore, in weeds. Dredged on 2 occasions, in 1-3 fms. BALLYNAKILL HARBOUR—Taken in the surface tow-net.

*Distribution.*—Dieppe.

***Sphaerodorum minutum*** (Webster and Benedict).

Pl. IX, figs. 21A-E.

1887. *Ephesia minuta*. Webster and Benedict, p. 728. 1913. *S.m.* Fauvel, p. 37.

This species has previously been found only at Eastport, on the east coast of the United States, and to the north of Spitzbergen, and has been very inadequately described and figured. In view of this uncertainty a full description of the Irish specimens is desirable.

Eleven specimens in all are available. They are small and broad, 2-3 mm. long, consisting of 17-22 setigerous segments. The ventral surface is flat and narrow, the dorsal surface almost rounded. The head (figs. 21A-B) is narrow in front, and is covered with papillae. On the anterior border are four tentacles, two dorsal and two ventral. The basal portion of the tentacles is covered with cylindrical papillae. Behind the paired tentacles there is a short thick median tentacle. The buccal segment carries a pair of cylindrical tentacular cirri. In some specimens these cirri have a number of cylindrical papillae round the base; in others these papillae are absent. The head is covered with papillae, in some specimens spherical, in others cylindrical, possibly depending on the state of preservation and contraction. Behind, and dorsal to, the tentacular cirri is a pair of large eyes, composed of lenses and dark reddish-brown pigment.

Each segment carries a row of 10-12 large globular papillae on the dorsum, in a line with the parapodia. Numerous smaller papillae of various sizes are scattered over the body. There are none of the large papillae on the ventral surface, but only the smaller papillae, arranged in no very definite manner.

The anal segment (fig. 21c) has two large globular lateral papillae and a long median cylindrical papilla. The anus is on the dorsal side.

The parapodia (fig. 21D) consist of a rounded setigerous lobe, with a pointed spine, and 4-9 compound setae. There is a large cylindrical ventral cirrus and a similar slightly smaller papilla on the anterior face of the setigerous lobe. In addition there are several spherical papillae on or near the

parapodium. When looked at from above, the foot seems to be bifid, this appearance being caused by the two cylindrical papillae. The setae (fig. 21 $\epsilon$ ) are slightly curved. The tips of the shafts are swollen and bevelled, with a row of minute serrations along one edge. The terminal pieces are of medium size, curved at the tip.

The barrel-shaped stomach (fig. 21A) occupies 2½-3 segments. It is dark in colour, furrowed along one side, and transversely striated. It is frequently everted in preserved specimens. The anterior margin is smooth, with a thickened rim.

Mature specimens of both sexes were found in June, July, and August. They were usually taken in the surface tow-net at night.

I have compared the Irish specimens with a number of individuals of *Ephesia minuta*, named by Webster and Benedict, belonging to the United States National Museum, and with others in the Museum of the Union College. All the American specimens had been collected at Eastport, Maine. I was unable to find any distinction of specific value between the Irish and American specimens. Webster and Benedict state that the stomach occupies four segments. An examination of the American specimens showed that this character is very variable, depending on the degree of contraction of the individual, and the number of segments occupied by the stomach ranged from three to six. In the Irish specimens the usual number of segments was three. The median tentacle, which the American naturalists describe as placed "between the eyes," is really at some distance in front of them. The "reddish purple" corpuscles noted in the body-cavity are eggs.

*Habitat*.—BLACKSOD BAY—A single specimen in Laminaria roots from Barranagh. CLEW BAY—Dredged in 24 fms., on a bottom of sand and shells. BALLYNAKILL HARBOUR—Taken in the surface tow-net at night on four occasions. Dredged on two occasions, in 2-8 fms.

*Distribution*.—Eastport, Maine, U.S.A.; Spitzbergen.

#### Family GLYCERIDAE.

##### *Glycera lapidum* Quatrefages.

1910. *Glycera lapidum*. McIntosh, p. 477.

This species was not found in Blacksod Bay. It is a characteristic member of the fauna living on the trawling grounds near Clare Island, that is to say, on a bottom of sand.

*Habitat*.—CLEW BAY—Dredged on ten occasions, in 11-28 fms. BOFIN HARBOUR—Dredged outside the harbour, in 15-16 fms.

*Distribution.*—British Isles; Scandinavia; North Sea; France; Spain; Mediterranean; Azores; west coast of North America.

***Glycera Ehlersi* Arwidsson.**

1910. *Glycera Ehlersi*. McIntosh, p. 481.

This species is very abundant in Clew Bay, living on a sandy bottom. It is easily distinguished by its long slender head, composed of many rings, and by the large dorsal cirrus placed close to the setigerous lobe.

*Habitat.*—CLEW BAY—Dredged on five occasions, in 10–19 fms.

*Distribution.*—Scotland; France (St. Malo).

***Glycera siphonostoma* (Delle Chiaje).**

1910. *Glycera siphonostoma*. McIntosh, p. 482.

I have only found this species in gravel or coarse shelly sand.

*Habitat.*—BLACKSOD BAY—In coarse sand on Carrigeenmore. CLEW BAY—Dredged on 2 occasions, in 21–24 fms., on gravel and shells. BALLYNAKILL HARBOUR—Found once on the shore.

*Distribution.*—British Isles; France; Mediterranean; Madeira; Canaries; Canada; South Africa; Porto Rico; Japan.

***Glycera alba* Blainville.**

1910. *Glycera alba*. McIntosh, p. 486.

This species is common on the shore, living in sand, under stones, and in the sand of *Zostera* beds.

*Habitat.*—BLACKSOD BAY.—Taken on the shore on 18 occasions. CLEW BAY—On the shore of Clare Island, near the Quay. Dredged on 4 occasions, in 4–18 fms. BALLYNAKILL HARBOUR—Found once on the shore. Dredged in 6–8 fms.

*Distribution.*—British Isles; France; Scandinavia; North Sea; Mediterranean; east coast of North America; Japan.

***Goniada maculata* Oersted.**

1910. *Goniada maculata*. McIntosh, p. 462.

This species was dredged in mud or in fine gravel.

*Habitat.*—CLEW BAY—Dredged in Inishlyre Harbour, in 4 fms.; in Killary Harbour, in 17½ fms.; north of Clare Island, in 21 fms.

*Distribution.*—British Isles; Scandinavia; North Sea; Spain; Portugal; Madeira; east coast of North America.



**Glycinde Nordmanni** (Mahugren).

1910. *Glycinde Nordmanni*. McIntosh, p. 469.

This species is very rare in the district, only a single specimen having been found.

*Habitat*.—CLEW BAY—Dredged in 18 fms.

*Distribution*.—A northern form. Ireland; Scotland; North Sea; Scandinavia; Siberia; Behring's Sea.

Family **ARICIIDAE**.

**Aricia Cuvieri** Aud. and Edw.

1910. *Aricia Cuvieri*. McIntosh, p. 497.

This species was only taken in Killary Harbour and Inishgowlá, on a muddy bottom.

*Habitat*.—CLEW BAY—Dredged on 5 occasions, in 7-17 fms.

*Distribution*.—British Isles; France; Greenland; Farøe; Scandinavia; North Sea; Mediterranean.

**Aricia Latreillii** Aud. and Edw.

1910. *Aricia Latreillii*. McIntosh, p. 502.

This species was only found in fairly clean sand.

*Habitat*.—BLACKSOD BAY—Found on the shore on 7 occasions. BALLYNA-KILL HARBOUR—Found on the shore on 2 occasions.

*Distribution*.—Great Britain; France; Naples.

**Scoloplos armiger** (O. F. Müller).

1910. *Scoloplos armiger*. McIntosh, p. 510.

This species is common under stones, in sand, and especially in the sand of *Zostera* beds. The everted proboscis of one specimen was composed of 8 lobes.

*Habitat*.—BLACKSOD BAY—Found on the shore on 14 occasions. Dredged in 2 fms. CLEW BAY—Dredged on 2 occasions, in 4-14 fms.

*Distribution*.—British Isles; France; Arctic; Scandinavia; east coast of Canada.

Family **PARAONIDAE**.

**Aricidea Jeffreysii** (McIntosh).

1878. *Scolocolepis* (?) *Jeffreysii*. McIntosh, p. 506. 1909. *Aricidea Jeffreysii*. Cerruti, p. 469.

Two specimens of this interesting addition to the British fauna were found

in Ballynakill Harbour, in 2-6 fms., whilst several fragments were dredged in 24 fms. in Clew Bay. The species has recently been described in detail by Cerruti, and I have nothing to add to his description.

*Habitat.*—CLEW BAY—Dredged in 24 fms., on a bottom of sand and shells.

BALLYNAKILL HARBOUR—Dredged in 2-6 fms.

*Distribution.*—Naples; Davis Strait.

**Paraonis (Paraonides) lyra** sp. n.

Pls. IX, X, figs. 22 A-G.

A mature male specimen belonging to a new species of *Paraonis* was taken in the surface tow-net at midnight in June, in Ballynakill Harbour. Two mature females were afterwards dredged in 1-2 fms. in New Harbour, Galway Bay, also in June, and were studied alive.

The specimens are 12-20 mm. long, consisting of 90-105 setigerous segments. The body is colourless, widest in the middle, and tapering gradually towards each end.

The head (fig. 22 B) is widest behind, rounded in front. On the anterior margin is a low rounded papilla, provided with stiff cilia. The nuchal organs are large and conspicuous, inclining backwards from the mid-lateral region on each side towards the posterior margin. They are richly ciliated, and are rendered conspicuous by the presence of brown pigment. No eyes were observed in any specimen, though there was a certain amount of yellow pigment on the head. The three anterior segments are provided with capillary setae and dorsal cirri. The branchiae commence on the fourth segment, and vary in number, the three specimens having eight, eleven, and fourteen pairs respectively. In the specimen with fourteen pairs, the two posterior pairs are small. The branchiae are richly ciliated. The dorsal cirri are small in the anterior segments, but gradually increase in size, and in the posterior segments are long and slender. The anal segment is rounded and almost globular (fig. 22 C). It bears three slender subulate cirri, two dorso-lateral, and one ventral median. A pair of cirri seem to be attached to the anterior ventral border of the anal segment; but they probably represent the posterior pair of dorsal cirri.

In the anterior bundles the dorsal and ventral setae are almost equal in length, and continue so to the end of the body in immature specimens. In the mature male specimen the ventral setae begins to increase in length at about the 15th-20th segment, whilst the dorsal setae become shorter.

The setae in the male specimen taken in the surface tow-net are much more prominent than in the females; and in length they exceed the width of the body, especially in the posterior segments (fig. 22 E). The dorsal cirri

are placed behind the dorsal bundle of setae (fig. 22D). The capillary setae are very slender, without wings; and in the male specimen the longer ventral setae are longitudinally striated. On the ventral side of the dorsal bundle there are 1-3 short setae with lyrate tips (fig. 22C). One arm is longer than the other, and has a row of spines on its inner margin. This type of seta makes its appearance in the fourth segment, and continues to the end of the body. It has not been found in any other species of this family. The setae in each bundle are arranged in two rows, and the lyrate setae are at the lower end of the front row. In the 4th foot (fig. 22D) the dorsal setae are slightly longer than the ventral setae. In the 50th foot (fig. 22E), the ventral setae are three times as long as the dorsal. In the male specimen the setae in the upper part of the ventral bundle are longer and thicker than the rest, and are longitudinally striated. The setae in the females do not show this distinction. In the 80th foot (fig. 22F) the difference in length between the setae in the dorsal and ventral bundles is not so marked.

In the female specimens the eggs commence in the 26th segment, and there are usually four in each segment. They are red in colour. The absence of appendages on the head is characteristic of the genus *Paraonis*, Grube. The sub-genus *Paraonides* was created recently by Cerruti (1909, p. 503) to contain a species *Paraonis (Paraonides) neapolitana* Cerruti, distinguished by the presence of modified setae in the posterior dorsal bundles. In this sub-genus the present species must be placed, owing to the presence of the lyrate setae in the dorsal bundles. This type of seta has not hitherto been found in any species of the family Paraonidae, and its occurrence adds an additional proof of the close relationship of this family to the Ariciidae.

*Habitat*.—BALLYNAKILL HARBOUR.—Mature male taken in the surface tow-net at midnight. This species was also found in Galway Bay, and in Dingle Bay.

#### Family SPIONIDAE.

##### *Spio martinensis* Mesnil.

1896. *Spio martinensis*. Mesnil, p. 122.

This species is very closely allied to *S. filicornis* Fabr., but as regards those characters in which the two species are said by Mesnil to differ, such as the shape of the head, feet, and setae, the Irish specimens agree with *S. martinensis*. According to McIntosh (1909, p. 162), the capillary setae of *S. filicornis* are striated but not dotted, whereas the Irish specimens have setae exactly like those figured by Mesnil for *S. martinensis*. I have not yet found the true *S. filicornis* in Ireland. The first crochets appear in the

ventral division of the 11th foot, whereas Mesnil found them in the 13th-15th foot. The anterior end of the body is marked with dark-brown pigment in longitudinal rows on the dorsal and ventral surfaces of the buccal segment, and in transverse rows on the following segments.

*Habitat*.—BLACKSOD BAY—Found on two occasions, in sand under stones.

*Distribution*.—Ireland (Dublin Bay); France (St. Martin).

#### *Spio seticornis* Fabricius.

1909. *Spio seticornis*. McIntosh, p. 163.

Numerous specimens of this species were found, usually living in Laminaria roots. The anterior dorsal end is marked with dark pigment. The crochets begin on the 8th setigerous segment. Four eyes are present. The anal segment bears two long dorsal and two short ventral cirri, the latter pair being full of brown pigment. Mature specimens were found in March.

*Habitat*.—BLACKSOD BAY—Found on the shore on three occasions. Dredged on three occasions, in 1-6 fms. CLEW BAY—Dredged in 7-10 fms. BOFIN HARBOUR.

*Distribution*.—Great Britain; Greenland; Farøe; Baltic.

#### *Scolecoplepis vulgaris* (Johnston).

1896. *Scolecoplepis Girardi*. Mesnil, p. 140. 1909. *Scolecoplepis vulgaris*. McIntosh, p. 159.

This species was generally found living in sand, rarely in Laminaria roots. It was never abundant. Mature specimens were found in March.

*Habitat*.—BLACKSOD BAY—Found on the shore on 5 occasions. CLEW BAY—Shore of Clare Island, near the Harbour.

*Distribution*.—British Isles; Norway; North Sea; France; Mediterranean.

#### *Scolecoplepis fuliginosa* (Claparède).

1896. *Scolecoplepis fuliginosa*. Mesnil, p. 132.

This species is common locally in Blacksod Bay, but not widely distributed. Mature specimens were found in March. One specimen was found feeding on a red seaweed (*Chylocladia* sp.).

*Habitat*.—BLACKSOD BAY—Found on the shore on 5 occasions.

*Distribution*.—South coast of England; North Sea; France; Mediterranean.

**Laonice cirrata** (Sars).

1867. *Scolecolepis* (*Laonice*) *cirrata*. Malmgren, p. 91. 1896. *Laonice cirrata*. Mesnil, p. 247. 1909. *S.* (*Laonice*) *cirrata*. McIntosh, p. 160.

This species is very common in Clew Bay, living usually on a sandy bottom. It is occasionally taken in the tow-net at night.

The anal segment bears nine long slender cirri and two short blunt ventral cirri.

Mature specimens were found in August.

*Habitat*.—CLEW BAY—Dredged on 10 occasions, in 5-27 fms.

*Distribution*.—British Isles; Arctic; Scandinavia; Canada.

Genus **Nerinides**.

This genus was created by Mesnil (1896, pp. 119, 152) for the species which de Saint-Joseph described under the name *Nerine longirostris* Quatr. (1894, p. 74). Mesnil gives some reasons (p. 164) for thinking that the *Nerine longirostris* of Quatrefages is identical with *Nerine cirratulus* (D. Chiaje), but the description of Quatrefages is too meagre to decide this point with certainty. The discovery of a new species, described below, does not necessitate any change in the generic description given by Mesnil. This genus is intermediate between *Spio* and *Nerine*, and is very closely allied to both of them.

A species has recently been described by McIntosh (1909, p. 175) under the title *Nerinides lamellata*, from Tangiers Bay. Only the anterior end was found, but it exhibits none of the generic characters of *Nerinides*. The head is broadened in front, with lateral peaks. The first setigerous segment bears a branchia and both dorsal and ventral bundles of setae. The dorsal lamella is shorter than the branchia, and is separated from it distally by a deep indentation. The ventral modified setae are wingless, and simply pointed. It is not clear from the description given what genus this species belongs to, though it seems to have great affinities with *Scolecolepis*, but at any rate it is not a *Nerinides*.

**Nerinides longirostris** (Quatr.) de St.-Joseph.

1894. *Nerine longirostris*. De St.-Joseph, p. 74. 1896. *Nerinides longirostris*. Mesnil, p. 152.

This species was occasionally found in clean sand in Blacksod Bay, but is nowhere abundant. As stated above, there is reason to doubt whether the *Nerine longirostris* of de St.-Joseph is identical with the *Malacoceros longirostris* of Quatrefages (1865, p. 444).

*Habitat*.—BLACKSOD BAY—Found on 6 occasions, in clean sand.

*Distribution*.—Dinard; ? St. Malo.

***Nerinides tridentata* sp. n.**

Pl. X, figs. 23 A-J.

Eleven specimens of this new species were found on four different occasions, living in *Laminaria* roots in Blacksod Bay. This habitat at once distinguishes it from other allied species of *Nerinides*, *Nerine*, and *Scolecolepis*, all of which live in sand.

The worms are comparatively small, resembling *Spio* in appearance. Mature individuals are 16-20 mm. in length, 1.5 mm. in width, and the body is formed of 61-70 segments. The body attains its greatest width in the anterior region, near the 10th segment, and gradually tapers to the very slender tail. The anterior end is blunt, and tapers very little. The dorsal surface is flattened, the ventral surface rounded. In the anterior region the segments are very short, but in the middle region they are almost as long as wide.

The head (fig. 23 A) is spindle-shaped, acutely pointed at both ends, the posterior end forming a distinct occipital tentacle. Just behind the middle line of the head are two pairs of black eyes, arranged almost in a straight line. The head is separated from the buccal segment both dorsally and ventrally by deep grooves. The buccal segment forms conspicuous translucent lobes on each side of the head, and is longitudinally folded on the ventral side. The tentacles are short, thick, and firmly adherent, of a deep chocolate colour. The first setigerous segment (figs. 23 A, 23 C) bears only a ventral bundle of capillary setae, and has no branchia. The setae are in two rows, one consisting of long slender setae, the other of shorter and thicker setae. Behind the setae is a low rounded lamella, and in the dorsal region of the foot are two rounded lobes. The second foot (fig. 23 D) bears two bundles of setae, those in the dorsal region being much the larger. These setae are all longitudinally striated. The dorsal lamella is large, and completely fused with the branchia, which it slightly exceeds in length. A considerable interval separates the dorsal from the ventral lamella.

The tenth foot (fig. 23 E) bears two large lamellae which are separated only by a small interval, and are much larger than those of the second foot. The dorsal division has two rows of setae, one row consisting of long slender longitudinally striated setae (fig. 23 H, *a*), the other row of short thick finely pointed setae, with flattened dotted blades and cylindrical striated proximal shafts (fig. 23 H, *b*). The ventral setae resemble the short dorsal setae, but are rather shorter and wider. On the lower margin of the ventral bundle is a group of three slender striated setae.

The branchiae attain their greatest length in the 15th-20th segments. They lie transversely across the dorsum, separated in front by a median

space. From the 15th to the 25th segment they meet in the mid-dorsal line, then further behind they are shorter again.

In the 15th or 16th setigerous segment a row of hooks appears in the ventral division of the feet (fig. 23*A*). They have an unusually long main tooth, bent at right angles to the shaft, and crowned with two sharp spines. The shaft is curved distally, and above the curve it is slightly constricted. The wing which envelops the distal end of the seta is wide beneath the main tooth, and then abruptly narrows towards the neck of the seta, and is very characteristic in outline.

The 24th foot (fig. 23*F*) does not differ much in outline from the 10th foot. The dorsal division bears long and short setae, all of which are striated. The ventral division has 13–15 crochets, and 2 or 3 slender capillary setae. None of the setae have dotted blades.

In the posterior feet (fig. 23*G*) the lamellae are more conspicuous. The branchia is short and the dorsal lamella projects outwards, forming an angle with the branchia. The ventral lamella is rounded and foliate. The dorsal setae are long and striated. The ventral division has 10–12 crochets, and 3 or 4 slender capillary setae.

The anal segment (fig. 23*B*) bears a ventral flattened expansion, which is more or less bilobed. This structure seems to be intermediate between the anal cirri of *Spio* and the anal funnel of *Nerine*.

Mature specimens were found in September.

This species differs in many respects from *Nerinides longirostris* (Quatr.). It is much smaller in size, has the four eyes in a transverse row, instead of in a square, and the ventral crochets begin on the 15th segment, whilst those of *M. longirostris* begin on the 33rd–45th segment. These setae have a very long main tooth crowned with two spines, whilst those of *N. longirostris* have a medium tooth with a single spine. The lamellae on the feet are more prominent in the posterior part of the body of the present species than those of *N. longirostris*, and the anal segment is quite different. *N. longirostris* lives in clean sand, *N. tridentata* in *Laminaria* roots.

*Habitat*.—BLACKSOD BAY. Found on 5 occasions, in *Laminaria* roots from near low-water mark.

### ***Nerine cirratulus* (Delle Chiaje).**

1896. *Nerine cirratulus*. Mesnil, p. 152.

In the sandy beach at the head of Feorinyeeo Bay, in Blacksod Bay, there is a zone of sand, two or three feet below high-water mark, where this species occurs in immense numbers. The sand is quite honeycombed with their burrows, and is stained with their secretions. In other parts of the

bay it is not so common. It was found living in the sand of a very exposed Zostera bed.

*Habitat.*—BLACKSOD BAY—Found in large numbers on the sandy beaches.

CLEW BAY—Clare Island, in sand near the Harbour.

*Distribution.*—British Isles; North Sea; France; Mediterranean; eastern North America.

***Nerine foliosa* (Aud. and Edw.).**

1896. *Nerine foliosa*. Mesnil, p. 165.

This species lives in clean sand, in the lower half of the littoral zone.

*Habitat.*—BLACKSOD BAY—Found on the shore on 6 occasions. BALLY-

NAKILL HARBOUR—Found once on the shore.

*Distribution.*—Great Britain; Iceland; Farøe; Scandinavia; France.

***Aonides oxycephala* (Sars).**

Pl. XI, fig. 25.

1896. *Aonides oxycephala*. Mesnil, p. 242.

This species is very common and widely distributed throughout the intertidal area. It is usually found in the sand under stones, especially if there is any admixture of mud or decaying weeds. Specimens are occasionally found in *Laminaria* roots.

Mature specimens were found in March.

*Habitat.*—BLACKSOD BAY—Found on the shore on 14 occasions. CLEW

BAY—Clare Island shore. BALLYNAKILL HARBOUR—Dredged

in 1-3 fms.

*Distribution.*—British Isles; Scandinavia; France; ?Port Vendres; ? United States.

***Aonides paucibranchiata* sp. n.**

Pl. XI, figs. 24 A-E.

A large number of specimens were dredged in Clew Bay which, whilst agreeing very closely in many respects with *Aonides oxycephala*, yet exhibit a certain number of constant and well-marked differences. It will be sufficient in describing this species to point out these differences, without giving a full account of the anatomy.

The worms are considerably smaller than *A. oxycephala*. No complete mature specimen was obtained, the largest fragment of a mature male being 18 mm. long, consisting of 80 segments. A small entire specimen from Berehaven had 54 segments. The general shape of the body resembles that of *A. oxycephala*. The head is spindle-shaped (fig. 24A), rounded at both ends. There are 4 dark kidney-shaped eyes, with lenses. In some specimens the



eyes are arranged in an almost straight transverse line, but the usual condition is that shown in fig. 24A. The first and second segments closely resemble those of *A. oxycephala* as figured by Mesnil (1896, pl. x, figs. 21, 22). The number of branchiae is only 10 pairs or rarely 11, as against 22–23 pairs always found in Irish specimens of *A. oxycephala*. The shape of the branchiae and lamellae in the anterior segments does not differ from the condition found in *A. oxycephala* (Mesnil, 1896, pl. x, fig. 23). The setae in these segments are all slender, with a delicate wing, and are not dotted. There is in each foot a row of long slender setae, and a row of shorter stouter setae, and the dorsal setae are longer than the ventral setae. Behind the 11th foot, the lamellae decrease rapidly in size, and are inconspicuous in the posterior part of the body. Winged crochets appear in the ventral division of the 31st foot, and in the dorsal division of the 36th foot, agreeing fairly closely with *A. oxycephala* in this respect. The crochets differ from those of *A. oxycephala* in having three teeth at the distal end. The large main tooth (fig. 24E) is bent at right angles to the shaft. The middle tooth is short and pointed, and outside this is a short blunt tooth.

In the 78th foot (fig. 24C) the dorsal division contains 4 crochets and 6 slender capillary setae. The ventral division has 5 crochets and 6 capillary setae, of which the two ventral are longer and stouter than the others, with a pronounced double curvature. The lamellae are rendered conspicuous by the presence of long finger-shaped glands, of a deep amber colour (fig. 24D). The anal segment (fig. 24B) bears two pairs of cirri, the ventral pair being the shorter. In *A. oxycephala* the anal segment bears two lateral plates, one on each side of the anus, and each plate has 3–5 cirri (fig. 25), usually 4.

The points which distinguish this species from *A. oxycephala* may be summarized as follows:—(1) Smaller size; (2) smaller number of branchiae, there being 10 or 11 pairs as against 22 or 23; (3) three teeth on the crochets as against 2; (4) only two pairs of anal cirri, as against 3–5 pairs in *A. oxycephala*.

Mature specimens were found in May.

*Habitat*.—CLEW BAY—Dredged on four occasions, in 9–24 fms. This species was also found in Berehaven.

#### **Prionospio Steenstrupi Malmgren.**

1867. *Prionospio Steenstrupi*. Malmgren, p. 93. 1880. *P. S.*  
Langerhans, p. 90. 1897. *P. S.* Mesnil, p. 90.

Three species belonging to the genus *Prionospio* have been described at length from European shores. Of these *P. plumosa* (Sars, 1873, p. 63) seems to be distinguished by the shape of the head, the anal segment, and the very

numerous branches on the gills. Of the other two species, *P. Steenstrupi* has been examined by Malmgren, Langerhans, and Mesnil, with different results. According to Malmgren, the species has no eyes, there are two rows of branches on the gills, crochets are absent from the dorsal divisions of the posterior feet, and those in the ventral divisions have only a single spine on the crown. According to Langerhans, who found his specimens at Madeira, the head bears two pairs of eyes, there are four rows of branches on the gills, crochets are present in the dorsal divisions of the posterior feet, and they have five spines above the main tooth. Mesnil re-examined the specimens described by Malmgren and Langerhans, and confirmed the identity of the two species. He pointed out that the spines on the crown of the crochets are arranged in pairs.

A large number of Irish specimens of this species have been collected, and they all show the same characters with very little variation. In only a single specimen are the eyes absent (Southern, 1910, p. 236), and this was a small immature worm. On the whole, they agree with the description of *P. Steenstrupi* given by Langerhans and Mesnil.

The third European species, *P. Malmgreni*, has been described by Claparède (1869, p. 73, and by Marion and Bobretzky (1875, p. 84). It appears to differ from *P. Steenstrupi* in having no crochets in the dorsal divisions of the posterior feet, and in having only two spines above the main tooth of the crochets. The head as figured by Marion and Bobretzky (1875, pl. xi, fig. 20) agrees exactly with Irish specimens of *P. Steenstrupi*. The statement that dorsal crochets are absent, and that those in the ventral divisions have only two spines, may be based on faulty observation. The anal segment and the structure of the gills agree closely with the Irish specimens; and it appears to me probable that a further examination of the Mediterranean forms will show that the two species are identical. McIntosh (1914, p. 82), who has examined some of the Irish specimens, refers them to *P. Malmgreni*. In his remarks, however, he ignores the chief character separating the two species, viz., the presence or absence of crochets in the dorsal divisions of the posterior feet.

*Habitat*.—BLACKSOD BAY—Dredged on two occasions, in 2-3 fms. CLEW BAY—Dredged in 18 fms.

*Distribution*.—Norway; Iceland; Greenland; Madeira.

#### ***Spiophanes bombyx* (Claparède).**

1896. *Spiophanes bombyx*. Mesnil, p. 249.

This species is rare in the district. Two specimens were obtained by digging in sand near low-water mark in Blacksod Bay, and several were dredged in Clew Bay.

Mature specimens were found in September.

*Habitat*.—BLACKSOD BAY—Two specimens in sand on the shore. CLEW BAY—Dredged on two occasions, in 13-17 fms.

*Distribution*.—Great Britain (St. Andrew's, Torquay); North Sea; France; Naples.

***Polydora ciliata* (Johnston).**

1896. *Polydora ciliata*. Mesnil, p. 210.

This species was found in Blacksod Bay in varied surroundings. It lives in Lithothamnion, in the roots of corallines, in sponges, and forming tunnels in old shells.

Larval forms were taken in the surface tow-net in September; and post-larval forms were dredged in weeds during the same month.

This species is very abundant in the rock-pools on Clare Island. Most of these pools are lined with a layer of Lithothamnion in varying degrees of thickness. The *Polydora* forms tunnels in the Lithothamnion. The two black tentacles protrude from a minute opening, and wave freely in the water.

*Habitat*.—BLACKSOD BAY—Found on the shore on six occasions. Dredged on 4 occasions in 2-5 fms. CLEW BAY—Common in rock-pools on Clare Island.

*Distribution*.—British Isles; France; Arctic; Scandinavia; North Sea; Mediterranean; eastern North America; Australia (Port Jackson).

***Polydora hoplura* Claparède.**

1869. *Polydora hoplura*. Claparède, p. 58.

These worms were found on several occasions living in sponges such as *Halichondria panicea*, where they form slender mud-tubes.

*Habitat*.—BLACKSOD BAY—Found once on the shore. BALLYNAKILL HARBOUR—Dredged in 1-3 fms. Also found on the bottom of the ship. BOFIN HARBOUR—Found in sponges on the shore.

*Distribution*.—Great Britain; France; Mediterranean.

***Polydora caeca* (Oersted).**

1896. *Polydora caeca*. Mesnil, p. 191.

This is probably the commonest species of *Polydora* on the coast. It is frequently found in *Laminaria* roots, under *Ascidians*, and in sponges. A specimen was dredged in Clew Bay which had regenerated the anterior end after having lost the first three setigerous segments.

*Habitat.*—BLACKSOD BAY—Found on the shore, on 9 occasions. Dredged on 4 occasions, in 1–8 fms. CLEW BAY—Shore of Clare Island, in sponges and in Lithothamnion. Dredged on 5 occasions, in 9–28 fms.

*Distribution.*—Plymouth; France; Arctic; North Sea; Farøe.

***Polydora flava* Claparède.**

1896. *Polydora flava*. Mesnil, p. 182.

This species was found living in Lithothamnion, and between flakes of schist.

*Habitat.*—BLACKSOD BAY—Found on 2 occasions on the shore. Dredged on 2 occasions, in  $3\frac{1}{2}$ – $5\frac{1}{2}$  fms. CLEW BAY—Dredged in 16 fms.

*Distribution.*—British Isles; France; Mediterranean.

***Polydora Giardi* Mesnil.**

1896. *Polydora Giardi*. Mesnil, p. 195.

This species, which has not been previously recorded from the British Isles, is rare in the district. It was found only in Laminaria roots. Mesnil found it only in Lithothamnion.

*Habitat.*—BLACKSOD BAY—Found on the shore on 4 occasions. CLEW BAY—Dredged in 13–16 fms.

*Distribution.*—North of France (St. Martin and Cap de la Hague); ?Marseilles.

***Polydora Caulleryi* Mesnil.**

1897. *Polydora Caulleryi*. Mesnil, p. 88. 1909. *Polydora Carazzi*. McIntosh, p. 172.

A single specimen of this species was dredged in Clew Bay, in 24 fms., on a bottom of sand or shells.

*Habitat.*—CLEW BAY—Dredged in 24 fms.

*Distribution.*—Great Britain; France (Cap de la Hague).

***Polydora quadrilobata* Jacobi.**

1897. *Polydora quadrilobata*. Mesnil, p. 87. 1909. *P. q.* McIntosh, p. 170.

A single specimen of this rare species was found in the sand of a *Zostera* bed in Blacksod Bay. It agrees exactly with the descriptions of Mesnil and McIntosh. The modified setae of the fifth segment have the brush-like row of spines between the two terminal teeth.

*Habitat.*—BLACKSOD BAY—In the sand of a *Zostera* bed.

*Distribution.*—Scotland (?St. Andrews); West Baltic (Kiel).

**Magelona papillicornis** Fr. Müller.

1896. Mesnil, p. 257.

Frequently obtained in Blacksod Bay by digging in sand near low-water mark.

*Habitat*.—BLACKSOD BAY—Common in clean sand near low-water mark.

CLEW BAY—Dredged in 5½–11 fms., on a sandy bottom.

*Distribution*.—British Isles; shores of Europe; Mediterranean.

**Magelona rosea** Moore.

1907. *Magelona rosea*. Moore, p. 201.

Only one species of *Magelona* has been previously recorded from European shores. This species has been referred by all zoologists to the *M. papillicornis* found by Fritz Müller on the coast of Brazil. As Moore (1907, p. 204) has pointed out, the two forms are probably specifically distinct. The form which occurs at Wood's Hole, Massachusetts, was examined by Moore, and found to differ markedly from the European *M. papillicornis*. Whether the latter species occurs on the American coast is still uncertain.

The most striking difference between *M. rosea* and *M. papillicornis* lies in the structure of the setae of the ninth setigerous segment. In the former species these setae are finely tapered to a point; in the latter they terminate in a characteristic bulbous tip. A number of specimens dredged from the muddy bottom of Killary Harbour agree with *M. rosea* in the structure of the setae. I sent several of the specimens to Professor Moore, and he confirmed the identification. This species also occurs in Galway Bay. The difference in habitat of the two forms in Ireland is very striking, *M. papillicornis* being found in clean sand, *M. rosea* in mud.

*Habitat*.—Dredged in 7 fms. in Killary Harbour, on mud.

*Distribution*.—Wood's Hole, Massachusetts.

Family **DISOMIDAE**.

**Poecilochaetus serpens** Allen.

1904. *Poecilochaetus serpens*. Allen, p. 79.

The larval form of this species has been described by Claparède, Levensen, McIntosh, and Gravelly. It is very commonly taken in the tow-net during the summer and autumn months. The adult has up to the present only been recorded by Allen, who obtained it by digging in sand at low-water spring-tides. Last year I found a number of adults in sand on the shore of Lough Swilly. I have no doubt that the specimens obtained in the tow-net are the larval forms of this species. The setae in the later larval stages are very

similar to those found in the adult. The short stout spines are found in the second and third setigerous segments of the larval form, as in the adult. The number of segments with flask-shaped cirri, however, is always five in the larval form, whilst the adult has seven.

*Habitat.*—CLEW BAY—Frequently taken in the tow-net, generally near the bottom. BALLYNAKILL HARBOUR. BLACKSOD BAY.

*Distribution.*—British Isles; Norway; Skagerrak; North Sea; France.

#### Family **CHAETOPTERIDAE.**

##### **Chaetopterus variopedatus** Renier.

1894. *Chaetopterus variopedatus.* De Saint-Joseph, p. 147.

This species is occasionally found in sand or muddy gravel near low-water mark in Blacksod Bay. Empty tubes are frequently obtained in the dredge. The living worm was almost always accompanied in its tube by the Polynoid *Gattyana cirrosa.*

*Habitat.*—BLACKSOD BAY—Found on the shore on 4 occasions. Dredged on 6 occasions, in 1–9 fms. CLEW BAY—Dredged on 4 occasions, in 16–19 fms. BALLYNAKILL HARBOUR—Found several times near low-water mark. BOFIN HARBOUR—Found on the shore.

*Distribution.*—Great Britain; shores of Atlantic; Mediterranean; Magellan Straits.

#### Family **AMMOCHARIDAE.**

##### **Owenia fusiformis** Delle Chiaje.

1898. de Saint-Joseph, p. 397.

*Habitat.*—BLACKSOD BAY—Found on the shore in sand on 3 occasions. Dredged in 9 fms. CLEW BAY—Dredged on 8 occasions, in 4–20 fms., on a bottom of sand or mud.

*Distribution.*—British Isles; Arctic; Atlantic; Mediterranean.

#### **Myriochele Heeri** Malmgren.

1867. Malmgren, p. 101. 1912. Wollebaek, p. 31.

This species has not previously been recorded from British waters. A number of specimens were found in Clew Bay, living on a sandy bottom. They are all small, with regenerated tails. The tube is composed of fragments of shell, which are set on edge and project at right angles to the tube. It thus differs from the imbricated tube of *Owenia fusiformis*, and from the membranous tube studded with quartz grains made by *Myriochele Heeri* in Arctic seas.

The anterior end and setae agree closely with the descriptions and figures given by Malmgren and Wollebaek.

*Habitat*.—Dredged on three occasions in Clew Bay, in 16–22 fms., on a bottom of sand.

*Distribution*.—Arctic; Scandinavia; North Sea; Madeira; Canada.

Family **CIRRATULIDAE**.

***Cirratulus tentaculatus* (Montagu).**

1911. *Cirratulus tentaculatus*. McIntosh, p. 151.

This species is sometimes found in enormous numbers in the sand of *Zostera* beds, where it is one of the dominant species. It also lives in the sand under or between stones, and occasionally in clean sand near rocks.

Mature specimens were found in June.

*Habitat*.—BLACKSOD BAY—Taken on the shore on 15 occasions. CLEW BAY—Shore of Clare Island near the Quay, under stones. BOFIN HARBOUR—On the shore.

*Distribution*.—British Isles; France; Skagerrak; North Sea.

***Cirratulus norvegicus* (Quatrefages).**

Plate XI, figs. 26 A–D.

1843. *Cirratulus borealis* Lamarck. Rathke, p. 180, Tab. viii, figs. 16–18.

1865. *Audouinia norvegica*. Quatrefages, p. 461. 1870. *C. norvegicus?* Grube, p. 85. 1872. *C. norvegicus*. Grube, p. 62.

Non *Cirratulus norvegicus* McIntosh (1911, p. 171).

A number of specimens of *Cirratulus*, from various parts of the Irish coast, differ from any other British form, and appear to belong to the species first described and figured by Rathke as *Cirratulus borealis* Lamarck. The latter species is now regarded as identical with *C. cirratus* (Müller), and differs markedly from that described by Rathke. Accordingly, Quatrefages (1865, p. 461) separated it as "*Audouinia norvegicus*," repeating the diagnosis of Rathke. At the same time he stated that he had found this species, or one extremely close to it, on the French coast at St. Vaast, the only difference being the somewhat smaller number of dorsal branchiae. A number of these specimens, labelled "*Cirratulus norvegicus*," by Quatrefages, are in the Paris Museum. I have been able to examine them, and without exception they belong to *Cirratulus tentaculatus* (Montagu), a species quite distinct from that described by Rathke. This fact does not, however, invalidate the name given by Quatrefages to Rathke's species; and accordingly I adopt *Cirratulus norvegicus* (Quatrefages) as the correct name

for this species. In 1870 Grube recorded *C. norvegicus* from St. Malo, without giving any description. The description and figures given by Rathke are very meagre; and I have thought it desirable to give a full account of this species.

A single mature female was dredged in Clew Bay, in  $5\frac{1}{2}$ –11 fms. Four other specimens were available from various places on the Irish coast, and have been utilized in drawing up the present description.

The worms are 35–40 mm. in length, with 130–140 segments. The body is rounded dorsally, flattened ventrally, with a shallow median groove. It is widest and thickest between the 30th and 40th segments, and tapers gradually towards both ends. The anus is large and funnel-shaped, with crenulate margin, and with a rounded ventral papilla.

There is a considerable amount of dark pigment on the ventral side of the head and anterior region and in the lateral region of the prostomium near the nuchal organs.

The prostomium is followed by three achaetous segments. The first is slightly elevated dorsally. The third post-oral segment bears a pair of cirri (branchiae) on the postero-lateral margin (fig. 26 A). The position of the first pair of lateral cirri has been utilized as a specific character by various naturalists; but I find them normally occurring on the third post-oral segment in all species I have investigated. The dorsal tentacles (gills) are on the fourth setigerous segment. There are nine or ten pairs of them forming an oblique band on the sides of the segment, and leaving bare a broad median area. Each segment, except a number at the posterior end, bears a pair of lateral cirri, which are attached behind and above the dorsal setae. In the anterior region the distance between the cirri and the dorsal setae is small, considerably less than the distance between the dorsal and ventral setae. In the anterior region also, the dorsal and ventral setae are further apart than in the middle region of the body. Thus in the anterior region the space between the dorsal and ventral setae gradually becomes less, whilst that between the cirri and the dorsal setae increases. Behind the 20th segment the ratio between these two spaces remains constant, the distance between the cirri and the middle of the dorsal setae being two-thirds of that between the middle of the dorsal and the ventral setae (fig. 26 B). This ratio supplies a useful character for differentiating the species of *Cirratulus*.

In the anterior region of the body the feet contain only capillary setae. The 10th segment has 13 setae in the dorsal division, 15 in the ventral, the dorsal setae being somewhat longer than the ventral. There are three kinds of setae. The longest setae are very slender, with flattened serrate blades. The shorter setae are only half as long, but quite as wide as the long setae



(fig. 26c). On the lower margin of the dorsal and the upper margin of the ventral divisions are 2 or 3 very slender, short, smooth setae. Curved hooks appear in the ventral division of the 21st setigerous segment, and in the dorsal division of the 35th–41st segment. The ventral hooks are slightly thicker, shorter, and more strongly curved than the dorsal hooks (fig. 26d). In the 26th foot there are 9–11 capillary setae in the dorsal division, 3 hooks and 4 capillary setae in the ventral division.

In the 75th foot there are 3–4 capillary setae and 2–3 hooks in the dorsal division, 3 capillary setae and 3 hooks in the ventral division. In the posterior feet there are 1–2 capillary setae and 2–3 hooks in each division of the foot. The dorsal capillary setae are longer than those in the ventral division. The difference in size between the dorsal and ventral hooks in the posterior segments is not so great as in *C. tentaculatus*.

The other specimens of this species show very little variation from the above description. In one specimen, obtained in Laminaria roots in Dublin Bay, the dorsal tentacles encroach on the lateral areas of the third setigerous segment. A specimen from Lough Swilly has a small dorsal bundle of setae on the third post-oral segment.

Mature specimens were found in August.

This species differs from *C. tentaculatus* in the following respects:—(1) Smaller size and smaller number of segments; (2) smaller number of dorsal tentacles (in *C. tentaculatus* the latter form an almost continuous band across the segment); (3) the dorsal tentacles are on the 4th setigerous segment, those of *C. tentaculatus* being on the 6th or 7th; (4) the distance between the cirri and the dorsal setae is greater in *C. norvegicus* than in *C. tentaculatus*; (5) the hooks appear in a more anterior region than in *C. tentaculatus*.

The relations with *C. filigerus* D. Chiaje are somewhat closer. The chief differences are:—(1) and (2) as above; (3) the dorsal tentacles in *C. filigerus* are on the 5th–7th setigerous segment; (4) the distance between the cirrus and the dorsal setae in *C. filigerus* exceeds that between the dorsal and ventral setae, reversing the ratio found in *C. norvegicus*.

The chief reasons in favour of regarding these Irish specimens as belonging to the same species as that described by Rathke are:—(1) the occurrence of the dorsal tentacles on the 4th setigerous segment; (2) the number of tentacles is the same in both forms; (3) the number and arrangement of the capillary setae and hooks in the posterior segments and the relative position of the dorsal cirri are in close agreement.

This species seems to be the same as that recently mentioned by McIntosh (1911, p. 154) as “A form approaching *Cirratulus filigerus* D. Chiaje, from Malahide, Co. Dublin.”

*Habitat.*—CLEW BAY—Dredged in  $5\frac{1}{2}$ –11 fms.

I have also found this species in Lough Swilly, Galway Bay, and on the Dublin coast, in Lithothamnion or Laminaria roots.

*Distribution.*—Norway (Molde and Drontheim); France (? St. Vaast, ? St. Malo).

***Cirratulus cirratus* (O. F. Müller).**

1911. *Cirratulus cirratus*. McIntosh, p. 154.

This species lives under stones almost up to high-water mark. It prefers situations where there is a slight admixture of mud. It is sometimes found in Laminaria roots, and young specimens have been taken in the dredge. It is mature at least from June to September; and young specimens are found in the spring.

*Habitat.*—BLACKSOD BAY—Taken on the shore on 7 occasions; young specimens dredged in  $4\frac{3}{4}$  fms., in March. CLEW BAY—East shore of Clare Island; young specimens dredged in 10 fms., in May.

*Distribution.*—British Isles; shores of the Arctic seas; Scandinavia; France; Madeira; Canaries; east coast of North America.

***Cirratulus McIntoshi* nom. nov.**

1911. *Cirratulus norvegicus?* McIntosh, p. 171.

“A form dredged off Dröbak, Christiania Fjord, in 30–100 fathoms,” was recently described by McIntosh under the name *Cirratulus norvegicus?* The meaning of the query-mark is not quite clear. It may indicate that the author is not certain that the form has not been previously described. In any case the title cannot be maintained, as Quatrefages described a species under the name *Andouinia norvegica* (1865, p. 461), afterwards changed to *Cirratulus norvegicus* by Grube (1870, p. 85; 1872, p. 62). The latter species is quite distinct from that described by McIntosh. Both occur in Clew Bay. I have used the name *C. norvegicus* for the species recorded by Rathke, Quatrefages, and Grube, and given the name *C. McIntoshi* to the species described by McIntosh. Four specimens were found in Clew Bay, and of these, two dredged in the mud of Killary Harbour in May and August were full of eggs. Of the other two specimens, one was dredged in the mud of Inishlyre Harbour, and the other was taken at night in the tow-net in Bofin Harbour. I have compared them with McIntosh's specimens, and with others of the same species from the west coast of Norway.

The relationship of this species with others having only capillary setae, such as *Heterocirrus Marioni* de St.-Joseph, *H. multibranchis* Grube, *Cirratulus filiformis* Keferstein, *C. tenuisetis* Grube, etc., requires investigation, and it will doubtless be found that a number of these titles refer to

the same species. Not one of them has been adequately described or figured.

*Habitat.*—CLEW BAY—Dredged in Inishlyre Harbour in 5 fms., on mud.

KILLARY HARBOUR—Dredged on two occasions in 7 fms., on

mud. BOFIN HARBOUR—Taken at night in the tow-net.

*Distribution.*—West coast of Norway.

#### Genus *Chaetozone*.

The genus *Heterocirrus* was created in 1855 by Grube, for a species he named *H. saxicola*. This species was afterwards shown to be the *Dodecaceria concharum* of Oersted, described in 1843. De Saint-Joseph (1894, p. 52) conserved the genus *Heterocirrus*, whilst giving it a new definition; but this is contrary to the Rules of Nomenclature; and Moore<sup>1</sup> adopted what, in his opinion, was the next available name, the *Tharyx* of Webster and Benedict (1887, p. 741).

The genus *Chaetozone* was created by Malmgren in 1867; but he gave no generic diagnosis. In the opinion of subsequent writers, the distinguishing character of this genus was the modification of the setae in the posterior part of the body, where they form an almost complete ring, consisting of a mixture of crochets and capillary setae. Caullery and Mesnil (1898), in reviewing the genera of the Cirratulidae, retain the three genera *Heterocirrus*, *Tharyx*, and *Chaetozone*, defining them by the structure and arrangement of the setae. In *Heterocirrus*, crochets are present in the dorsal and ventral rami; in *Tharyx* all the setae are capillary; and in *Chaetozone* the crochets form an almost complete ring in the posterior segments. In practice this classification breaks down hopelessly. For instance, the *Chaetozone zetlandica* of McIntosh (p. 115) has crochets in the ventral rami, and capillary setae in the dorsal rami. Again, the degree to which the crochets form a ring on the posterior segments is very variable; and it is impossible to draw a distinction between *Heterocirrus* and *Chaetozone* in this respect. There is reason to think that some species which have crochets when fully grown have only capillary setae in their earlier stages. The marked development of the crochets in *Chaetozone* is evidently an adaptation for a pelagic life—an adaptation which exists in various degrees in all species of the three genera, and is a character to which no generic importance can be attached.

In view of these facts the conclusion is irresistible that no valid distinction exists between the three genera. *Chaetozone* has clearly priority over *Tharyx*, and hence must be used, with *Chaetozone setosa* Malmgren, as the type species.

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<sup>1</sup> Proc. Acad. Nat. Sciences of Philadelphia, 1909, p. 268.

**Chaetozone viridis** (Langerhans.)

1898. *Heterocirrus viridis*. Caullery and Mesnil, p. 117.

This species, which has been described accurately by Langerhans, de Saint-Joseph, and by Caullery and Mesnil, is very common in Laminaria roots. It was recorded by Elwes from Torquay.

Mature ♂ specimens were found in August and September. The eyes are much larger than in the immature specimens, and the dorsal capillary setae are longer and more numerous.

*Habitat*.—BLACKSOD BAY—Found on the shore on 6 occasions; dredged in 1 fm. CLEW BAY—Dredged on 2 occasions, in 9–16 fms. BOFIN HARBOUR—A mature male with large eyes and long swimming setae was taken in the surface tow-net at night.

*Distribution*.—South coast of England; France; Madeira; east coast of United States?

**Chaetozone alata** sp. n.

Pl. XII, figs. 27 A–D.

Three specimens of this species were obtained two from Ballynakill Harbour and one from Blacksod Bay. The body is 10–12 mm. long, consisting of 100–110 segments. It is very slender, and uniform in width, tapering only slightly at each end. The colour of the preserved specimens is a greyish brown.

The head is conical in front (Pl. XII, fig. 27A). There is a pair of dark eyes deeply embedded on the dorsal side of the head, probably lying on the brain. The nuchal organs could not be seen.

The dorsal tentacles are very large, attaining a length of 2 mm. The lateral cirri are 3 mm. long. The dorsal tentacles seem to be on the segment in front of the first setigerous segment, each accompanied by a lateral cirrus. This species is characterized chiefly by the shape and arrangement of the setae. The capillary setae vary in number and length according to the age of the specimen, and the following description applies to the largest individual. All the specimens were immature, and probably further changes in the setae occur with the advent of sexual maturity.

Capillary setae are present in all the dorsal bundles. The longer ones are slender and cylindrical with no evident flattening of the blades (fig. 27B, *a*). The shorter ones have a distinctly flattened blade, which is very thin along one edge (fig. 27B, *b*). In the anterior segments there are 4–6 capillary setae in the dorsal bundles, but in the middle and posterior regions the number is reduced to 2 or 3. Dorsal crochets appear on the twenty-first setigerous

segment. In the middle region there are 1 or 2 crochets in each dorsal bundle; in the posterior region the number increases to 3. In the smaller specimens there are only 3 or 4 capillary setae in each of the anterior dorsal bundles. The number gradually decreases, the 15th–20th segments containing 1 or 2 capillary setae, and the posterior segments only a single capillary. Crochets are present in all the ventral bundles—a character which distinguishes this species from all others. In the anterior segments there are 5–7 crochets in each bundle, accompanied by 2 very slender capillary setae (fig. 27B, c). In the posterior segments each ventral bundle contains 3–5 crochets and 1 or 2 fine capillary setae.

The crochets (figs. 27c, 27d) are distinctly bifid at the tip and boldly curved. The shaft is constricted at the point where it emerges from the skin. Above the constriction, on the posterior margin, is a delicate wing, a structure which I have not noticed in any other Cirratulid. The dorsal setae in each bundle are slightly thicker than the ventral ones. Passing backwards the crochets gradually increase in size (compare figs. 27c and 27d), although they still remain small as compared with *C. setosa* and *C. zetlandica*. The slender capillary setae (fig. 26B, c) which usually accompany the crochets, both dorsally and ventrally, are frequently absent.

This species is most nearly allied to *Chaetozone viridis* (Langerhans), and these two species are sharply separated from other species of the genus by the structure and arrangement of the setae. The present species is distinguished from *C. viridis* by the following characters:—(1) the presence of crochets in *all* the ventral bundles (in *C. viridis* they are absent from the two anterior bundles); (2) the shape of the crochets is somewhat different, and the wing is absent in the setae of *C. viridis*; (3) the presence of capillary setae in all the ventral bundles.

*Habitat*.—BLACKSOD BAY—A single specimen found in Laminaria roots from Carrigeenmore. BALLYNAKILL HARBOUR—Taken on two occasions, in the surface tow-net at night.

*Chaetozone killariensis* sp. n.

Pl. XII, figs. 28A–F.

This species has only been found, up to the present, in Killary Harbour. A number of specimens were obtained by washing the rich black mud, dredged from the bottom of the harbour, through a fine silk net. Some of the specimens contained immature eggs. The largest individual was 11 mm. in length, and consisted of 84 setigerous segments. The body is widest in the anterior third, tapering rapidly towards the head, and very gradually towards

the tail. In the anterior region the dorsal surface is flatter than the ventral, and the segments are very narrow. Further behind, the segments are longer and the body more rounded in section. The anus is dorsal, with a ventral lobe beneath.

The head (fig. 28A) is pointed in front, and in the preserved specimens neither eyes nor nuchal organs can be seen. The dorsal tentacles are on the segment in front of the first setigerous segment. Each tentacle is accompanied as usual by a lateral cirrus, situated externally to it. The dorsal cirri are fixed above the dorsal setae.

Both dorsal and ventral bundles in the anterior and middle regions of the body contain only capillary setae. The dorsal setae are longer than the ventral setae; but there are long and short setae in each bundle. The longest setae are in the upper part of the dorsal bundles. Passing backwards these dorsal setae gradually become longer, till in the 20th-30th segment they attain the length of .75-1.00 mm. They then gradually decrease in length. In the anterior segments there are 5-7 setae in each bundle; in the middle region, 6-8. The shorter setae in the anterior segments (fig. 28B) have a cylindrical shaft and a flattened blade, with a distinct curve at the junction of the shaft and the blade.

The segment on which the crochets first appear is variable in position. In the largest specimen the first ventral crochet appears in the 56th segment, the first dorsal crochet in the 61st segment.

The normal arrangement of the setae in the posterior segments is shown in fig. 28F. In the dorsal division there are two crochets in the upper part of the bundle, the outer one being the largest in the whole segment (fig. 28C). Then follow a smaller crochet, and 4 or 5 capillary setae, alternately long and short. The ventral division usually contains 2 or 3 crochets in the lower part of the foot, the lowest being also the shortest. Above the crochets are 3 or 4 capillary setae closely resembling the short capillary setae of the dorsal bundle (fig. 28D, a). In the segments near the tail all the capillary setae of the ventral bundle may be replaced by crochets.

The arrangement of the crochets in the posterior segments depends on the age and size of the specimens. Two individuals of 44 and 50 segments respectively had crochets in the ventral bundles of the posterior 13-14 segments; but the dorsal bundles consisted solely of capillary setae. Another specimen, somewhat larger, had crochets in the dorsal bundles of the posterior 8 segments. As already stated, the largest specimen, of 84 segments, had crochets dorsally in 24 segments, ventrally in 29 segments.

The dorsal crochets (fig. 28C) resemble the short capillary setae in shape, except that the tip is curved and bifid. The uppermost crochet in the

dorsal bundle is much larger than any of the others in either division. The upper crochet in the ventral division (fig. 28D, *b*) is larger than the lower ones (fig. 28D, *c*). The tip of the crochets is curved, and the two points diverge at a very wide angle (fig. 28E).

So far as can be seen from the available specimens, there is no tendency for the posterior setae to form a ring round the segment, such as characterizes *Chaetozone setosa* and other species. However, as all the specimens except one fragment are immature, it is possible that considerable changes take place in the setae at the period of sexual maturity. This species is closely related to *Chaetozone zetlandica* McIntosh, but differs in having no eyes, in having crochets in the posterior dorsal bundles, in the relative position, size, and shape of the setae, etc. It differs from *Chaetozone caput-esocis* (de St.-Joseph) in having no eyes, in having bifid crochets, and in the position, shape, and numbers of the crochets.

*Habitat*.—Dredged in Killary Harbour, in 7 fms., in rich black mud.

**Chaetozone zetlandica** McIntosh.

Pls. XII, XIII, figs. 29A-K.

1911. *Chaetozone zetlandica*. McIntosh, p. 161.

This species was recently described by McIntosh from a single fragment consisting of the posterior end of a specimen dredged in 100 fathoms in St. Magnus Bay, Shetland. It is at once distinguished from all other species of the genus by the arrangement of the crochets, which are present in the ventral, absent in the dorsal bundles. Through the courtesy of Professor McIntosh, I was able to examine the type-specimen, and compare it with the individuals here described. Consequently any errors which may be involved in the assumption here made that the various forms described below are referable to one specific form—*C. zetlandica* McIntosh—will be due either to the fragmentary nature of the type-specimen, or to the wrongful interpretation of alterations in structure due to growth and development.

Altogether, 25 specimens are available for study. These can be easily divided into 3 stages, the most obvious distinction being the size. These 3 stages will be considered separately.

**Stage A.**—The occurrence of this form is worthy of note. Twenty-three specimens were taken, on ten different occasions in the months of March—August. These specimens were always captured at night, in the tow-net, usually at the surface, and have only been obtained in Fahy Bay, a branch of Ballynakill Harbour.

These worms are 4-6 mm. long, composed of 36-64 segments, of which, in the larger specimens, 40-50 are provided with cirri. The shape of the

body is very constant and characteristic. It gradually increases in size up to the 15th setigerous segment, and then tapers towards the tail (Pl. XIII, fig. 29c). The body thus seems to be inflated in the anterior region, resembling that of *Scalibregma inflatum*. The body segments are narrow, and not clearly differentiated.

The head (fig. 29A, 29D) is pointed in front, swollen behind. Just behind the narrow part of the head is a pair of laterally placed reddish-brown kidney-shaped eyes, the pigment of which seems to be partially soluble in alcohol. In front of, and on the outer side of, the eyes are the ciliated nuchal organs. The individual segments composing the anterior part of the body are not distinguishable, except by the appendages they bear. The dorsal tentacles, each accompanied by a lateral cirrus placed externally, occur on the segment in front of that bearing the first bundles of setae. The lateral cirri, of which there are about 46 pairs, are situated as usual just behind and above the dorsal setae. The anus (fig. 29E) is dorsal, bounded above by three ill-defined papillae and below by a prominent lobe.

In the anterior segments the setae, 5-8 in number, both dorsal and ventral, are capillary. In the dorsal bundles there are a few very long slender cylindrical setae, without any distinct neck or flattening of the blade. These setae are about 1 mm. long. The ventral bundles sometimes have one or two slender capillary setae. The remaining capillary setae in the dorsal division and in the anterior ventral feet are shorter capillary setae, with flattened blades and a distinct neck and curvature where the cylindrical shaft emerges from the body-wall (fig. 29F). They are .2-.3 mm. in length. There are only capillary setae in the dorsal bundles. The position of the first crochets in the ventral division is not constant, varying from the 15th to the 25th segment. At first there are only 1 or 2 crochets in each foot, but in the posterior region the arrangement is fairly constant, as shown in fig. 29B. The dorsal division usually contains 3 long slender cylindrical setae, alternating with 3 shorter thicker setae, with slightly flattened blades. The ventral division contains 3 crochets alternating with short capillary setae. The uppermost seta of the ventral division is usually a short capillary seta, thicker and more flattened than the rest.

The crochets (figs. 29G, 29H) are bifid at the tip, the two points forming an acute angle. This is best seen in the ventral crochet. In the uppermost crochet, and sometimes in some of the others, the point is simple, through abrasion of the tip. The shaft of the crochet is longitudinally striated. A distinct neck separates the shaft from the blade, and the latter is obliquely striated. This applies to all the setae except the very long dorsal capillary setae. The thick flattened setae in the middle and posterior dorsal divisions



resemble the crochets in shape, except that they terminate in long slender points. The crochets increase in size in the posterior segments, where the setae are relatively much more prominent than in the anterior and middle regions, and occupy all the lateral area of the body. The distance between the dorsal and ventral bundles remains fairly constant, diminishing only very slightly towards the posterior end. Thus the arrangement of the setae in the posterior region is intermediate between that usually associated with *Heterocirrus* on the one hand and *Chaetozone* on the other.

None of the pelagic specimens were sexually mature; and the free-swimming habit at night has evidently been adopted for the purpose of seeking food.

**Stage B.**—This stage is represented by a single specimen obtained by digging in clean sand in Blacksod Bay in September. It is 11 mm. long, consisting of about 120 segments. The body is long and slender, and the inflation of the anterior end characteristic of Stage A is not evident. The anterior end resembles that of Stage A, but the eyes are darker and slightly more ventral in position. The setae resemble those already described, but are, on the whole, stronger, thicker, more prominent, and more numerous, especially at the posterior end. In the anterior region they do not differ from the arrangement found in Stage A. The concave side of the curved blade shows the same tendency to become frayed, owing to abrasion. In the posterior region there is also a close resemblance; but some of the ventral divisions have each four crochets, the bifid nature of which is not so evident as in those of Stage A. The lowest crochet is always bifid; the next may show a slight indication of a cleft at the tip; and the two remaining crochets have simple rounded points (fig. 29J, *a-c*). The thick capillary setae of both divisions taper rapidly to very fine points (fig. 29J, *d*). These thick setae and the crochets alternate with very slender long capillary setae. The tail shows a slight indication of flattening.

**Stage C.**—This stage, to which the fragment described by McIntosh also belongs, is also represented by an entire specimen found in clean sand in Blacksod Bay in March. It attains the relatively enormous length of 44 mm., but consists only of 150 segments—a number not greatly exceeding that of Stage B. The head bears two ventrally placed reddish-brown eyes. A characteristic feature is the marked flattening of the posterior part of the body, which is only slightly indicated in Stage B. The setae are much more numerous than in Stages A and B, but have the same arrangement in two rows, one consisting of thick flattened setae, the other of long slender cylindrical setae. In the posterior segments there are 18-25 setae in each bundle. The ventral bundles contain 6-7 crochets, terminating in simple

rounded points. In some of the feet the lowest crochet shows traces of a cleft at the tip, but no distinctly bifid setae were seen (fig. 29K).

No trace of genital products was seen in this specimen.

The characteristics of the three stages may now be tabulated, so as to make the comparison clearer:—

STAGE A.	STAGE B.	STAGE C.
1. Taken only in the surface tow-net at night. Found from March-August.	Living in clean sand. Found in September.	Living in clean sand. Found in March.
2. Length 4-6 mm.	Length 11 mm.	Length 44 mm.
3. Number of segments 36-64.	Number of segments 120.	Number of segments 150.
4. Body inflated in the anterior region, with cylindrical posterior end.	Body cylindrical, with slight flattening of posterior end.	Body cylindrical in front, with marked flattening of posterior end.
5. Head with pair of lateral eyes.	Head with pair of ventro-laterally placed eyes.	Head with pair of ventrally placed eyes.
6. Dorsal branchiae on segment in front of that bearing the setae.	Resembles Stage A.	Resembles Stage A.
7. Setae 5-8 in number in each division.	Setae 7-9 in each division, longer and more prominent than in Stage A.	Setae 18-25 in each division, longer and more prominent than in Stage A or B.
8. Crochets absent from dorsal divisions.	Crochets absent from dorsal divisions.	Crochets absent from dorsal divisions.
9. The majority of the crochets distinctly bifid, but the upper crochet with simple tip.	Crochets not so distinctly bifid as in Stage A.	Crochets with simple rounded tips. Only exceptionally the lowest crochet shows indication of a bifid tip.

It will thus be seen that the three stages resemble each other in the shape of the head, the position of the dorsal branchiae, the arrangement of the setae, the absence of crochets from the dorsal divisions of the feet, and the general shape of the setae. The chief differences between Stage A and Stage C relate to the size, number of segments, shape of the body, and the nature of the tips of the crochets. In all these characters, Stage B seems to

be an intermediate form, with greater leanings towards Stage A, as might be expected from the relative sizes of the three stages. The differences between Stages A and C may be regarded as due to the different ages of the specimens; and the dates of capture indicate that C is a year older than Stage A; whilst Stage B is intermediate in age. In view of the close resemblance in certain characters between the three forms, it seems safer to accept this conclusion for the present than to regard Stages A and C as separate species. The discovery of other intermediate stages will be necessary for conclusive proof.

In any case, it is evident that the species represented by Stage A has adopted the free-swimming habit as part of its normal existence, and not merely as an aid to reproduction.

*Habitat.*—BLACKSOD BAY—Found on 2 occasions in clean sand. BALLYNAKILL HARBOUR—Taken on 10 occasions in the surface tow-net at night, in Fahy Bay.

*Distribution.*—Dredged in 100 fathoms in St. Magnus Bay, Shetland.

#### ***Chaetozone setosa* Malmgren.**

1867. *Chaetozone setosa*. Malmgren, p. 96.

Several specimens of this species were taken in the tow-net, usually at night. None of them were mature.

*Habitat.*—BLACKSOD BAY—Surface tow-net at night. CLEW BAY—Many specimens taken in tow-net attached to dredge, in 14–17 fms. BALLYNAKILL HARBOUR—One specimen taken in surface tow-net at night.

*Distribution.*—Scotland (Firth of Clyde); Arctic; Siberia; Scandinavia; North Sea; eastern North America.

#### ***Dodecaceria concharum* Oersted.**

1898. *Dodecaceria concharum*. Caullery and Mesnil, p. 11.

This species is common throughout the district, especially in a calcareous habitat. It is found in Lithothamnion, in the roots of Corallines, in certain sponges, boring in shells and limestone, and between layers of schist.

An epitokous male was dredged in Blacksod Bay in March.

*Habitat.*—BLACKSOD BAY—Found on the shore on 9 occasions; dredged in 4 fathoms. CLEW BAY—Common on the shores of Clare Island; dredged in 16 fms., in limestone.

*Distribution.*—British Isles; west coast of Europe; Mediterranean; Madeira; eastern North America.

**Macrochaeta clavicornis** (Sars).

1835. *Nais clavicornis*. Sars, p. 64. 1880. *Macrochaeta clavicornis*. Langerhans, p. 95. 1898. *Macrochaeta clavicornis* Caullery and Mesnil, p. 130.

This species was originally found by Sars near Bergen, and many years afterwards by Langerhans at Madeira. These are the only records of its occurrence. It is very common throughout Clew Bay and Blacksod Bay; but I have not found it elsewhere in Ireland. In Blacksod Bay it occurs in corallines on the shore, in *Laminaria* roots, and is very common in weeds dredged in a few fathoms.

The systematic affinities of this species are at present not clearly recognized. It is regarded by Levensen and de St.-Joseph as belonging to the Syllidae; by Langerhans and by Caullery and Mesnil, as undoubtedly a Cirratulid. I hope at some future date to give an adequate description of this species and its allies. For the present it may be stated that the relation to the Syllidae is very slight, whilst that to the Cirratulidae is not so pronounced as Caullery and Mesnil maintain.

Mature specimens are found in May.

This species is phosphorescent on irritation, showing a bright blue light.

*Habitat*.—BLACKSOD BAY—Obtained on 7 occasions, in weeds from rock-pools, in *Laminaria* roots, and with weeds in 1-4 fathoms.

CLEW BAY—Obtained in the dredge or tow-net on 4 occasions, in 4-21 fms. BALLYNAKILL HARBOUR—Dredged on 6 occasions, in 2-8 fms.

*Distribution*.—Norway (Floröen); Madeira.

Family **TEREBELLIDAE**.**Proclea Graffi** (Langerhans).

1884. *Leaena Graffi*. Langerhans, p. 262. 1894. *Proclea Graffi*. de St. Joseph, p. 180. 1899. *Solowetia Malmgreni*. Ssolowiew, p. 195.

A single specimen of this very interesting Terebellid was dredged in Clew Bay in 11-19 fms., on a sandy bottom. It was a mature female full of eggs, and was taken in August.

The description and figures given by Langerhans are very meagre and unsatisfactory. The characters of the species are so remarkable, however, and the agreement is so close between the two forms, that there can be little doubt as to the identification of the Irish specimen.

The chief characters distinguishing this species are (1) the absence of branchiae; (2) the presence of capillary setae in 16 segments. These setae

are of three types; one type occurring in the anterior eight bundles, a second type in the posterior eight bundles, and the third type in all the bundles; (3) uncini, which have a characteristic shape and arrangement.

I hope to publish a more complete description of this species on some future occasion; but meanwhile a single point may be mentioned. The first bundle of capillary setae is on the fourth segment. Langerhans says the third segment; but it may be inferred from his figure of *Leaena oculata* that he does not include the buccal segment.

In 1899 Ssolowiew described a new genus and species from the White Sea, which he named *Solowetia Malmgreni*. Apparently he was unaware of the writings of Langerhans and de Saint-Joseph on the ebranchiate Terebellidae, as their names are not mentioned in the paper.

*S. Malmgreni* agrees with *P. Graffi* in the following characters:—(1) Branchiae are absent. (2) There are 16 pairs of bundles of capillary setae consisting of smooth and serrate setae, beginning on the 4th segment. (3) Uncini begin in the 3rd setigerous segment, and have the characteristic shape and arrangement in single and double rows.

Ssolowiew does not appear to have noticed the peculiar arrangement of the smooth and serrate capillary setae, but otherwise no distinction can be found between the two forms, and I have no doubt but that they are referable to the same species.

*Habitat.*—CLEW BAY—Dredged in 11–19 fms., 1 mile E.S.E. of Clare Island lighthouse, on a sandy bottom.

*Distribution.*—White Sea ( $7\frac{1}{2}$ – $9\frac{1}{2}$  fms.); Franz-Joseph Land; Madeira.

#### ***Amphitrite affinis* Malmgren.**

1865. *Amphitrite affinis*. Malmgren, p. 375. 1912. *A. a.* Wollebaek, p. 101.

A single small specimen, dredged in 16–19 fms. in Clew Bay, appears to belong to this species. It agrees with it in having 3 pairs of branched gills, capillary setae on 17 segments, in the shape and arrangement of the uncinata setae, and in having a tube formed of mud, with thick walls. The wings and teeth on the capillary setae are rather more prominent than is shown in the figures of Malmgren and Wollebaek. The uncini agree closely, the rounded base being very characteristic. On segments 11–20 the uncini are in two rows, on the other segments in a single row.

This species seems to be very closely related to the *Amphitrite variabilis* (Risso) found in the Mediterranean, differing, so far as I can see, only in the simpler gills and the shape of the uncini.

*Habitat*.—CLEW BAY. Dredged in 16-19 fms., on a sandy bottom, 1 mile E. by S. of Clare Island lighthouse.

*Distribution*.—Spitzbergen ; Iceland ; Norway ; Siberia.

**Amphitrite Johnstoni** Malmgren.

1865. *Amphitrite Johnstoni*. Malmgren, p. 377. 1898. *A. J. de Saint-Joseph*, p. 421. 1912. *A. J. Wollebaek*, p. 103.

This species is occasionally found under stones on the shore, but usually it lives in wide deep tunnels in the sand of *Zostera* beds. It lines the tunnel with a thick mud tube.

A small specimen, 20 mm. long, was dredged in 1 fm. in Blacksod Bay, living in *Laminaria* roots. It agreed with fully grown specimens in having 3 pairs of gills, 24 bundles of capillary setae, and double rows of uncini on segments 11-27.

*Habitat*.—BLACKSOD BAY—Found on the shore on two occasions. Dredged in 1 fm., in *Laminaria* roots. BALLYNAKILL HARBOUR—Found on the shore. BOFIN HARBOUR—Found on the shore.

*Distribution*.—British Isles ; France ; North Sea ; Scandinavia ; White Sea ; east North America.

**Amphitrite gracilis** (Grube).

1884. *Amphitrite gracilis*. Marenzeller, p. 176. 1894. *A. g. de Saint-Joseph*, p. 198.

This species is extremely common on the shore at Blacksod Bay. It lives under stones on the shore, and in crevices of the flaky schist.

*Habitat*.—BLACKSOD BAY—Found on the shore on 26 occasions. CLEW BAY—Dredged on two occasions, in 18-19 fms., on a rocky bottom. BALLYNAKILL HARBOUR—Found on the shore on two occasions.

**Lepraea lapidaria** (L.)

1894. *Terebella lapidaria*. De Saint-Joseph, p. 202.

This species was very rare, only two specimens being found.

*Habitat*.—CLEW BAY—Dredged in 16 fms.

*Distribution*.—South of England ; France ; Mediterranean.

**Scione maculata** (Dalvell).

1894. *Scione maculata*. De Saint-Joseph, p. 205.

This species forms a fine tube of sand, small fragments of shell, and pieces of seaweed, usually attached to Hydroids, Polyzoa, or seaweeds.

*Habitat.*—BLACKSOD BAY—Found once on the shore. Dredged on 2 occasions, in  $4\frac{3}{4}$ – $5\frac{1}{2}$  fms. CLEW BAY—Dredged in Laminaria roots from 13– $16\frac{1}{2}$  fms.

*Distribution.*—Scotland; north of France.

**Nicolea venustula** (Montagu).

1894. *Nicolea venustula*. De Saint-Joseph, p. 207.

All the specimens of *Nicolea* from the Clare Island district, whether from between tide-marks, or dredged in 25 fms., agree with the species described by Marenzeller and de Saint-Joseph in having two pairs of gills and capillary setae on 17 segments. The form *zostericola* with capillary setae on 15 segments was not obtained.

Mature specimens were found in March and May.

*Habitat.*—BLACKSOD BAY—Found on the shore on 5 occasions. Dredged on 3 occasions, in 3–6 fms. CLEW BAY—Dredged on 5 occasions, in 9–26 fms. BALLYNAKILL HARBOUR—Dredged in 6–9 fms.

*Distribution.*—British Isles; France; Mediterranean; Red Sea; ? Arctic; ? Scandinavia; ? North Sea.

**Lanice conchilega** (Pallas).

1894. *L. c.* de Saint-Joseph, p. 211. 1912. *L. c.* Wollebaek, p. 105.

This species is very abundant on the shores of Blacksod Bay. It lives with its tube buried deeply in the sand, the upper end usually projecting between two stones. It is also found occasionally living in clean sand, but more usually in mud, gravel, or the sand of *Zostera* beds. The empty tubes are very common in the dredge. Young specimens were dredged in May.

*Habitat.*—BLACKSOD BAY—Found on the shore on 19 occasions. Dredged on 9 occasions in 1–9 fms. CLEW BAY—Dredged on 17 occasions, usually only empty tubes, in 5–22 fms. BALLYNAKILL HARBOUR—Found on the shore on 4 occasions.

*Distribution.*—British Isles; France; Scandinavia; North Sea; Madeira; Mediterranean.

**Pista cristata** (O. F. Müller).

1865. *Pista cristata*. Malmgren, p. 382. 1912. *P. c.* Wollebaek, p. 99.

This species was rare in the district, only a single specimen having been dredged in Inishlyre Harbour, on a muddy bottom. It had four unequal gills.

*Habitat.*—CLEW BAY—Dredged in 4 fms., in Inishlyre Harbour.

*Distribution.*—Shetlands; France; Iceland; Scandinavia; Spitzbergen; Nova Zembla; White Sea; east North America; Mediterranean.

***Polymnia nebulosa* (Montagu).**

1896. *Polymnia nebulosa*. De Saint-Joseph, p. 219.

1912. *Terebella debilis*. Wollebaek, p. 96.

This species is abundant on the shore, living in long tubes on the under-side of stones in gravel, and in the sand of *Zostera* beds. The tubes are sometimes as much as a foot and a half long, consisting of a parchment-like membrane covered with sand and pieces of shell. Specimens taken in the dredge are always much smaller than those found on the shore. Mature specimens were found in September.

*Habitat*.—BLACKSOD BAY.—Found on the shore on 15 occasions. Dredged on 4 occasions, in 2-6 fms. CLEW BAY—On the shore of Annagh Island. Dredged on 5 occasions, in 4-10 fms., usually on muddy ground. BALLYNAKILL HARBOUR—Found on the shore on 3 occasions. Dredged on 4 occasions in 1-8 fms.

*Distribution*.—Great Britain; France; Norway; Finmark; Skaggerak; Helgoland; Mediterranean.

***Polymnia nesidensis* (Delle Chiaje).**

1896. *Polymnia nesidensis*. De Saint-Joseph, p. 225. 1912. *Terebella Danielsseni*. Wollebaek, p. 97.

This species is found on the shore, under stones and in the sand of *Zostera* beds. Mature specimens were found from February to May.

*Habitat*.—BLACKSOD BAY—Found on the shore on 8 occasions. Dredged on 7 occasions, in 1-8 fms. CLEW BAY—Dredged in Inishlyre Harbour, in 5 fms. BALLYNAKILL HARBOUR—Dredged on 3 occasions, in 2-9 fms.

*Distribution*.—Great Britain; France; Scandinavia; North Sea; Mediterranean.

***Thelepus setosus* (Quatrefages).**

1894. *Thelepus setosus*. De Saint-Joseph, p. 230.

This species was common on the shore in Blacksod Bay, living under stones, in *Laminaria* roots, and in the sand of *Zostera* beds. It is frequently accompanied in its tube by the Polynoid worm *Polynoe scolopendrina*. Mature specimens were found in August, the eggs being of a pale salmon colour.

*Habitat*.—BLACKSOD BAY—Found on the shore on 8 occasions. Dredged on 6 occasions, in 3-8 fms. CLEW BAY—Dredged on 4 occasions, in 9-26 fms.

*Distribution*.—Dublin Bay; south of England; France.



**Thelepus cincinnatus** (Fabricius).

1912. *Thelepus cincinnatus*. Wollibaek, p. 89.

This species is very rare in Blacksod Bay, only two specimens having been found there. In Clew Bay, it was usually dredged in mud or muddy sand. Mature specimens were found in August, young specimens in May.

*Habitat*.—BLACKSOD BAY—Found on the shore on two occasions.

CLEW BAY—Dredged off Mulranny in 7 fms.; in Inishlyre Harbour in 2-4 fms.; in Killary Harbour on two occasions in 7 and 17½ fms.; near Inishgowla in 8-10 fms.

*Distribution*.—British Isles; France; Arctic; Scandinavia; North Sea; east North America; Mediterranean.

**Thelepides collaris** gen. et sp. nov.

Pl. XIII, figs. 30 A-E.

A single specimen only of this interesting form was dredged in Clew Bay, in 15 fathoms. The tube is missing.

The specimen, which is incomplete posteriorly, is 25 mm. long, and consists of 29 segments, of which 27 bear setae. The sexual organs are not mature.

The body is only slightly swollen in the thoracic region, tapering towards the head. The abdominal region is cylindrical. The skin is smooth, and does not show the pitted markings so prominent in *Thelepus setosus* and *T. cincinnatus*.

In the anterior region the segments are four times as broad as long, but the length gradually increases, and in the abdominal region the length considerably exceeds the breadth. In the thoracic segments there is a superficial annulation of the skin.

A conspicuous folded membrane surrounds the mouth (figs. 30A, 30B). In the median ventral line there is a small lobe not connected with the folded membrane. The tentacles emerge in two lateral bunches.

The first segment has two groups of eyes in a dorso-lateral position. On the ventral side it forms a smooth rounded lower lip (fig. 30B), with its lateral boundaries indicated by the nerve commissures.

The branchiae occur on the second and third segments (fig. 30A). As in the genus *Thelepus*, they are slender, cirriform, and unbranched. Each is faintly grooved. On the second segment there are four pairs of branchiae, on the third segment two pairs. These numbers are much smaller than those found in species of *Thelepus*, and approximate to the condition in the genus *Enthelepus* McIntosh, where there is only a single pair of branchiae on

each segment. The branchiae on the second segment are somewhat larger than those on the third segment.

Capillary setae commence on the third segment, as in the genus *Thelepus*, but they are only present on fifteen segments. On the 3rd and 4th segments a conspicuous row of glands runs round the segment in a line with the setae (figs. 30A, 30B). In each of the dorsal bundles the setae are in two rows. The posterior row consists of long slender setae (fig. 30C), tapering to a fine point, with a smooth edge and narrow unequal wings. The anterior row consists of shorter setae, with narrower wings, and with more abruptly tapered tips (fig. 30D).

The ventral rows of uncini only commence on the 11th segment (9th setigerous segment). In the genus *Thelepus* they commence on the 5th segment. On the 9th setigerous segment there are 9 uncini, on the 10th there are 20, on the 18th 93, and on the 26th there are 86. They are arranged side by side in a single row, with no alternation. In the posterior segments they are moved by long slender chitinous tendons ('soies de soutien'). In side view (fig. 30E, *a*), each uncinus shows two teeth above the main tooth. The base is rounded, with a sharp spinous muscle attachment in front, and a blunt one on the posterior border. In surface view (fig. 30E, *b*) the crest shows a single row of seven slender teeth above the main tooth. The uncini of the posterior segments are slightly larger than those of the anterior segments.

These uncini differ considerably in shape from those so characteristic of the genus *Thelepus*. The rounded button-shaped knob on the base of the uncini of *Thelepus* is represented in the present species by a sharp spine, as in most genera of the Terebellidae. Moreover in *Thelepus* there are usually two or three rows of teeth on the crest of the uncini, as against a single row in *Thelepides*.

In these circumstances I propose a new genus for this form, which may be provisionally defined as follows:—

#### ***Thelepides* gen. nov.**

*Forms agreeing with Thelepus in having (1) setae on the third segment; (2) filiform unbranched gills; (3) uncini in a single row. They differ from Thelepus in having (1) capillary setae on 15 segments only; (2) uncini with a single row of teeth on the crest, without the characteristic knob on the base. The uncini commence on the eleventh segment, those of Thelepus on the fifth.*

*Habitat.*—CLEW BAY—Dredged in 15 fms., 9 miles E.S.E. of Clare I. lighthouse, on stony ground.

**Polycirrus caliendrum** Claparède.

1894. *Polycirrus caliendrum*. De Saint-Joseph, p. 237.

Numerous specimens of this species were found throughout the area. It was most commonly found in *Laminaria* roots; but it was also found in the sand of a *Zostera* bed, and was dredged on several occasions. Mature specimens were found in March and May.

The species most commonly recorded from the European coasts is *P. aurantiacus* Grube. It differs from the present species in having only three pairs of nephridia instead of six pairs. In other respects the two species are almost identical. A careful examination of all the Irish specimens has shown that in all cases six pairs of nephridia are present. The three posterior pairs are, however, very small and easily overlooked. The three anterior pairs are large and easily seen lying free in the body-cavity, whilst the three posterior pairs are hidden by overlying transverse strands of muscle.

In view of these observations, it seems probable that a large proportion of the records of *P. aurantiacus* should really be referred to *P. caliendrum*, if indeed the two species are not identical. I am not in a position to pronounce definitely on this point. Specimens from various parts of Europe should be examined and compared.

*Habitat*.—BLACKSOD BAY—Found on 2 occasions, on the shore. CLEW BAY—Dredged on 4 occasions, in 7–16 fms. BALLYNAKILL HARBOUR—Dredged on 2 occasions, in 1–8 fms. BOFIN ISLAND—Dredged in 16 fms.

*Distribution*.—England; France; Naples.

**Polycirrus Smitti** (Malmgren).

1865. *Ereutho Smitti*. Malmgren, p. 391.

This species was found by digging in clean sand and in muddy gravel in Blacksod Bay. Mature specimens were found in May.

The capillary setae occur on 13 segments. They are very slender, and either without, or with only a slight indication of, wings. The edge of the seta is sometimes serrate; but this is owing to abrasion, and is not a specific character. The uncini have a single row of small teeth on the crest of the large tooth. The base of the uncini is striated. There are six pairs of nephridia.

*Habitat*.—BLACKSOD BAY—Obtained on the shore on 3 occasions, by digging in sand and muddy gravel.

*Distribution*.—Scotland; Arctic shores; Scandinavia; Eastport, Maine, U.S.A.

**Polycirrus haematodes** (Claparède).

1894. *Polycirrus haematodes*. De Saint-Joseph, p. 241.

In the littoral region this species was always obtained from *Laminaria* roots. It was taken a few times in the dredge. Mature specimens were found in August. The capillary setae of this species are frequently serrate at the tip, owing to abrasion of the blade.

*Habitat*.—BLACKSOD BAY—Taken on 3 occasions on the shore, in *Laminaria* roots. CLEW BAY—Dredged on 2 occasions, in 8–16 fms.  
BALLYNAKILL HARBOUR—Dredged in 6–8 fms.

*Distribution*.—Scotland (Fairlie Channel); France; Madeira; Naples.

**Polycirrus denticulatus** de Saint-Joseph.

1894. *Polycirrus denticulatus*. De Saint-Joseph, p. 242.

This species was particularly characterized, according to de Saint-Joseph, by the serrate wings of the capillary setae. My observations on several species have convinced me that this character is of no importance. The serration of the delicate edge of the setae is caused by abrasion. I have frequently found smooth and serrate setae in the same bundle. In this genus the capillary setae have a fibrous structure, and readily become frayed at the edge.

There is great resemblance between this species and *P. haematodes* (Claparède). The chief differences are (1) the absence of uncini from the thoracic region in *P. haematodes*; (2) in *P. denticulatus* the winged portion of the capillary setae is shorter than in *P. haematodes*. It is possible that the species *P. triglandula* Langerhans, and *P. tenuisetis* Langerhans, are identical with the present species. According to Langerhans, these two species have only three pairs of nephridia; but he may have overlooked the three posterior pairs, which, in *P. denticulatus*, are very small, and are hidden by an overlying sheet of muscle.

*Habitat*.—BLACKSOD BAY—Obtained on one occasion in *Laminaria* roots on the shore. BALLYNAKILL HARBOUR—Dredged on 2 occasions, in 3–8 fms.

*Distribution*.—France (Dinard).

**Terebellides Stroemi** Sars.

1865. *Terebellides Stroemi*. Malmgren, p. 396. 1912. *Terebellides Strömi*. Wollebaek, p. 78.

This species is usually found in mud, or in the sand of *Zostera* beds. Mature specimens were found in May and November. The geographical range is very extended, stretching from the Arctic to the South Pacific.

*Habitat.*—BLACKSOD BAY—Found once on the shore. Dredged on 3 occasions in 1–4½ fms. CLEW BAY—Dredged in Killary Harbour, in 7 fms.; in Inishlyre Harbour on 5 occasions, in 4–5 fms. BALLYNAKILL HARBOUR—Found on the shore on 3 occasions. Dredged on 2 occasions in 1–4 fms.

*Distribution.*—Great Britain; Arctic; Scandinavia; Siberia; Adriatic; east coast of North America; Magellan Straits; Kerguelen; east of Bouvet Islands.

**Trichobranchus glacialis** Malmgren.

1894. *Trichobranchus glacialis*. De Saint-Joseph, p. 244. 1912. *T. g.* Wollebaek, p. 79.

This species is comparatively rare in the district. It is generally found on a muddy bottom.

*Habitat.*—CLEW BAY—Dredged in Inishlyre Harbour, in 5 fms.; in Killary Harbour in 8 fms. BALLYNAKILL HARBOUR—Dredged on 4 occasions, in 1–8 fms.

*Distribution.*—Scotland; Arctic; Scandinavia; North Sea; France; Madeira; Canaries; Mediterranean; eastern North America.

Family **AMPHARETIDAE.**

**Ampharete Grubei**, Malmgren.

1865. *Ampharete Grubei*. Malmgren, p. 363. 1897. *Ampharete Grubei*. Fauvel, p. 13.

Mature specimens of this species were found in May.

*Habitat.*—BLACKSOD BAY—Dredged on 6 occasions, in 2–6 fms. CLEW BAY—Dredged on 4 occasions, in 5½–17 fms.

*Distribution.*—British Isles (Dublin Bay, Isle of Man); France; Arctic; Scandinavia; North Sea; eastern North America.

Family **AMPHICTENIDAE.**

**Pectinaria auricoma** (Müller).

1865. *Amphictene auricoma*. Malmgren, p. 357.

This species usually lives in sand. It was also found in fine gravel, and in the sand of *Zostera* beds.

*Habitat.*—BLACKSOD BAY—Found twice on the shore. Dredged in 7–8 fms. CLEW BAY—Dredged on 11 occasions, in 4–22 fms., usually on a sandy bottom.

*Distribution.*—British Isles; Scandinavia; North Sea; Mediterranean.

**Pectinaria belgica** (Pallas).

1865. *Pectinaria belgica*. Malmgren, p. 356.

The only specimens of this species obtained in the district were secured by passing the rich black mud from the bottom of Killary Harbour through a sieve. Some of the specimens grow here to a great size, up to 80 mm. in length. The longest tube obtained was 90 mm. long.

This species has been repeatedly confused with *Lagis Koreni*, and its distribution is probably much more restricted than would appear from the records. It is a northern form.

*Habitat*.—CLEW BAY—Dredged on 3 occasions in Killary Harbour, in 8–17 fms.

*Distribution*.—Irish Sea (Lambay Deep); Scotland (St. Andrews); Scandinavia; Belgium.

**Lagis Koreni** Malmgren.

1891. *Lagis Koreni*. De Saint-Joseph, p. 405.

This species is common in Blacksod Bay, living in clean sand, more rarely in the sand under stones.

*Habitat*.—BLACKSOD BAY—Found on the shore, on 8 occasions. Dredged in 6–8 fms. BALLYNAKILL HARBOUR—Found once on the shore.

*Distribution*.—Great Britain (Plymouth); France; Scandinavia; North Sea; Mediterranean.

Family **CAPITELLIDAE**.**Capitella capitata** (Fabricius).

1887. *Capitella capitata*. Eisig, p. 849.

This species is not very common in the district, and was only taken on 4 occasions. Mature specimens were found in August.

*Habitat*.—BLACKSOD BAY—In muddy sand on the shore. Dredged in 1 fm. CLEW BAY—In sand near the Harbour, Clare Island. Dredged in Laminaria roots, 13–24 fms.

*Distribution*.—British Isles; Scandinavia; Arctic; North Sea; Madeira; Naples; Black Sea; east coast of North America; South Africa; Kerguelen.

**Notomastus latericeus** M. Sars.

1894. *Notomastus latericeus*. De Saint-Joseph, p. 117.

This species is very abundant on the shore in clean sand, and especially in the sand of *Zostera* beds. It is also common in muddy sand and gravel.

*Habitat*.—BLACKSOD BAY—Found on the shore on 20 occasions. CLEW BAY—Dredged in various parts of the bay, including Killary Harbour and Inishgowla, on 6 occasions, in 4–24 fms. BALLYNAKILL HARBOUR—Dredged in 4–8 fms.

*Distribution*.—British Isles; Arctic; Scandinavia; North Sea; France; Madeira; Adriatic; east coast of North America; east of Bouvet Island (South Pacific).

Family **OPHELIIDAE**.

**Travisia Forbesi** Johnston.

1898. *Travisia Forbesii*. De Saint-Joseph, p. 381.

This species lives in clean sand. It is exceedingly abundant in certain of the sandy beaches in Blacksod Bay, especially in Elly Bay, where large numbers were obtained by passing the sand through a sieve. The worms are enveloped in a delicate membranous tube, covered with sand-grains.

Mature specimens were found in March.

*Habitat*.—BLACKSOD BAY—Found on the shore on 11 occasions.

*Distribution*.—Great Britain; France; Scandinavia; Arctic; North Sea; east coast of North America; South Africa.

**Ophelia limacina** (Rathke).

1843. *Ammotrypane limacina*. Rathke, p. 190.

This species only lives in sand. A few large specimens were found in Blacksod Bay; and it was taken in Clew Bay, when dredging on a sandy bottom.

*Habitat*.—BLACKSOD BAY—Found on 3 occasions. CLEW BAY—Dredged on 3 occasions, in 8–19 fms.

*Distribution*.—British Isles; Scandinavia; Arctic; North Sea; east coast of North America.

**Ammotrypane aulogaster** Rathke.

1843. *Ammotrypane aulogaster*. Rathke, p. 188.

Very rare in the district. Not found in Blacksod Bay.

*Habitat*.—CLEW BAY—Dredged in Inishlyre Hbr., in 5 fms.; in the middle of the bay, in 18 fms. BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution*.—Great Britain; Scandinavia; Arctic; North Sea; Gulf of St. Lawrence.

***Armandia flagellifera* sp. n.**

Pl. XIV, figs. 31 A-D.

A single specimen of this new species was taken in the tow-net near the entrance to Ballynakill Harbour. A well-preserved specimen has also been dredged in 11 fathoms in Galway Bay; and as the latter individual is in some respects in better condition than the former, it has been largely used in drawing up the following description.

The body is 12 mm. long in one specimen, and 9 mm. in the other, the latter being more strongly contracted and thicker than the former. It is of very uniform thickness throughout the greater part of its length, tapering to the pointed head, and more abruptly towards the tail. Starting immediately behind the mouth, a ventral groove runs along the body to the anal funnel. It is shallow in front, but gradually deepens towards the middle of the body; and it is bounded laterally by two conspicuously rounded ridges. The colour is pale-brown with a greenish sheen, and any pattern which may have been present in the living worms has vanished.

There are 33 setigerous segments in both specimens. Each segment is composed of three distinct rings, and each ring is biannulate. The annulation is not very distinct near the ends of the body.

The head (fig. 31 A) tapers gradually to a slender tip. No eyes are visible on the head.

In front of the first setigerous lobe on each side is a conspicuous nuchal organ.

Long slender dorsal cirri are present on all setigerous segments except the first and the two last. Their absence from these segments is probably due to accident.

The lateral eyes occur on 16 setigerous segments, the 4th to the 19th. The posterior ones are small and inconspicuous. In the specimen from Galway Bay the eye consists of small spheres of pigment, like a compound eye; but in the Ballynakill specimen the pigment in each eye is fused into a single sphere.

The anal funnel (fig. 31 C) is formed of a delicate membrane, ringed externally. The opening is dorsal, sloping from below upwards and forwards. The membrane on each side of the opening projects in four lobes, each lobe bearing a fusiform papilla.

On the ventral side of the anal funnel, in the median line in front, rises a long slender cirrus, nearly twice as long as the anal funnel. Such a cirrus has been found previously in two species of *Armandia*, *A. leptocirris* Grube,



and *A. intermedia* Fauvel, though its absence may in some other cases have been due to accident, as it is easily detached. In the latter case a careful search will reveal the fractured base of the cirrus. In other respects the anal funnel of these two species differs widely from that of *A. flagellifera*.

In the specimen from Galway Bay, the proboscis is partially protruded (fig. 31 B). It projects as an arched membrane over the mouth, and is fringed with 13 slender papillae. A similar structure does not seem to have been noted in any other species of *Armandia*. Kukenthal<sup>1</sup> gives a figure of the extended proboscis of *A. polyophthalma*. It is a globular lobate organ, without any papillae, and de Saint-Joseph states (1894, p. 115) that *A. Dollfusi* resembles *A. polyophthalma* in this respect.

The feet are situated on the upper and outer sides of the ventro-lateral ridges. There is a rounded setigerous lobe (fig. 31 D) from the upper and lower margins of which emerge the dorsal and ventral setae respectively. The dorsal cirri are long, slender, and tapering, the ventral cirri short and finger-shaped.

The setae are longitudinally striated, and are easily fractured into a bundle of long, slender needles. In the specimen from Ballynakill, the setae are all frayed out in this manner.

In the dorsal division of the foot there are 7-8 long flat setae, the upper ones being the longest. In the ventral division there are 9-10 similar setae, almost equal in length, but shorter than the dorsal setae.

In the posterior nine or ten segments, the setae are greatly elongated, exceeding the anal funnel in length.

This species is easily distinguished by the shape of the head, absence of eyes, structure of the anal funnel, especially by the presence of the median ventral cirrus, and by the papillae on the proboscis.

*Habitat.*—BALLYNAKILL HARBOUR—A single specimen taken in the surface tow-net at night.

Another specimen was dredged in 11 fms. in Galway Bay, living in sand.

#### ***Polyophthalmus pictus* (Dujardin).**

1898. *Polyophthalmus pictus*. De Saint-Joseph, p. 385.

This species is extremely common in the littoral and shallow-water areas of the west coast of Ireland. It is found in weeds from rock-pools, in *Zostera* beds, *Laminaria* roots, and is dredged on all types of ground, except clean sand and mud.

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<sup>1</sup> Jenaische Zeitschrift, Bd. xx, 1887, Taf. xxxiii, fig. 28.

*Habitat.*—BLACKSOD BAY—Found on the shore on 11 occasions. Dredged on 6 occasions, in 1-8 fms. CLEW BAY—Shore of Achill Island. Dredged in Inishlyre Harbour on 2 occasions, in 2-5 fms. Dredged in 14 fms.,  $1\frac{1}{2}$  miles off Cleggan Head. BALLYNAKILL HARBOUR—Dredged on 11 occasions, in 1-8 fms. BOFIN HARBOUR—Dredged on 17 occasions, in 1-6 fms.

*Distribution.*—West coast of Ireland; south-west coast of England; France; Mediterranean; Red Sea.

Family **MALDANIDAE.**

**Micromaldane ornithochaeta** Mesnil.

1897. *Micromaldane ornithochaeta*. Mesnil, p. 146.

A number of specimens of this interesting little species were found in Laminaria roots dredged in 9-11 fms., in Clew Bay. I have also found them in Laminaria roots from Howth, Co. Dublin. Apparently the species has been previously seen only by Mesnil, who found it in the cavities of *Lithothamnion polymorphum* at La Hague, near Cherbourg.

*Habitat.*—CLEW BAY—Dredged in 9-11 fms.

*Distribution.*—France (La Hague).

**Nicomache maculata** Arwidsson.

1911. *Nicomache (Nicomache) maculata*. Arwidsson, p. 209.

This species was described by Arwidsson partly from specimens collected in Blacksod Bay. They were found in muddy sand between stones on the north side of Feorinyeo Bay.

Mature specimens were found in October.

*Habitat.*—BLACKSOD BAY—Found once on the shore.

*Distribution.*—Ireland (Howth, Portstewart); Scotland (Firth of Forth, St. Andrews); Helgoland.

**Caesicirrus neglectus** Arwidsson.

1911. *Caesicirrus neglectus*. Arwidsson, p. 217.

This species—only recently described by Arwidsson, from Irish material—is exceedingly abundant in certain patches of clean sand in Blacksod Bay. The fine sandy tubes project in vast numbers from the sand near low-water mark. In other adjacent patches of sand, apparently of the same nature and under the same conditions, *Caesicirrus* is quite absent.

Mature specimens were found in September.

*Habitat*.—BLACKSOD BAY—Found in the sand on the shore on 13 occasions. Dredged on 2 occasions, in 4–5½ fms. CLEW BAY—Dredged in Inishlyre Harbour, in 4 fms., on corallines. BALLYNAKILL HARBOUR—Found once on the shore.

*Distribution*.—Ireland (Galway Bay, Valencia Harbour); Great Britain (Bangor, Firth of Forth).

**Petaloproctus terricola** Quatrefages.

1894. *Petaloproctus terricola*. De Saint-Joseph, p. 144.

Two specimens of this species were found in Blacksod Bay, living under stones on the shore. They were compared with individuals from St. Vaast-la-Hogue, with which they agreed closely. The identification was confirmed by Arwidsson. The species has not previously been recorded from the British Isles, and has only been found on the Atlantic and Mediterranean shores of France.

*Habitat*.—BLACKSOD BAY—Found on 2 occasions, on the shore.

*Distribution*.—Atlantic and Mediterranean shores of France.

**Heteroclymene robusta** Arwidsson.

1906. *Heteroclymene robusta*. Arwidsson, p. 227. 1911. *H. r.* Arwidsson, p. 224.

A single complete specimen was dredged in Ballynakill Harbour, in 1–3 fms. It was named by Arwidsson (1911). This is the only record from the British Isles.

*Habitat*.—BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution*.—West of Ireland; west coast of Norway.

Family **ARENICOLIDAE**.

**Arenicola marina** (L.).

1909. *Arenicola marina*. Ashworth, p. 1. 1912. *A. m.* Ashworth, p. 86.

Post-larval stages of this species were found in Laminaria roots in September. One pelagic specimen, enveloped in a gelatinous tube, was taken in the surface tow-net in March, in Blacksod Bay.

*Habitat*.—BLACKSOD BAY—Very common in the sandy beaches. CLEW BAY—Common on the sandy beach near the Harbour, Clare Island. BALLYNAKILL HARBOUR—Common in the sandy beaches.

*Distribution*.—Shores of North Atlantic, Arctic, and western Mediterranean.

**Arenicola ecaudata** Johnston.

1909. *Arenicola ecaudata*. Ashworth, p. 2. 1912. *A. e.* Ashworth, p. 132.

Post-larval stages of this species were frequently obtained in *Laminaria* roots in Blacksod Bay, in September, and young stages in March. Adults were rare in Blacksod Bay, only 4 specimens being found, whilst *A. branchialis* was common.

*Habitat*.—BLACKSOD BAY—Adults on 2 occasions, under stones on the shore. Post-larval stages frequently in *Laminaria* roots. CLEW BAY—Shore of Clare Island. BALLYNAKILL HARBOUR—Under stones on the shore.

*Distribution*.—British Isles; Scandinavia; France.

**Arenicola branchialis** Audouin and Edwards.

1909. *Arenicola Grubii*. Ashworth, p. 2.

1912. *A. branchialis*. Ashworth, p. 138.

The only post-larval specimens of this species known up to the present were found in *Laminaria* roots in Blacksod Bay, in September, 1910. Young specimens were found in March. Adults were common in Blacksod Bay, living in gravel and coarse sand under stones. They were not found in clean sand, but live in numbers in the sand of *Zostera* beds. Some of the specimens are coloured a dark greenish brown; others are light brown with broad bands of a deeper colour.

*Habitat*.—BLACKSOD BAY—Found on the shore on 10 occasions. BALLYNAKILL HARBOUR—Three specimens on the shore.

*Distribution*.—West shores of the British Isles; France; Spain; Portugal; Morocco; northern Mediterranean; Black Sea.

Family **SCALIBREGMIDAE**.**Scalibregma inflatum** Rathke.

1901. *Scalibregma inflatum*. Ashworth, p. 237.

This species was found on many occasions. It is fond of muddy places, and lives also between flakes of schist, in the sand of *Zostera* beds, in muddy gravel, and in coarse shelly sand.

A large number of small specimens were taken in the surface tow-net at night, in Ballynakill Harbour, in the months of March, April, and May.

*Habitat*.—BLACKSOD BAY—Found on the shore on 3 occasions. CLEW BAY—Dredged in Inishlyre Hbr., in 4 fms., on a bottom of mud. Dredged in 12 fms., off Killary Hbr., on a bottom of sandy mud. BALLYNAKILL HARBOUR—Taken on 6 occasions in the surface tow-net at night;

*Distribution*.—British Isles; Arctic; Scandinavia; North Sea; east coast of North America; South Africa; Kerguelen; New Zealand.

***Sclerocheilus minutus* Grube.**

1894. *Sclerocheilus minutus*. De Saint-Joseph, p. 104.

This species is not common in the district, but is occasionally found under stones on the shore, or taken in the dredge. When living, it is of a bright red colour. Its distribution is distinctly southern.

*Habitat*.—BLACKSOD BAY—Found on the shore on 4 occasions. Dredged in 1 fm. CLEW BAY—Dredged in 5½–11 fms.

*Distribution*.—South coast of England; Channel Islands; France; Mediterranean.

***Asclerocheilus intermedius* (de St.-Joseph).**

1894. *Lipobranchius intermedius*. De St.-Joseph, p. 113.

1901. *Asclerocheilus intermedius*. Ashworth, pp. 294, 297.

Several specimens of this species dredged in Blacksod Bay had regenerated the anterior end.

The absence of eyes and ventral cirri at once distinguished this species from *Sclerocheilus minutus*.

*Habitat*.—BLACKSOD BAY—Found twice on the shore, living in the roots of *Laminaria*. Dredged in 1 fm., also in *Laminaria* roots. BALLYNAKILL HARBOUR—Dredged in 1–3 fms.

*Distribution*.—France (Dinard); Azores (760 fathoms).

**Family CHLORHAEMIDAE.**

***Stylarioides plumosa* (O. F. Müller).**

1894. *Stylarioides plumosa*. De Saint-Joseph, p. 101.

This species is very common in Blacksod Bay, where it lives on the shore under stones and in gravel. It prefers sand with an admixture of mud, and is common in the sand of *Zostera* beds.

*Habitat*.—BLACKSOD BAY—Found on the shore on 18 occasions. Dredged on 4 occasions, in 1–5 fms. CLEW BAY—Dredged on 5 occasions in 4–17 fms. BALLYNAKILL HARBOUR—Found on 2 occasions on the shore. Dredged in 2 fms.

*Distribution*.—British Isles; Arctic; Scandinavia; North Sea; France; eastern North America.

***Stylarioides glauca* (Malmgren).**

1867. *Trophonia glauca*. Malmgren, p. 82.

This species is rare in the district. It is generally dredged on sandy ground.

*Habitat.*—CLEW BAY—Dredged on two occasions, in 4–12 fms. BALLYNAKILL HARBOUR—Dredged on 2 occasions, in 1–6 fms.

*Distribution.*—Scotland; Norway; Sweden; North Sea.

**Flabelligera affinis** Sars.

1894. *Flabelligera affinis*. De Saint-Joseph, p. 96.

This species is very common in Blacksod Bay, where it lives under stones on the shore, and in Laminaria roots. It is possible that a number of the records may refer to *Flabelligera Buskii* McIntosh (1869, p. 420, and 1908 A, p. 533), but this species has not yet been adequately described, and the characters given by McIntosh are not sufficient to diagnose specimens, especially when they have been preserved in spirit.

*Habitat.*—BLACKSOD BAY—Found on the shore on 23 occasions. Dredged on 2 occasions, in 1–6 fms. CLEW BAY—Shore of Clare Island, near Portlea. Dredged on 5 occasions, in 10–21 fms. BALLYNAKILL HARBOUR—Common on the shore. Dredged on 2 occasions, in 1–4 fms. BOFIN HARBOUR—Dredged in 1–4 fms.

*Distribution.*—British Isles; Arctic; Siberia; shores of western Europe; Mediterranean; eastern North America.

Family **SABELLIDAE**.

**Sabella pavonina** Savigny.

1894. *Sabella pavonina*. De Saint-Joseph, p. 267.

Littoral specimens were found in muddy gravel, and in the sand of Zostera beds. Dredged specimens are usually attached to stones or shells.

*Habitat.*—BLACKSOD BAY—Found on the shore on 5 occasions. Dredged on 2 occasions, in 3–9 fms. CLEW BAY—Shore of Annagh Island. Dredged on 7 occasions, in 1–21 fms. BALLYNAKILL HARBOUR—Found on the shore, and also on the ship's bottom.

*Distribution.*—British Isles; Arctic; Scandinavia; North Sea; France; Mediterranean; eastern North America.

**Potamilla reniformis** (O. F. Müller).

1894. *Potamilla reniformis*. De Saint-Joseph, p. 292.

This species was found in Laminaria roots, in crevices of limestone, and in the sponge *Cliona celata*.

*Habitat.*—BLACKSOD BAY—Dredged in 5 fms. CLEW BAY—Dredged on 5 occasions, in 5–28 fms.

*Distribution*.—South coast of England; Arctic; Scandinavia; France; eastern North America; Mediterranean; Madeira.

**Potamilla Torelli** Malmgren.

1894. *Potamilla Torelli*. De Saint-Joseph, p. 296.

This species is very abundant throughout the area. The tube is found attached to Lithothamnion, Polyzoa, shells, stones on the shore, Laminaria roots, &c.

*Habitat*.—BLACKSOD BAY—Found on the shore on 4 occasions. Dredged on 3 occasions, in 1-6 fms. CLEW BAY—Shores of Clare Island. Dredged near Dorinish; near Inishgowla, in 8-10 fms.; north of Clare Island, in 25 fms. BALLYNAKILL HARBOUR—Dredged in 1-3 fms.

*Distribution*.—Great Britain; Iceland; France; Madeira; Mediterranean; Japan; Cape Agulhas.

**Branchiomma vesiculosum** (Montagu).

1894. *Branchiomma vesiculosum*. De Saint-Joseph, p. 300.

*Habitat*.—BLACKSOD BAY—Found on the shore on 4 occasions, in muddy gravel, and in the sand of *Zostera* beds. BALLYNAKILL HARBOUR—Found on the shore on 4 occasions. Young specimen dredged in 1-3 fms.

*Distribution*.—Great Britain; France; Naples; Madeira.

**Dasychone bombyx** (Dalyell).

1894. *Dasychone bombyx*. De Saint-Joseph, p. 309.

This species is able to adapt itself to a great variety of conditions. On the shore it is found under stones, in Laminaria roots, and sometimes in the sand of *Zostera* beds. It is frequently obtained in the dredge.

*Habitat*.—BLACKSOD BAY—Found on the shore on 8 occasions. Dredged on 5 occasions, in 1-8 fms. CLEW BAY—Shore of Annagh Island. Dredged near Dorinish. Dredged in the bay on 3 occasions, in 13-21 fms. BALLYNAKILL HARBOUR—Found on 3 occasions on the shore. Dredged on 4 occasions, in 1-9 fms.

*Distribution*.—British Isles; Nova Zembla; Scandinavia; North Sea; Mediterranean.

**Laonome Kröyeri** Malmgren.

1865. *Laonome Kröyeri*. Malmgren, p. 400.

A single specimen of this species was dredged in Inishlyre Harbour, on a bottom of mud.

*Habitat.*—CLEW BAY—Dredged in Inishlyre Harbour, in 4 fms.

*Distribution.*—Scotland (Firth of Forth); Spitzbergen; west Baltic.

***Jasmineira elegans* de Saint-Joseph.**

1894. *Jasmineira elegans*. De Saint-Joseph, p. 316.

This species is fairly common throughout the district. Mature specimens were found in May, August, and September.

*Habitat.*—BLACKSOD BAY—Found on 2 occasions on the shore, in *Laminaria* roots. Dredged on 4 occasions, in 1-6 fms. CLEW BAY—Dredged on 11 occasions, in 4-28 fms. Dredged near Inishgowla, in 9 fms., on sandy mud. BALLYNAKILL HARBOUR—Dredged on 3 occasions, in 1-8 fms.

*Distribution.*—Great Britain (Dublin Bay, Firth of Clyde, Torquay); France.

***Jasmineira caudata* Langerhans.**

1880. *Jasmineira caudata*. Langerhans, p. 114.

Four specimens, dredged in 17 fms. in Clew Bay, agree with the above species, and differ from *J. elegans*, in having a filiform anal appendage. In the structure of the setae no difference could be found between these specimens and typical *J. elegans*. The number of setigerous segments in the abdomen is 20. Langerhans states that his specimens had 17 abdominal segments, whilst *J. elegans* has 28-32. The collar in *J. caudata* seems to be somewhat higher than, and not so oblique as, in *J. elegans*. No other distinctions could be found between the two species.

The specimens were fully mature in May.

*Habitat.*—CLEW BAY—Dredged in 17 fms.

*Distribution.*—Madeira.

***Fabricia sabella* (Ehrenberg).**

1894. *Fabricia sabella*. De Saint-Joseph, p. 319.

This species lives amongst corallines, and forms tubes in sponges and Lithothamnion.

*Habitat.*—BLACKSOD BAY—Found in weeds from the shore on 10 occasions. CLEW BAY—Shore of Clare Island, in weeds and Lithothamnion.

*Distribution.*—British Isles; Arctic; Scandinavia; western Baltic; North Sea; France; Mediterranean; Black Sea; Madeira; Canaries; eastern North America.



**Oria Armandi** (Claparède).

1894. *Oria Armandi*. De Saint-Joseph, p. 321.

This species was found only in Laminaria roots. Mature specimens were found in September.

*Habitat*.—BLACKSOD BAY—Found on the shore on 2 occasions. CLEW BAY—Dredged on 2 occasions, in 9–16 fms.

*Distribution*.—South-west coast of England; France; Mediterranean; Madeira.

**Chone Duneri** Malmgren.

1867. *Chone Duneri*. Malmgren, p. 116. 1911. *C. D.* Fauvel, p. 42.

A single specimen was dredged in 11 fathoms in Clew Bay. The trunk is slender, 16 mm. long, and the anal region is pointed. The specimen is a mature male full of sperm, and was taken in August. The chief points distinguishing this species from *C. infundibuliformis* are the low narrow collar and the long filiform tips to the branchiae, and in both these respects the present specimen agrees with *C. Duneri*. I have compared it with specimens from the Arctic Ocean, named by Fauvel, and now in the Brussels Museum, and the resemblance between the two forms is very close. *C. Duneri* has been recorded from the Clyde area,<sup>1</sup> but an examination of the specimen kindly sent to me by Dr. Gemmill shows that it is a large example of *C. infundibuliformis*.

*Habitat*.—CLEW BAY—Dredged in 11 fms., on stony ground.

*Distribution*.—North Sea (Jutland); Norway; Spitzbergen; Kara Sea; Arctic; Madeira.

**Chone filicaudata** sp. n.

Pls. XIV–XV, figs. 32A–L.

1910. *Chone infundibuliformis* (Kröyer). Southern, p. 241.

I formerly recorded this species from Dublin Bay as *C. infundibuliformis* (Kröyer), but a subsequent examination of a number of specimens from the west coast has shown that it differs markedly from any previously described species. It resembles *Jasmineira caudata*, Langerhans, in having a filiform anal appendage.

This species has been found in Inishlyre Harbour, Ballynakill Harbour, Dingle Bay, and Dublin Bay.

The body is short, and comparatively stout. The whole body is 11 mm. long; the trunk being 7 mm., and the branchiae 4 mm. The width is 1.5 mm. in the largest specimen, a female full of eggs.

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<sup>1</sup> J. F. Gemmill: "Marine Worms." Reprinted from the British Association Handbook on the Natural History of Glasgow and the West of Scotland (1901).

In a smaller specimen, 5 mm. long, the branchiae are proportionally much longer, equalling the trunk in length.

There are 26-28 setigerous segments, 8 thoracic and 18-20 abdominal. The first and last segments bear no setae. The body is creamy-white, at least in preserved specimens, and tapers somewhat abruptly towards the tail. The segments are biannulate.

There are 8 or 9 pairs of branched gills, and one pair of ventral unbranched gills attached to the gill membrane. In addition there is an inner ring of unbranched gills of varying number and length. The connecting membrane runs up to the tip of the gills, the naked portion of which is intermediate in length between those of *C. Duneri* and *C. infundibuliformis* (Pl. XIV, fig. 32 E). The connecting membrane is about two-thirds as high as the filaments. The collar resembles that of *C. infundibuliformis*, but is not quite so high and prominent. It is entire on the ventral side, is infolded dorsally, and does not slope obliquely as in *C. Duneri* (figs. 32 A-C).

The lip-membrane terminates on the ventral side in a bifid process (figs. 32 B, C), which is absent in *C. infundibuliformis*.

The first setigerous segment is narrow, and bears only a dorsal bundle, consisting of a row of long setae with narrow wings, and a row of short, slender setae with only traces of wings.

The second setigerous segment bears a row of glands behind the setae (fig. 32 A). This character has been noted in several species of Chone, Euchone, and other Sabellidae, and also in *Thelepidetes collaris* and *Trichobranchus glacialis*.

The thorax consists of one achaetous and eight setigerous segments. They are biannulate, and longer than the abdominal segments, of which there are 19-21. The anal segment (fig. 32 D) is achaetous. The anus is on the ventral side. On the dorsal side of the anal segment is a long filiform appendage which tapers to a fine point. It varies in length, but is generally longer and thinner than is shown in fig. 32 D. It closely resembles the anal appendage of *Jasmincira caudata* Langerhans.

There is a longitudinal median groove, which is dorsal in the thoracic, ventral in the abdominal region, passing round from the ventral to the dorsal side in the first abdominal segment. The margins of this groove, and also of the intersegmental grooves, are lined by numerous gland cells (fig. 32 D), which are also present in a more diffused condition over the whole body.

In the thoracic segments the dorsal bundles contain setae of three types. In the upper part of the bundle there are 13 long, slender setae (fig. 32 H), with narrow striated wings. Beneath these are 14 setae with spatulate tips (fig. 32 F), which taper to a fine point much more gradually than those of

*C. Duneri* and *C. infundibuliformis*. At the base of the spatulate setae is a row of short, slender setae, the basal setae, 13 in number (fig. 32c). They are bayonet-shaped, with finely pointed tips, and some of them have very narrow wings. All these setae have shafts with delicate longitudinal striations, and are very finely dotted.

In the ventral division there are 17-27 long, stout crochets (fig. 32j). The main tooth is long and stout, making rather more than a right angle with the neck. Behind it are two distinct teeth and several indistinct ones. At the back of the crown is a delicate wing. I have noticed a similar wing in other species of Sabellidae. The shaft expands slightly below the neck, and is longitudinally striated.

In the abdominal segments the capillary setae are long and slender (fig. 32k), with very narrow wings. There are 10 in the first segment, 12 in the sixth. Below the origin of the wing, the shaft has a characteristic bend, and narrows suddenly, giving the setae the aspect of a very slender bayonet. The capillary setae in the abdominal segments are longer than those in the thoracic segments.

There are 34 uncini in the first abdominal segment, 42 in the sixth. The upper uncini are very small compared with the lower ones, but in all segments of the abdomen they have a similar shape. In surface view (fig. 32l, b) the crown shows seven or eight rows of teeth, 5-7 in a row. In side view (fig. 32l, a) the main tooth projects beyond the base, and is surmounted by 10-12 rows of teeth. These numerous teeth are very characteristic of the uncini of this species. The posterior margin is rounded. The 13th abdominal segment has 5 capillary setae and 35 uncini.

Mature specimens were found in May, July, and August.

This species is readily distinguished from forms already described, with the exception of *C. suspecta*, Kröyer, by the presence of the filiform anal appendage. The latter species, recently redescribed by Hofsommer (1913, p. 339), has a conical anal appendage. In other respects, however, it shows considerable differences. It has 35-42 segments, as compared with 26-28, 6 pairs of branched gills, as compared with 8 or 9, and finally the setae are very different. The difference is specially marked in the number of setae in each bundle, it being far greater in *C. flicaudata* than in *C. suspecta*. The shape of the basal thoracic setae ('spieszborsten') is quite different in the two species, and finally the abdominal uncini of *C. flicaudata* are quite characteristic.

*Habitat*.—CLEW BAY—Three specimens dredged in Inishlyre Harbour, in 5 fms. BALLYNAKILL HARBOUR—A single specimen dredged in 2 fms.

Also dredged in Dublin Bay (8-12 fms.), and in Dingle Bay (20 fms. in gravel).

***Euchone rubrocincta* (Sars).**

1865. *Euchone rubrocincta*. Malmgren, p. 406.

Four specimens of this species were dredged in various parts of Ballynakill Harbour. Whilst preserved in formalin they retained the characteristic and beautiful bands of bright red pigment, but the colour disappeared quickly when the specimens were transferred to alcohol.

In the thoracic segments the spatulate setae have long, gradually tapering tips, and more closely resemble the long capillary setae than in any other species of *Euchone*, but the resemblance is exaggerated in the figure drawn by Malmgren's artist (1865, *Taf. xxix*, fig. 91B, 91B'). The short capillary setae at the base of the spatulate setae, which might be called the 'basal' setae for convenience, have the characteristic 'bayonet' bend of the shaft, and are distinctly winged. These 'basal' setae furnish a useful specific character in many species of Sabellidae, but have only been figured in a few cases. The naked tips of the branchiae are filiform. The usual row of glands encircles the body behind the setae of the second setigerous segment. There are usually 31-32 setigerous segments, of which 9-11 form the anal funnel.

Mature specimens were found in March, April, July, and September.

*Habitat*.—BALLYNAKILL HARBOUR—Dredged on 4 occasions, in 1-8 fms.

*Distribution*.—Norway; Skagerrak; Gulf of Marseilles.

***Euchone rosea* Langerhans.**

Pl. XV., figs 33 A-K.

1884. *Euchone rosea*. Langerhans, p. 271.

Two small specimens of *Euchone*, dredged in 1-3 fms. in Ballynakill Harbour, agree in so many respects with those described by Langerhans from Madeira, that it seems advisable for the present to regard the two forms as identical. The description given by Langerhans is somewhat inadequate, so I have described the two Irish specimens at some length, and with figures. The points in which they resemble and differ from the description of Langerhans will then be noted.

Of the two specimens found, one is a male and the other a female. They are very small, the female having a total length of 4.4 mm., of which the trunk is 3.2 mm., and the branchiae 1.2 mm. The male specimen is slightly smaller.

The body is very uniform in width, tapering slightly towards the tail. The colour of the preserved specimens is a transparent brown with a slight tinge of green. The ventral surface (Plate XV, fig. 33A) is almost covered by

a series of opaque white glands. In the thorax there are two of these glands in each segment, but in the abdominal segments they are divided into four by the ventral furrow.

Both specimens have 20 setigerous segments, 8 being thoracic and 12 abdominal. The first thoracic as usual bears only dorsal capillary setae. Behind the setae of the second setigerous segment is the row of glands which has been noted in other species of the Sabellidae.

No eyes or otocysts were noted.

There are five pairs of branched tentacles, and several pairs of unbranched ones, of which one long ventral pair is attached to the connecting membrane, whilst the others are free. Each of the branched branchiae has about 26 branches arranged in two rows. The terminal portion (fig. 33C) without branches is .3 mm. long. The longest unbranched branchia is 1 mm. long, the shorter ones .3 mm. long.

The collar is wide, and its anterior border is curved outwards. It is dorsally infolded, ventrally only slightly indented. Beneath the collar on the dorsal side, the terminal portions of the thoracic excretory organs show as conspicuous dots. The anal funnel (figs. 33 A, B) is wide, with a much-folded border. It is formed by the four posterior setigerous segments, the first of which forms the anterior border.

The first setigerous segment bears only dorsal capillary setae, of which 6 are long, with conspicuous wings. There is also a second row of shorter, slender setae, with curved shafts and delicate wings.

The other thoracic segments bear dorsally a row of 5 capillary setae, the upper ones (fig. 33D, *a*) being longer than the lower ones (fig. 33D, *b*). Beneath these elongate capillary setae is a row of 4-5 spatulate setae, the upper ones having longer blades than the lower ones (fig. 33E). At the base of the spatulate setae is a row of six shorter setae, the basal setae, of characteristic shape (fig. 33F). The shaft, on emerging from the skin, grows rapidly thinner, and shows a double curvature. It is delicately winged on both sides. The corresponding setae in *Euchone rosea* from Madeira, as figured by Langerhans (1884, Taf. XVI, fig. 35, *g*), are shorter, thicker, more abruptly curved, and have no wings. In the ventral division of the foot are 9 crochets with long stalks (fig. 33G). Behind the main tooth there are 4 smaller teeth, and a delicate wing. Below the neck the shaft expands abruptly.

In the abdominal segments the capillary setae have long, slender, tapering tips (fig. 33K), winged on both sides.

In the anterior abdominal segments, the uncini (fig. 33H) differ slightly in shape from those in the posterior segments. In surface view the anterior

uncini have about four rows of teeth above the main tooth, in lateral view 5 or 6 rows can be seen. The posterior uncini have a much greater number of teeth, as Langerhans has pointed out.

In the second abdominal segment, there are 9 capillary setae and 7 uncini; in the seventh segment there are 6-7 capillary setae and 14 uncini.

The two specimens, which were mature, were found in September. This form agrees with the *E. rosea* of Langerhans in the following points:— (1) size, the Madeira specimens measuring 5 mm.; (2) number of branchiae; (3) shape of the collar; (4) the number of segments composing the anal funnel; (5) the number and arrangements of the ventral glands; (6) the distinction between the uncini of the anterior and posterior abdominal segments.

The only points of difference noted are (1) the absence of eyes on the peristomium and anal segment. This may be due to the method of preservation; (2) the larger number of setigerous segments, e.g. 26 as against 20; (3) the difference in the structure of the basal thoracic capillary setae, which are winged in the Irish specimens, and without wings in those from Madeira.

As these differences, in themselves not very important, may be minimized by future observations, it seems preferable for the present to regard the two forms as identical. This is another instance of the great affinity between the fauna of the west coast of Ireland and that of Madeira.

*Habitat.*—BALLYNAKILL HARBOUR—Two specimens dredged in 1-3 fms.

*Distribution.*—Madeira.

#### **Myxicola infundibulum** (Renier).

1898. *Myxicola infundibulum*. De Saint-Joseph, p. 433.

The only place in the Clare Island area where this species has been found is a small patch of muddy sand near the entrance of a small stream into Ballynakill Harbour.

*Habitat.*—BALLYNAKILL HARBOUR—On the shore of Fahy Bay.

*Distribution.*—South-west coast of England; France; Mediterranean.

#### Family **SERPULIDAE.**

##### **Serpula vermicularis** L.

1894. *Serpula vermicularis*. De Saint-Joseph, p. 328.

*Habitat.*—BLACKSOD BAY—Found under stones on the shore on 3 occasions. CLEW BAY—Dredged on 8 occasions, in 5-28 fms.

*Distribution.*—British Isles; North Atlantic; Mediterranean.

**Pomatoceros triqueter** L.

1894. *Pomatoceros triqueter*. De Saint-Joseph, p. 353.

This species is extremely common throughout the whole area, growing on stones, shells, and Lithothamnion. Mature specimens were found in March.

*Habitat*.—BLACKSOD BAY—Common everywhere on the rocky shore, and dredged at all depths. CLEW BAY—Common on the shores of Clare Island. Dredged in the bay on 5 occasions, in 19–28 fms. BALLYNAKILL HARBOUR—Common on the shore, and at all depths.

*Distribution*.—British Isles; Arctic; North Atlantic; Mediterranean.

**Hydroides norvegica** Gunnerus.

1898. *Hydroides norvegica*. De Saint-Joseph, p. 440.

This species is very commonly obtained in the dredge, attached to stones and shells.

*Habitat*.—BLACKSOD BAY—Dredged on 3 occasions, in 3–6 fms. CLEW BAY—Dredged on 9 occasions, in 9–28 fms.

*Distribution*.—British Isles; Arctic; Scandinavia; North Sea; Baltic; France; Mediterranean; Persian Gulf.

**Filograna implexa** Berkeley.

1894. *Filograna implexa* + *Salmacina Dysteri*. De Saint-Joseph, pp. 335, 340.

Only a few specimens were dredged in Clew Bay, attached to shells. They were without operculum, thus agreeing with the form described as *Salmacina Dysteri* Huxley. This species is now considered as identical with *Filograna implexa* Berkeley.

*Habitat*.—CLEW BAY—Dredged on 2 occasions, in 5–19 fms.

*Distribution*.—British Isles; Scandinavia; Faroes; North Sea; France; Mediterranean; eastern North America.

**Protula tubularia** (Montagu).

1894. *Protula tubularia*. De Saint-Joseph, p. 362.

The specimens of this species obtained in the district fall readily into two groups. One form was only obtained by dredging in the mud of Killary Harbour, where the tubes are very common. These tubes are 100–140 mm. long, more or less straight, and attached to each other in masses, but not to any extraneous object. The contained worms are 60–70 mm. long, not including the branchiae.

The other form from Ballynakill Harbour, Inishgowla, and Killary

Harbour is much smaller, the largest specimen having a body 50 mm. long, the usual size being 15–20 mm. The tubes were always attached to stones or shells. Both these forms were obtained in the same haul of the dredge in Killary Harbour. No differences could be found in the setae or shape of the collar in these two forms. In these respects they all agree with the descriptions of *P. tubularia*. The larger form has the habit of *P. intestinum* (Lamarck). The characters distinguishing these two forms do not seem to be of great weight.

According to Fauvel,<sup>1</sup> the *P. Meilhaci*, found at Marseilles and Cette, is identical with *P. tubularia*. He examined specimens 80–120 mm. in length, comparable with the large specimens from Killary Harbour.

*Habitat*.—KILLARY HARBOUR—Dredged on 5 occasions, in 6–22 fms., in mud. WESTPORT BAY—Inishgowla. Dredged in 8–10 fms., in sandy mud. BALLYNAKILL HARBOUR—Dredged in 2–8 fms.

*Distribution*.—Great Britain; France; Mediterranean.

#### *Spirorbis spirorbis* (L.).

1894. *Spirorbis borealis*. De Saint-Joseph, p. 345.

This species is extremely common throughout the area. In the littoral region it covers the rocks and Fuci. It is also found on shells, worm-tubes, crabs, &c. The tube varies considerably, ridged and smooth forms being equally common. The smooth form is generally found on seaweeds, the ridged form on rocks. Some forms have narrow mouths, others wide trumpet-shaped mouths. Specimens were dredged in 26 fathoms in Clew Bay, on stones, others in 1 fathom in Blacksod Bay, on *Laminaria* roots.

*Habitat*.—Clare Island; Clew Bay; Blacksod Bay on 24 occasions; Ballynakill Harbour.

*Distribution*.—Arctic; Atlantic; Mediterranean.

#### *Spirorbis pusilloides* Bush.

1894. *Mera pusilla*. De Saint-Joseph, p. 351.

1912. *Spirorbis pusilloides*. Pixell, p. 797.

This species is closely related to, if not identical with, the *S. Pagenstecheri* of the Mediterranean. Like the latter species, the tube has ridges. It has not previously been recorded from the British Isles.

*Habitat*.—CLARE ISLAND—On stones from Portlea. BLACKSOD BAY—On shells of *Mytilus* and *Trochus*.

*Distribution*.—France (St. Vaast, Arcachon); Gabriola Island, British Columbia.

<sup>1</sup> Comptes Rendus de l'Assoc. Française pour l'Avancement des Sciences. Lille, 1909, p. 696.



**Spirorbis medius** Pixell.

1912. *Spirorbis medius*. Pixell, p. 800.

This species has only recently been described from the Pacific coast of Canada. In Blacksod Bay it occurred in dense masses under stones. The Irish specimens agree closely with the description and figures given by Miss Pixell, who has verified the identification. It is a comparatively large species. Mature specimens were found in September, and incubation takes place in the tube. The collar setae of the first setigerous segment show great variation. Some of them have the notch and fin as well developed as those of *S. spirorbis*, whilst in others the notch is quite absent, and the serrated edge is uninterrupted. All intermediate stages occur.

*Habitat*.—BLACKSOD BAY—Under stones on the shore.

*Distribution*.—Departure Bay, Vancouver Island.

Family **HERMELLIDAE**.

**Sabellaria spinulosa** Leuckart.

1894. *Sabellaria spinulosa*. De Saint-Joseph, p. 154.

Isolated specimens of this species are common on the shore at Blacksod Bay, living under stones, in Laminaria roots, and on shells. One tube was found embedded in a sponge. It is commonly taken in the dredge, growing on shells and stones. Mature specimens were found in September.

*S. alveolata* was not found in the Clare Island area, though it is common in some places on the west coast, forming large reefs.

*Habitat*.—BLACKSOD BAY—Taken on the shore on 17 occasions. Dredged on 4 occasions, in 2-6 fms. CLEW BAY—Dredged on 5 occasions in 5-17 fms.

*Distribution*.—British Isles; France; North Sea; Skagerrak and Kattegat.

APPENDIX TO THE POLYCHAETA.

**MYZOSTOMARIA.**

**Myzostoma cirriferum** Leuckart.

1877. L. von Graff in "Das Genus Myzostoma," p. 10.

Two specimens of this species were found on the Crinoid *Antedon bifida* (Pennant), dredged in 4-8 fms. in Ballynakill Harbour, in June, 1902. One specimen was full of eggs.

This species is widely distributed in European seas and in the Mediterranean.

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## DESCRIPTION OF PLATES.

## PLATE I.

Fig.

1. *Erogone hebes* var. *hibernica* var. nov.
  - 1 A. Anterior end, dorsal view.  $\times 60$ .
  - 1 B. Head.  $\times 170$ .
  - 1 C. Anal segment.  $\times 120$ .
  - 1 D. Foot from anterior region.  $\times 330$ .
  - 1 E. Foot from posterior region, showing arrangement of setae.  $\times 400$ .
  - 1 F. Setae.  $\times 850$ .  $a$  = simple setae;  $b$  = compound setae;  $c$  = tip of a spine.
  - 1 G. Tooth in the pharynx.
  - 1 H. Ciliated sacs entering posterior part of the proventriculus.
2. *Sphaerosyllis bulbosa* sp. n.
  - 2 A. Anterior end, dorsal view.  $\times 85$ .
  - 2 B. Posterior end, dorsal view.  $\times 85$ .
  - 2 C. Nuchal organ and tentacular cirrus, right side.  $\times 530$ .
  - 2 D. Fifth foot.  $\times 350$ .

## PLATE II.

2. *Sphaerosyllis bulbosa* sp. n. (continued).
  - 2 E. Setae from the second setigerous segment.  $\times 850$ .  $a$  = compound setae;  $b$  = simple dorsal setae;  $c$  = spine.
  - 2 F. Setae from the twenty-fourth setigerous segment.  $\times 850$ .  $a$  = compound setae;  $b$  = dorsal simple seta;  $c$  = spine.
  - 2 G. Simple dorsal seta from a posterior foot.  $\times 850$ .
3. *Streptosyllis Websteri* sp. n.
  - 3 A. Anterior end, dorsal view.  $\times 66$ .
  - 3 B. Posterior end, dorsal view.  $\times 66$ .
  - 3 C. Third foot.  $\times 330$ .
  - 3 D. Sixteenth foot.  $\times 330$ .
  - 3 E. Setae from third foot.  $\times 850$ .  $a$  = dorsal simple seta;  $b$  = compound seta with long tip;  $c$  = compound seta with short tip;  $d$  = spine.
  - 3 F. Setae from sixteenth foot.  $\times 850$ .  $a$  = dorsal simple seta;  $b$  = compound seta;  $c$  = spine;  $o$  = distal end of the shaft of a compound seta;  $e$  = terminal piece of a compound seta.

## PLATE III.

4. *Streptosyllis bidentata* sp. n.
  - 4 A. Anterior end, dorsal view.  $\times 66$ .
  - 4 B. Head, ventral view.  $\times 66$ .

Fig.

- 4 C. Third foot.  $\times 330$ .  
4 D. Sixteenth foot.  $\times 330$ .  
4 E. Setae from third foot.  $\times 850$ .  $a$  = spine;  $b$  = dorsal simple seta;  $c$  = compound seta with short tip;  $d$  = compound seta with long tip.  
4 F. Setae from sixteenth foot.  $\times 850$ .  $a$  = spine;  $b$  = dorsal simple seta;  $c$  = compound seta with short tip;  $d$  = compound seta with long tip.
5. *Pionosyllis serrata* sp. n.  
5 A. Anterior end.  $\times 74$ .  
5 B. Posterior end.  $\times 74$ .  
5 C. Anterior end of alimentary canal, showing tooth.  $\times 100$ .

PLATE IV.

5. *Pionosyllis serrata* sp. n. (continued).  
5 D. Typical foot.  $\times 210$ .  
5 E. Setae.  $\times 800$ .  $a$  = spine;  $b$  = dorsal seta, with long tip;  $c$  = ventral seta, with short tip.
6. *Opisthodonta pterochaeta* sp. n.  
6 A. Anterior end, showing pharynx and proventriculus.  $\times 42$ .  
6 B. Anterior end.  $\times 115$ .  
6 C. Thirteenth foot.  $\times 160$ .  
6 D. Foot from middle of body.  $\times 160$ .  
6 E. Tooth in the pharynx, greatly enlarged.  
6 F. Setae of thirteenth foot.  $\times 850$ .  $a$  = spine;  $b$  = compound seta;  $c$  = tip of compound seta on edge.  
6 G. Setae from mid-body.  $\times 850$ .  $a$  = spine;  $b$  = compound seta;  $c$  = simple dorsal winged seta;  $d$  = simple ventral seta.

PLATE V.

6. *Microphthalmus Sczelkowi* Mecznirow.  
6 A. Anterior end, dorsal view.  $\times 100$ .  
6 B. Posterior end, dorsal view.  $\times 230$ .  
6 C. Posterior end, lateral view.  $\times 230$ .  
6 D. Fourteenth foot.  $\times 250$ .  
6 E. Setae of fourteenth foot.  $\times 1150$ .  $a$  = Pectinate seta from dorsal lobe;  $b$  = compound seta from middle of foot;  $c$  = seta with short tip from ventral part of foot.
7. *Microphthalmus aberrans* (Webster and Benedict). Setae in dorsal division of foot.  $\times 1150$ .

Fig.

8. *Castalia fusca* var. *hibernica* var. nov. *a* = seta from middle of anterior foot; *b* = setae from middle of posterior foot.  $\times 530$ .
9. *Ophiodromus flexuosus* (Delle Chiaje). Simple bifid serrate seta from ventral side of dorsal division of the foot.  $\times 800$ .
10. *Autolytus brachycephala* (Marenzeller). Part of pharyngeal armature, to show the arrangement of the teeth. Greatly enlarged.
11. *Scalisetosus communis* (Delle Chiaje), var. Papillae on the elytron.  $\times 100$ .
12. *Mystides* (*Mesomystides*) *elongata* sp. n.
- 12 A. Anterior end, dorsal view.  $\times 133$ .
- 12 B. Anterior foot.  $\times 200$ .
- 12 C. Foot from mid-body.  $\times 200$ .
- 12 D. Setae.  $\times 850$ . *a* = simple setae; *b* and *c* = compound setae.

## PLATE VI.

13. *Sthenelais zetlandica* McIntosh.
- 13 A. Anterior end, dorsal view.  $\times 20$ .
- 13 B. First foot on the left side, external view.  $\times 42$ . *a* = dorsal ctenidium of first foot; *b* = lateral tentacle; *c* = dorsal cirrus; *d* = ventral cirrus; *e* = buccal ctenidium.
14. *Pholoe tuberculata* sp. n.
- 14 A. Anterior end, dorsal view.  $\times 42$ . *f* = facial tubercle.
- 14 B. Anterior end, ventral view.  $\times 42$ . *f* = facial tubercle.
- 14 C. Facial tubercle.  $\times 75$ .
- 14 D. First elytron.  $\times 42$ .
- 14 E. Tenth elytron.  $\times 42$ .
- 14 F. Fifteenth foot.  $\times 42$ .
- 14 G. Dorsal lobe of foot, viewed from above, showing arrangement of setae.  $\times 110$ .
- 14 H. Papilla on tip of foot.
- 14 I. Compound seta from the middle of the ventral lobe of the first foot.  $\times 400$ .
- 14 K. Compound seta from the upper part of the ventral lobe of the fifteenth foot.  $\times 400$ .
- 14 L. Simple setae from the dorsal lobe of the fifteenth foot.  $\times 400$ . *a* = median seta; *b* = lateral seta.

## PLATE VII.

15. *Prægeria remota* gen. et sp. nov.
- 15 A. Anterior end, dorsal view.  $\times 56$ .



Fig.

- 15 B. Head, dorsal view.  $\times 210$ .  
15 C. Head, ventral view.  $\times 210$ .  
15 D. Anterior end, lateral view.  $\times 85$ .  
15 E. Posterior end, dorsal view.  $\times 40$ .  
15 F. Anterior end of everted proboscis, showing jaws and papillae.  $\times 133$ .  
15 G. Setae from fifth foot.  $\times 800$ .  $a$  = compound seta;  $b$  = upper simple seta.  
15 H. Second simple seta from twentieth foot.  $\times 660$ .

PLATE VIII.

15. *Praegeria remota* gen. et sp. nov. (continued).  
15 I. Fifth foot.  $\times 210$ .  
15 K. Simple setae from a posterior segment.  $\times 660$ .  $a$  = dorsal seta;  $b$  = second seta.  
16. *Paranaitis Wahlbergi* (Malmgren). Typical setae from mid-body.  $\times 530$ .  
17. *Mystides bidentata* Langerhans.  
17 A. Foot of a mature male, from mid-body, with swimming setae.  $\times 120$ .  
17 B. Compound setae from mid-body.  $\times 530$ .  $a$  = ventral seta;  $b$  = seta from middle of foot.  
18. *Mystides limbata* de Saint-Joseph.  
18 A. Typical foot from mid-body.  $\times 215$ .  
18 B. Compound setae from mid-body.  $\times 530$ .  
19. *Mystides borealis* Théel.  
19 A. Entire animal, dorsal view.  $\times 40$ .  
19 B. Anterior end, dorsal view.  $\times 132$ .  
19 C. Posterior end, dorsal view.  $\times 132$ .  
19 D. Compound setae from mid-body.  $\times 800$ .  
20. *Morphysa fallax* Marion and Bobretzky. Posterior view of anal segment, greatly enlarged.

PLATE IX.

21. *Sphaerodorum minutum* (Webster and Benedict).  
21 A. Anterior end, dorsal view.  $\times 40$ .  
21 B. Head, dorsal view.  $\times 210$ .  
21 C. Posterior end, ventral view.  $\times 140$ .  
21 D. Sixth foot, front view.  $\times 330$ .  
21 E. Setae.  $\times 1150$ .

Fig.

22. *Paraonis (Paraonides) lyra* sp. n.  
 22 A. Anterior end, dorsal view.  $\times 64$ .  
 22 B. Head, dorsal view, drawn from living specimen.  $\times 132$ .  
 22 C. Posterior end, ventral view.  $\times 80$ .  
 22 D. Fourth foot, ♂.  $\times 85$ .  
 22 E. Fiftieth foot, ♂.  $\times 85$ .

## PLATE X.

22. *Paraonis (Paraonides) lyra* sp. n. (continued).  
 22 F. Eightieth foot, ♀.  $\times 85$ .  
 22 G. Lyrate seta.  $\times 1050$ .  
 23. *Nerinides tridentata* sp. n.  
 23 A. Anterior end, dorsal view.  $\times 40$ .  
 23 B. Posterior end, dorsal view.  $\times 100$ .  
 23 C. First foot.  $\times 146$ .  
 23 D. Second foot.  $\times 146$ .  
 23 E. Tenth foot.  $\times 85$ .  
 23 F. Twenty-fourth foot.  $\times 85$ .  
 23 G. Foot from posterior part of the body.  $\times 85$ .  
 23 H. Capillary setae, from tenth foot.  $\times 500$ .  $a$  = long dorsal striated seta;  $b$  = short flat dotted seta, either dorsal or ventral.  
 23 J. Crochet from twenty-fifth foot.  $\times 500$ .

## PLATE XI.

24. *Aonides paucibranchiata* sp. n.  
 24 A. Anterior end, dorsal view.  $\times 56$ .  
 24 B. Posterior end, ventral view. Compare fig. 25.  $\times 100$ .  
 24 C. Seventy-eighth foot.  $\times 146$ .  
 24 D. Ventral lamella of the seventy-eighth foot, to show the glands.  $\times 146$ .  
 24 E. Crochet from ventral division of seventy-eighth foot.  $\times 574$ .  
 25. *Aonides orycephala* (Sars). Posterior end, side view. Compare fig. 24 B.  $\times 100$ .  
 26. *Cirratulus norvegicus* (Quat.).  
 26 A. Anterior end, dorsal view.  $\times 18$ .  
 26 B. Part of transverse section of thirty-first segment.  $\times 40$ .  
 26 C. Short capillary seta from dorsal division of tenth foot.  $\times 210$ .  
 26 D. Crochets from seventy-fifth segment.  $a$  = dorsal crochet;  $b$  = ventral crochet.  $\times 85$ .

PLATE XII.

Fig.

27. *Chaetozone alata* sp. n.  
27 A. Anterior end, dorsal view.  $\times 56$ .  
27 B. Capillary setae.  $\times 570$ . *a* = long cylindrical dorsal seta from sixth segment; *b* = short flattened dorsal seta from sixth segment; *c* = slender capillary seta accompanying crochets in ventral and posterior dorsal segments.  
27 C. Ventral crochet from the sixth segment.  $\times 1150$ .  
27 D. Ventral crochet from the eighty-sixth segment.  $\times 1150$ .
28. *Chaetozone killariensis* sp. n.  
28 A. Anterior end, dorsal view.  $\times 56$ .  
28 B. Short thick capillary seta from the eighth segment.  $\times 586$ .  
28 C. Upper dorsal crochet from a posterior foot.  $\times 586$ .  
28 D. Ventral setae from a posterior foot.  $\times 586$ . *a* = upper capillary seta; *b* = upper crochet; *c* = lower crochet.  
28 E. Tip of ventral crochet shown in previous figure (*c*).  $\times 850$ .  
28 F. Transverse section of a posterior segment, to show the arrangement of the setae.  $\times 146$ .
29. *Chaetozone zetlandica* McIntosh. "Stage A."  
29 A. Anterior end, dorsal view.  $\times 56$ .  
29 B. Transverse section of a posterior segment, to show the arrangement of the setae.  $\times 146$ .

PLATE XIII.

29. *Chaetozone zetlandica* McIntosh. "Stage A." (continued).  
29 C. Figure of entire animal, side view.  $\times 25$ .  
29 D. Anterior end, side view.  $\times 56$ .  
29 E. Posterior end, dorsal view.  $\times 85$ .  
29 F. Short thick dorsal capillary seta from an anterior segment.  $\times 574$ .  
29 G. Bifid crochet from middle of ventral division of a posterior segment.  $\times 574$ .  
29 H. Tip of crochet in previous figure.  $\times 740$ .  
29 J. "Stage B." Tips of setae in the ventral division of a posterior foot.  $\times 574$ . *a* = lowest crochet; *b* = crochet next above "*a*"; *c* = the two upper crochets; *d* = tip of thick capillary setae.  
29 K. "Stage C." Tips of lowest crochets in the ventral division of posterior feet, showing indication of bifid termination.  $\times 574$ .
30. *Thelepidides collaris* gen. et sp. nov.  
30 A. Anterior end, dorsal view.  $\times 18$ .  
30 B. Anterior end, ventral view.  $\times 18$ .  
30 C. Long capillary seta from the fifth setigerous segment.  $\times 660$ .

Fig.

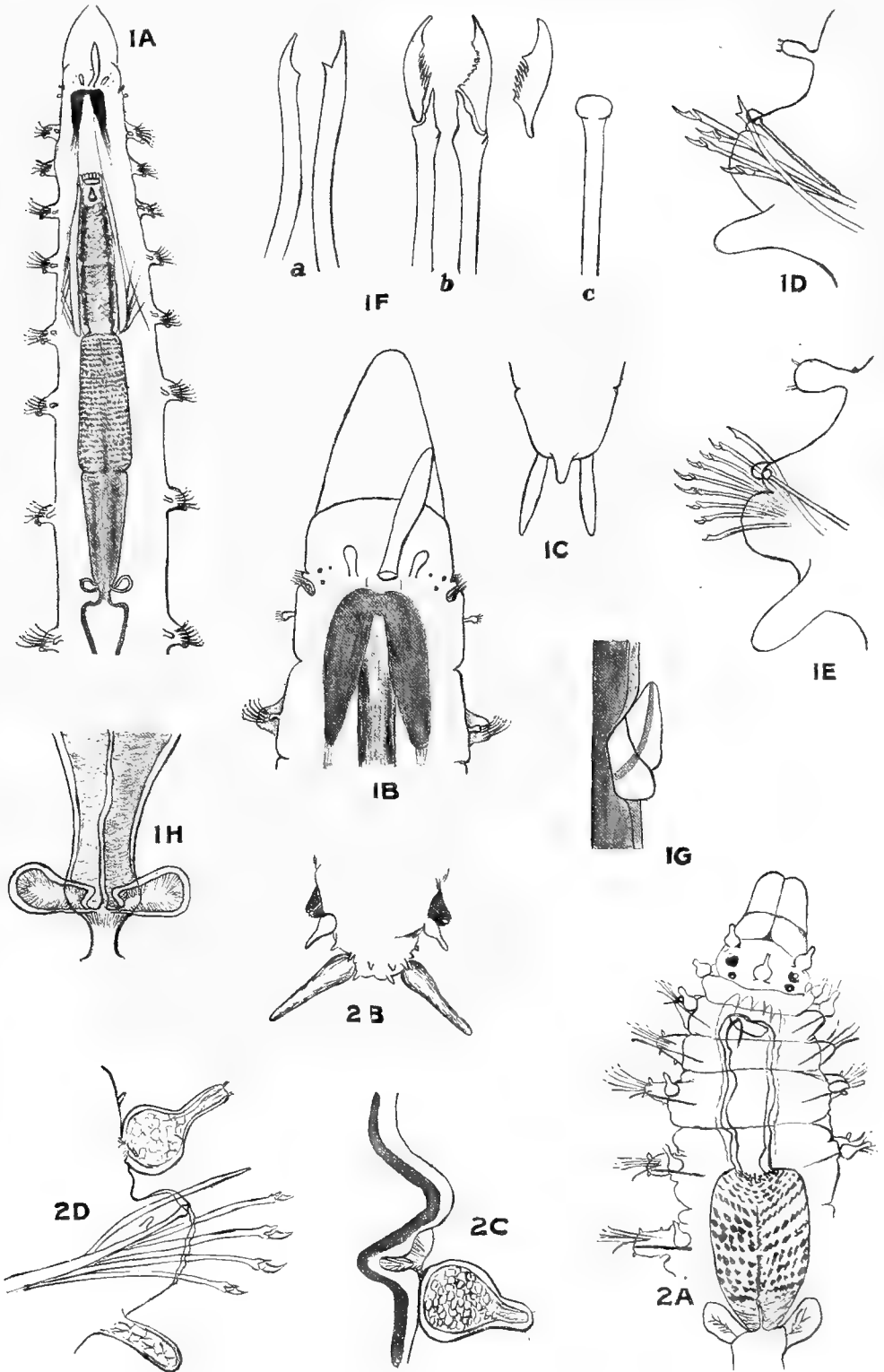
- 30 D. Tip of short capillary seta from the fifth setigerous segment.  $\times 660$ .  
 30 E. Uncinus from the eighteenth setigerous segment.  $\times 1070$ .  $a$  = side view;  $b$  = front view.

## PLATE XIV.

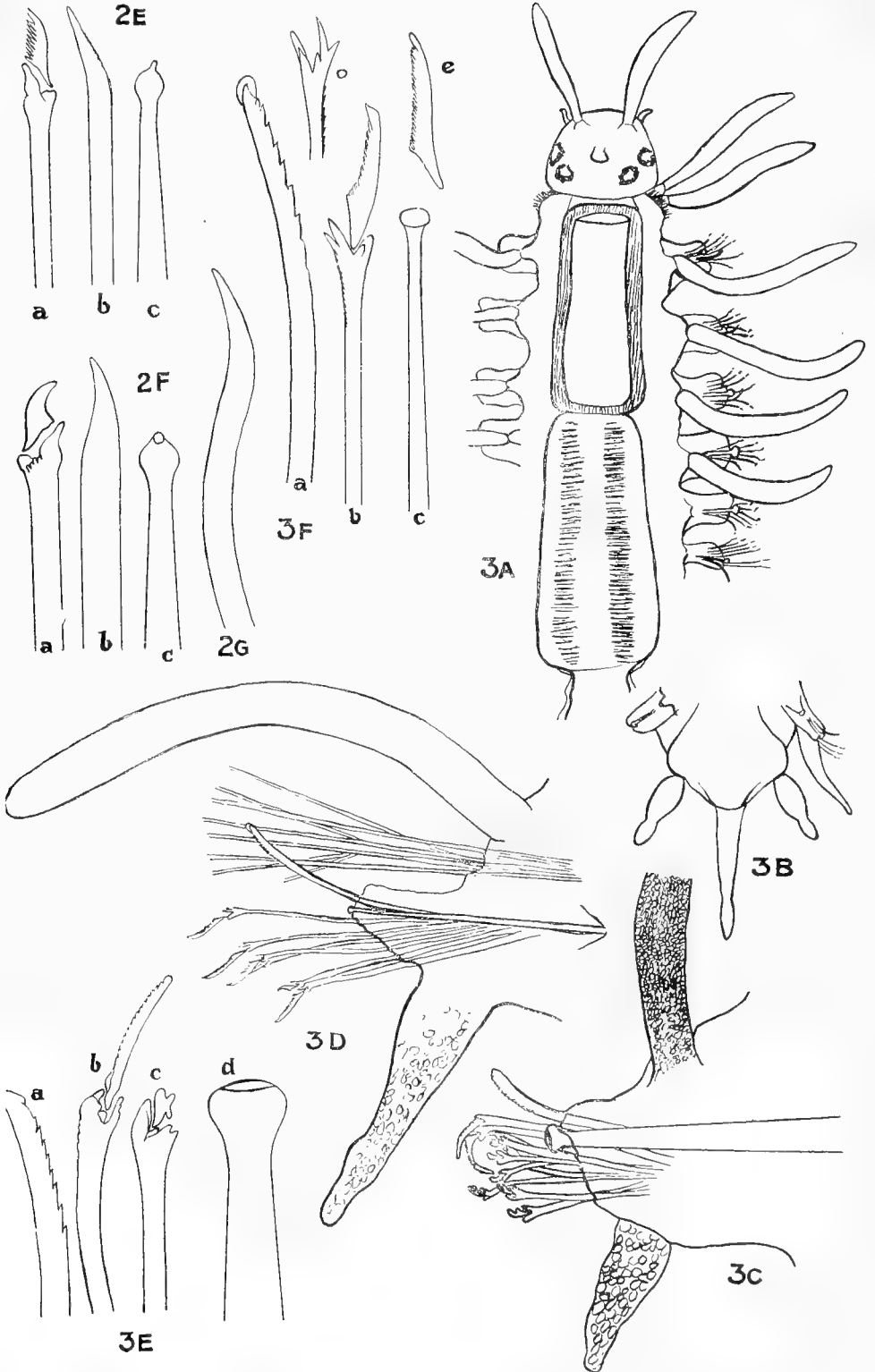
31. *Armandia flagellifera* sp. n.  
 31 A. Anterior end, dorso-lateral view.  $\times 40$ .  
 31 B. Lateral view of head of specimen with extruded proboscis.  $\times 40$ .  
 31 C. Posterior end, lateral view.  $\times 40$ .  
 31 D. Foot of twenty-second segment.  $\times 56$ .  
 32. *Chone filicaudata* sp. n.  
 32 A. Collar region, dorsal view.  $\times 18$ .  
 32 B. The same, with branchiae removed.  $\times 18$ .  
 32 C. Collar region, ventral view.  $\times 18$ .  
 32 D. Posterior end, ventral view.  $\times 56$ .  
 32 E. Tip of a branchia.  $\times 26$ .

## PLATE XV.

32. *Chone filicaudata* sp. n. (continued).  
 32 F. Spatulate setae from the fifth thoracic setigerous segment.  $\times 530$ .  
 32 G. Basal seta ('spieszborste') from the fifth thoracic setigerous segment.  $\times 530$ .  
 32 H. Winged capillary seta from the fifth thoracic setigerous segment.  $\times 330$ .  
 32 J. Crochet from fourth setigerous segment.  $\times 530$ .  
 32 K. Capillary seta from an abdominal segment.  $\times 330$ .  
 32 L. Uncini from sixth abdominal segment.  $\times 600$ .  $a$  = side view;  $b$  = front view.  
 33. *Euchone rosæ* Langerhans.  
 33 A. Entire animal, ventral view.  $\times 26$ .  
 33 B. Posterior end, side view.  $\times 56$ .  
 33 C. Tip of branchia.  $\times 56$ .  
 33 D. Capillary setae from second thoracic setigerous segment.  $\times 530$ .  $a$  = seta from upper part of the bundle;  $b$  = seta from the middle of the bundle.  
 33 E. Spatulate setae from the third thoracic setigerous segment.  $\times 530$ .  
 33 F. Basal seta ('spieszborste') from the second thoracic setigerous segment.  $\times 660$ .  
 33 G. Crochet from the middle of the ventral bundle of the second thoracic setigerous segment.  $\times 530$ .  
 33 H. Uncini from the second abdominal segment.  $a$  = front view;  $b$  = side view.  $\times 530$ .  
 33 J. Uncinus from the fourteenth abdominal segment.  $\times 530$ .  
 33 K. Capillary seta from the second abdominal segment.  $\times 530$ .

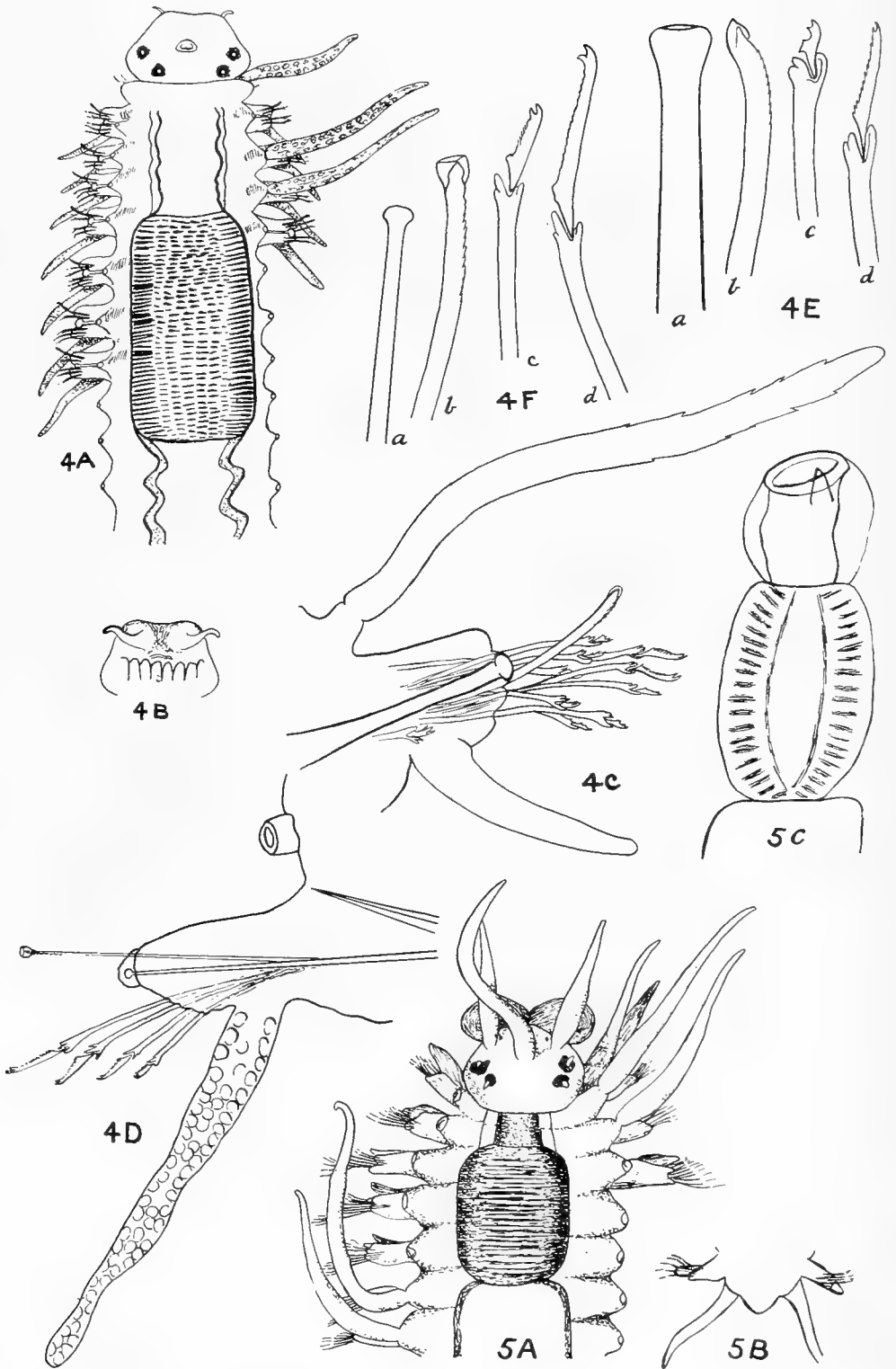




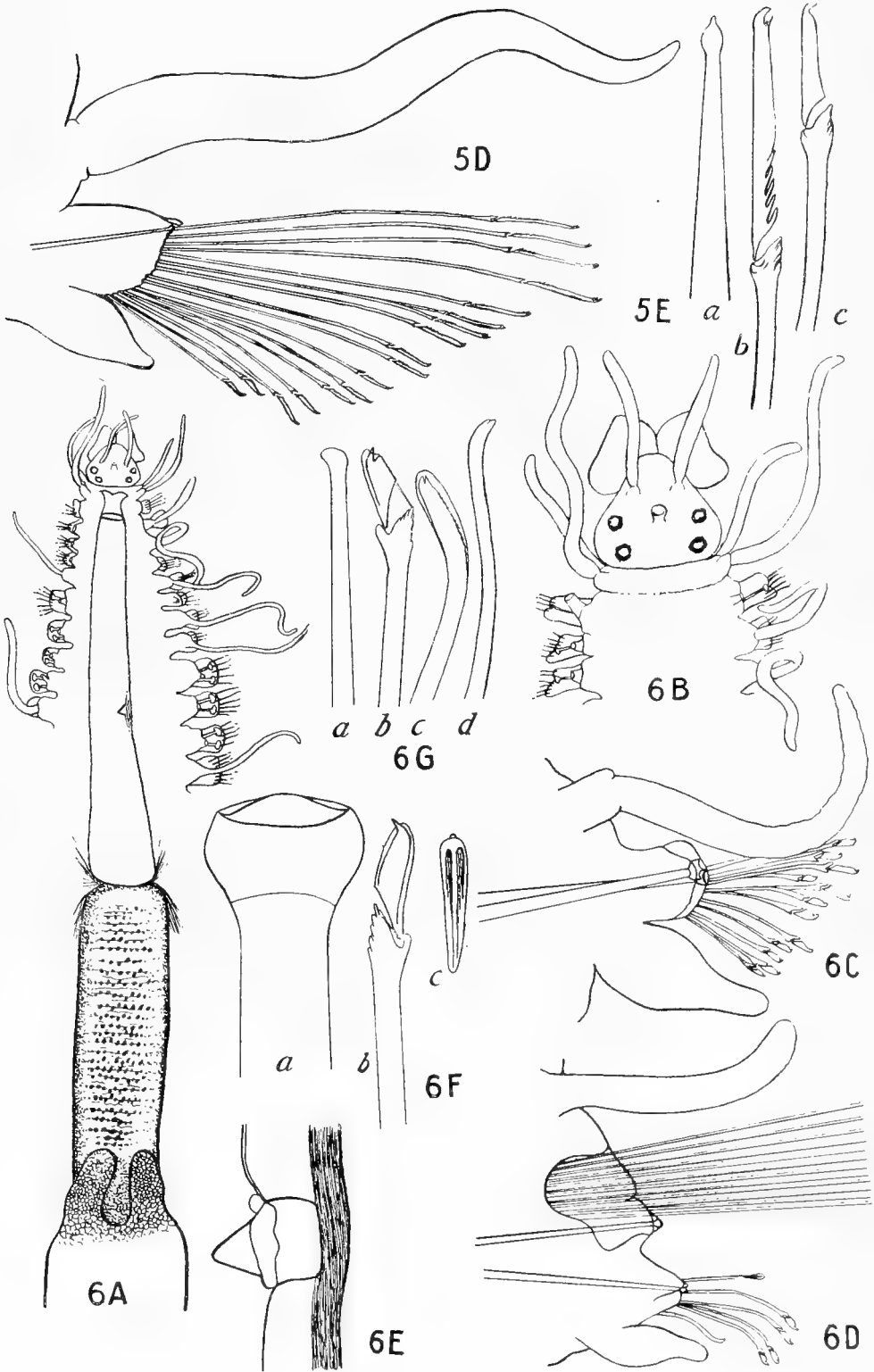




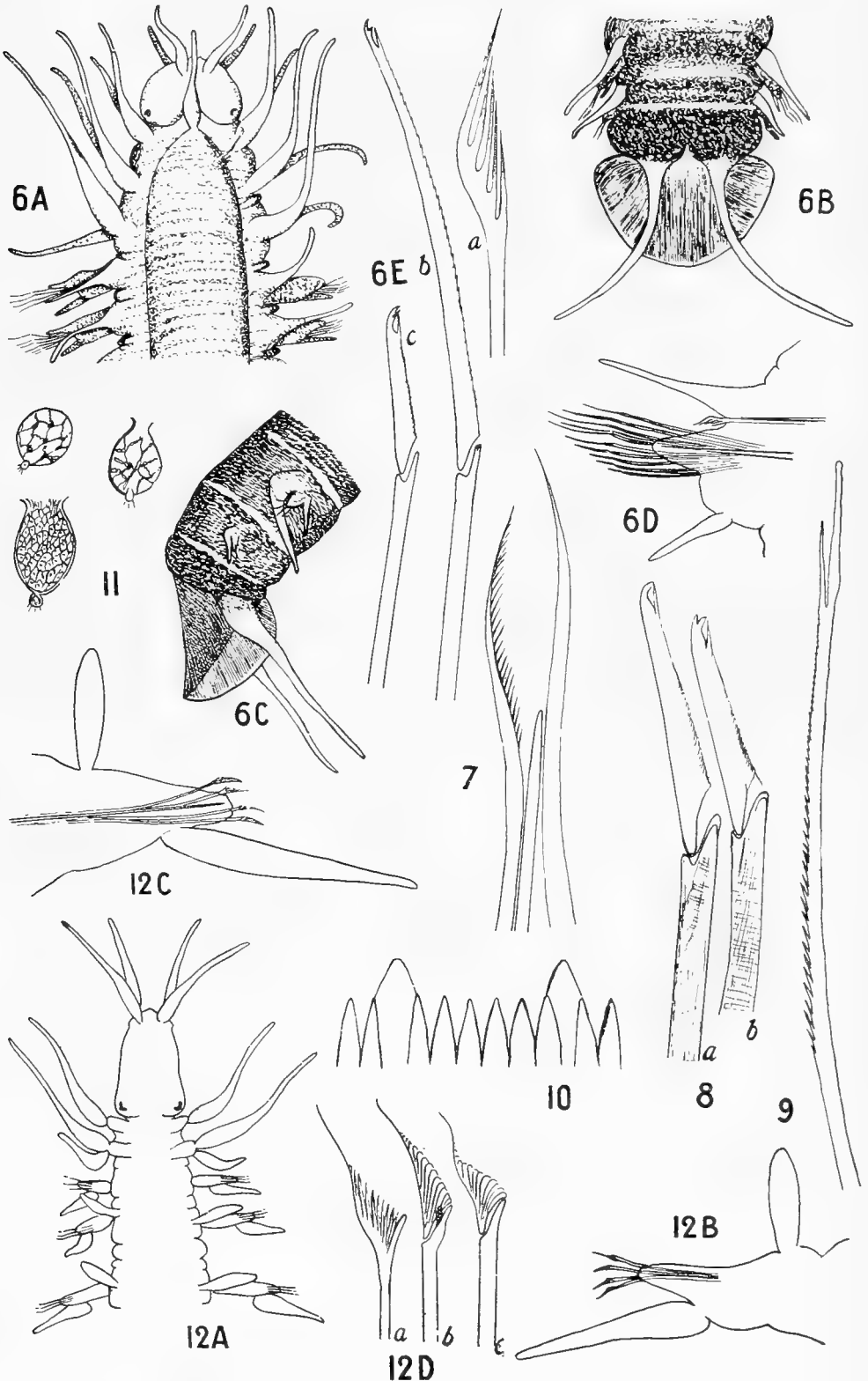




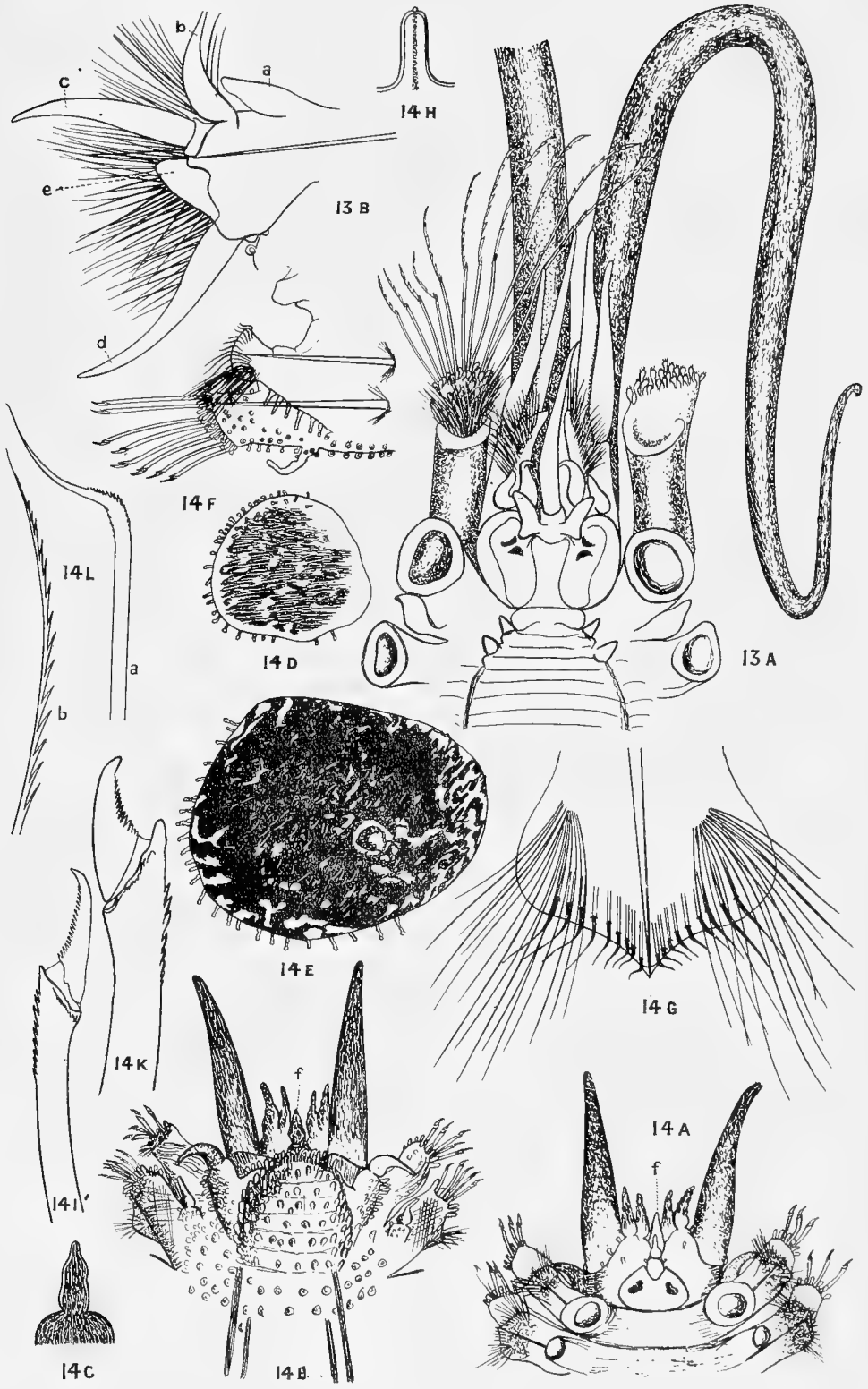








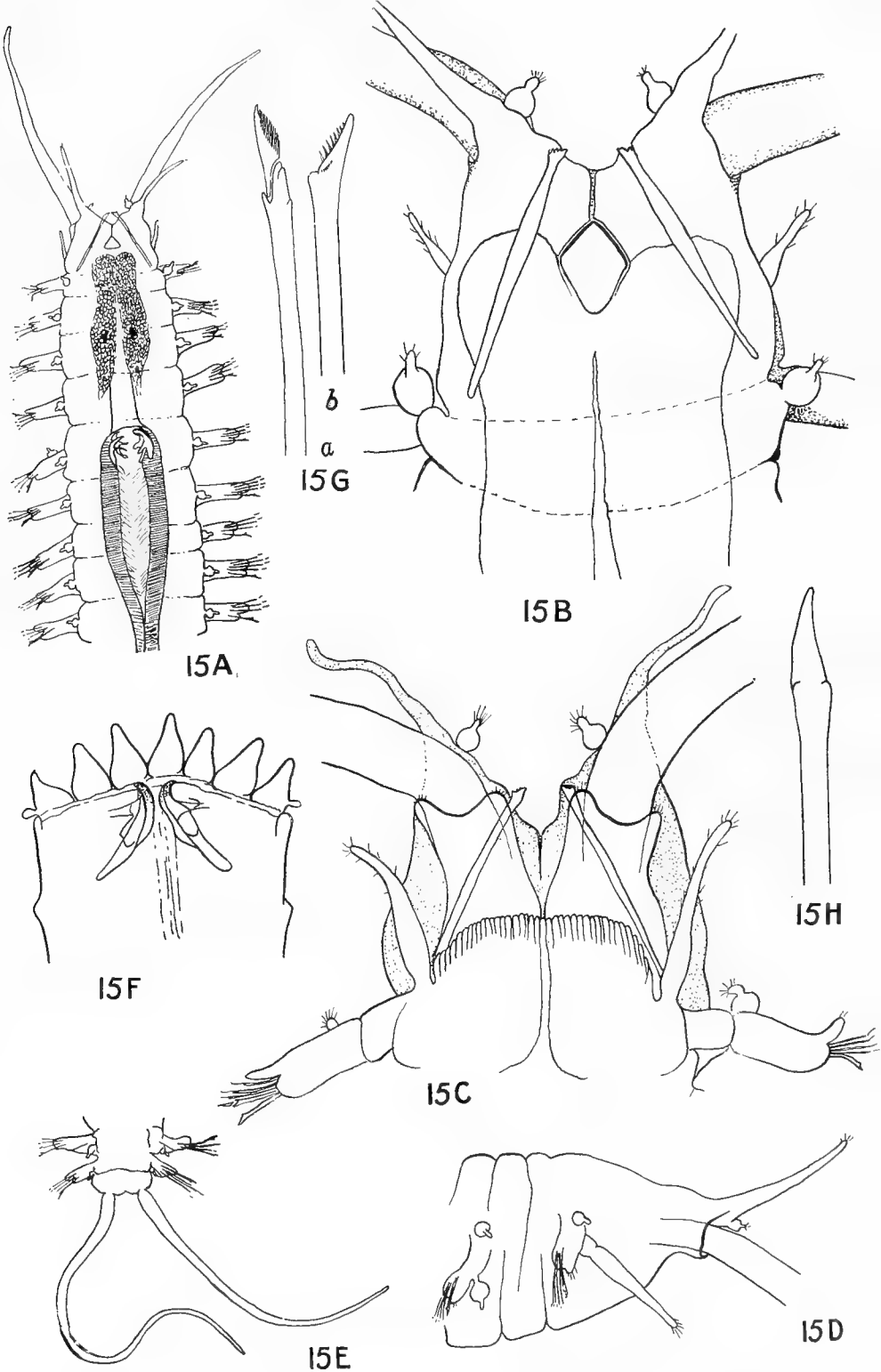




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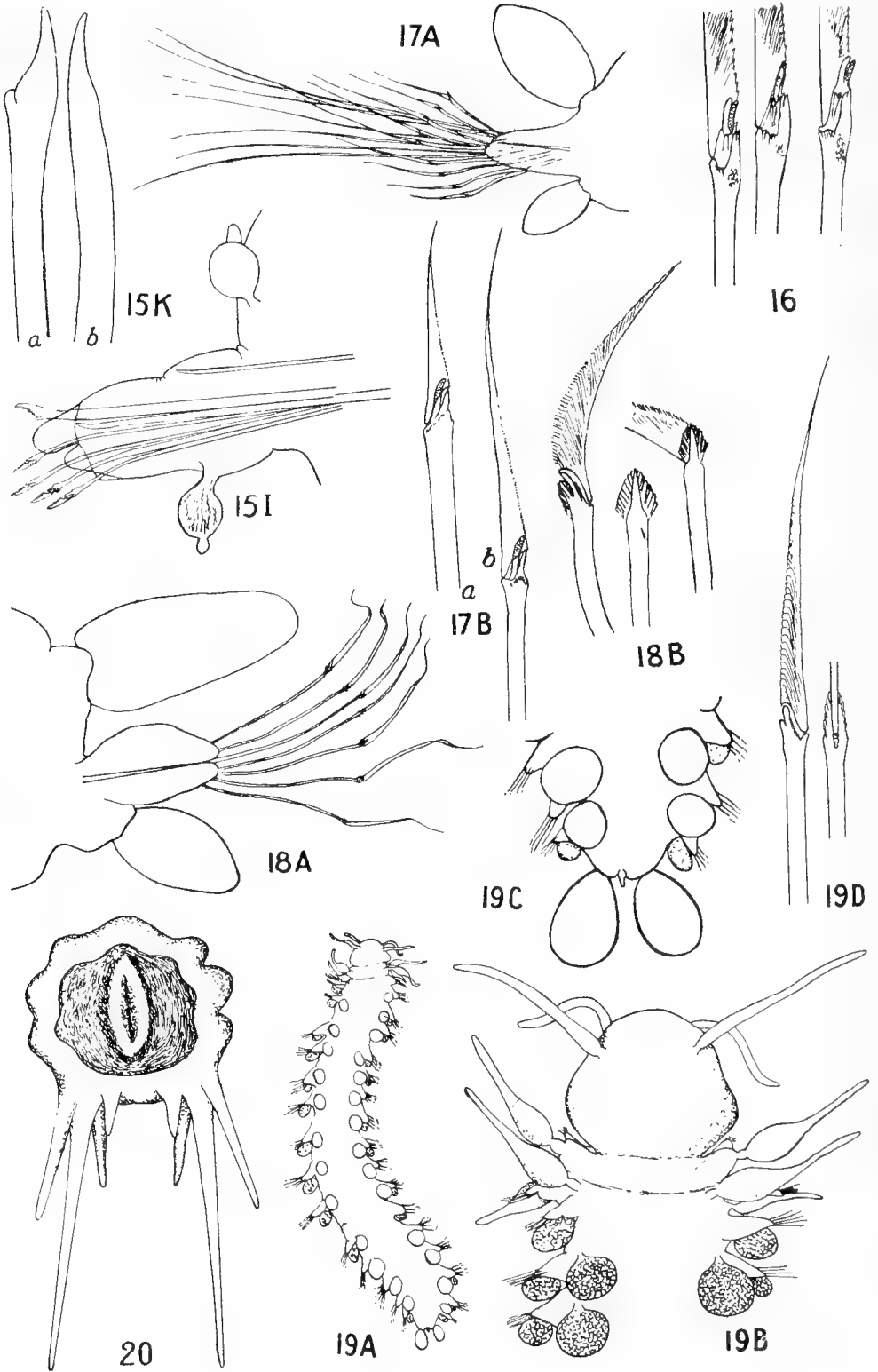




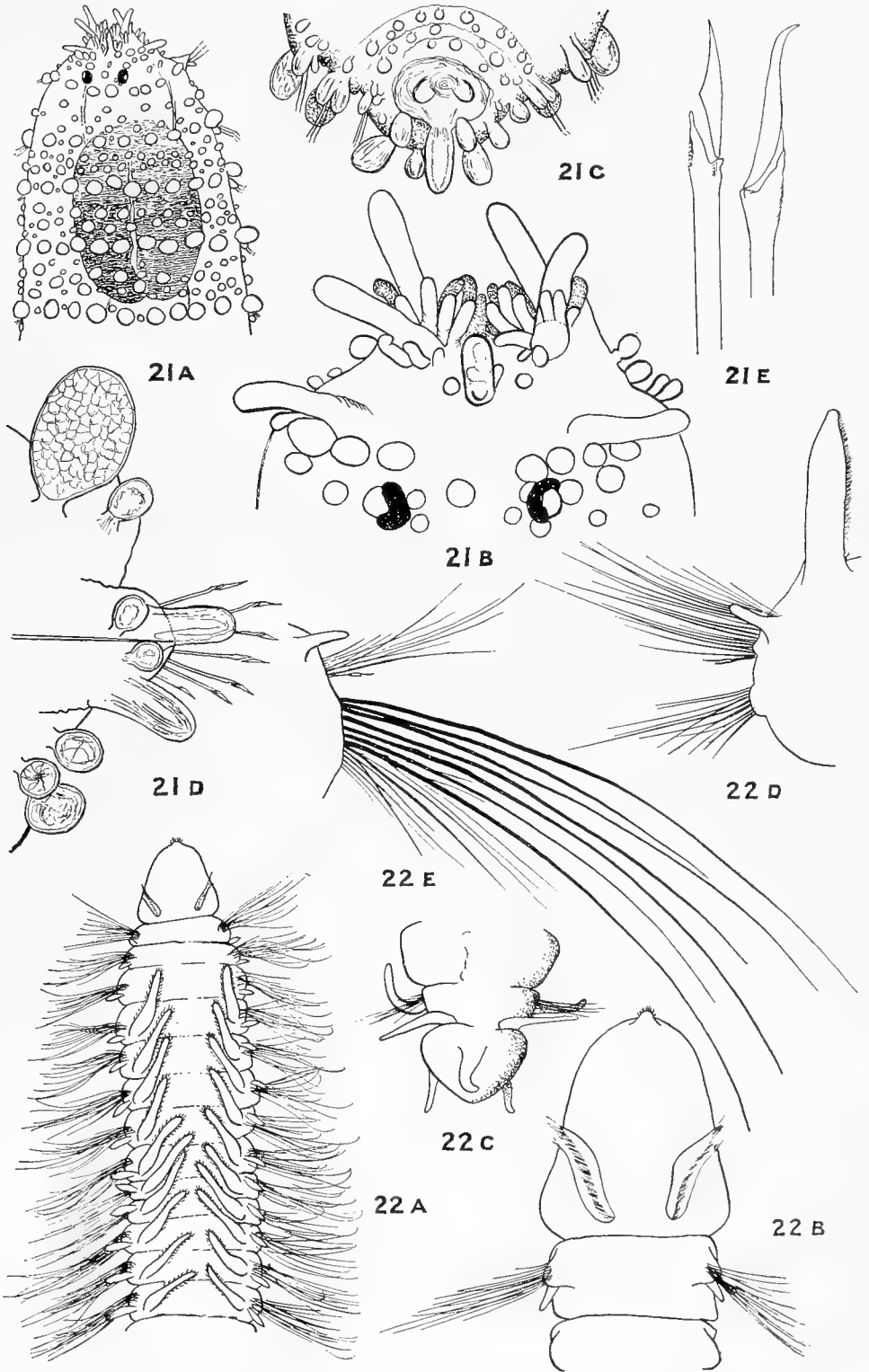


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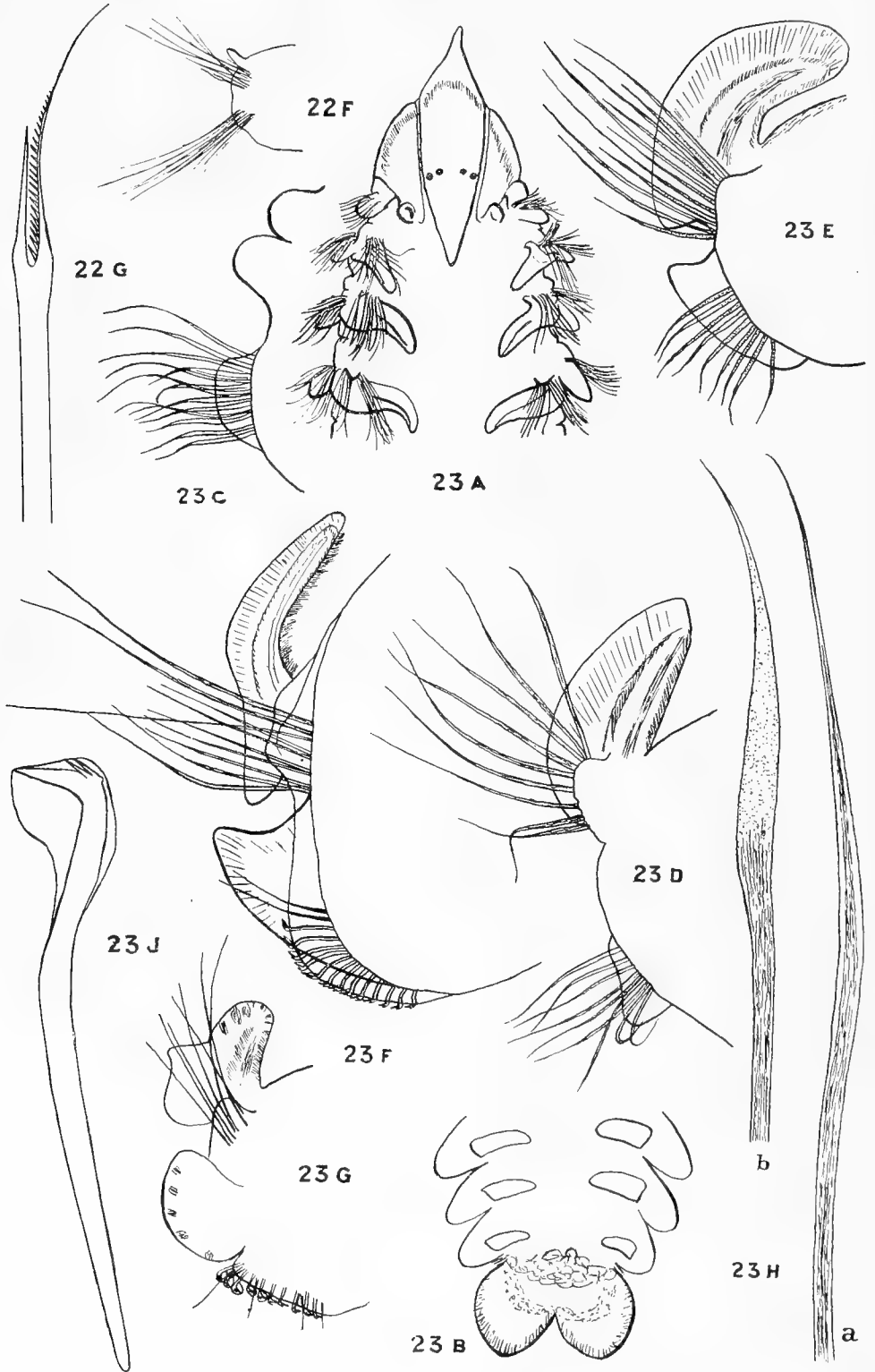






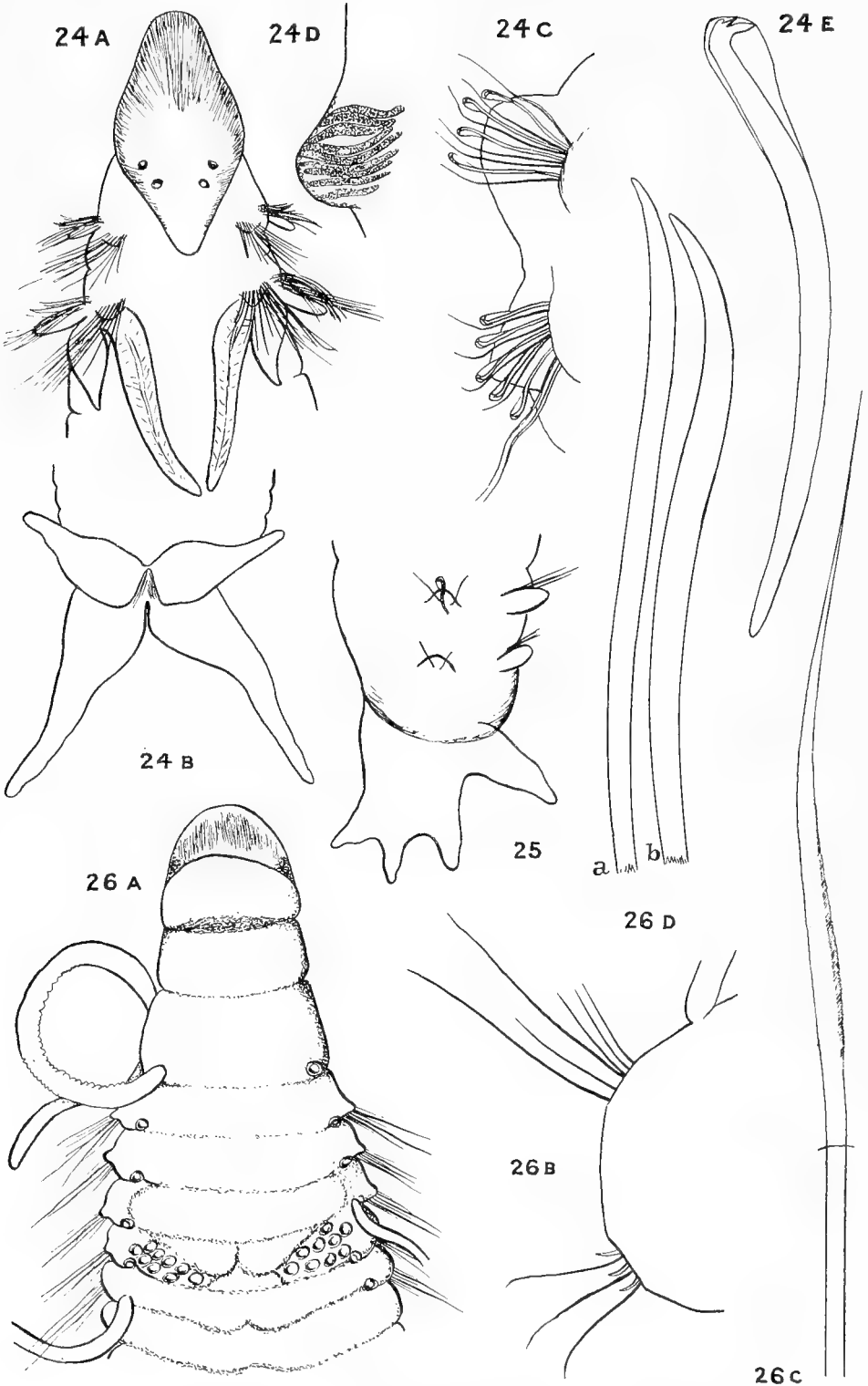




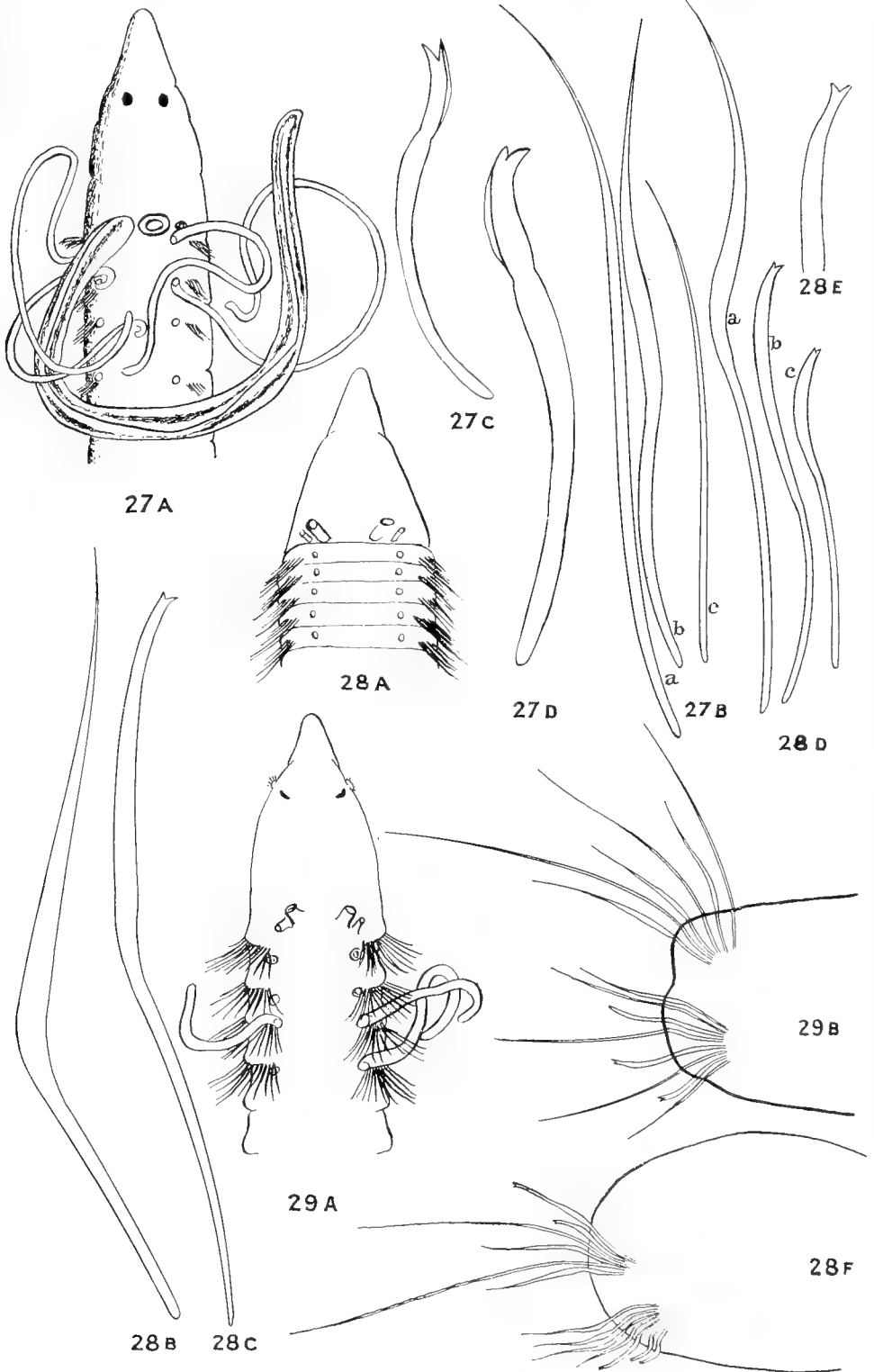




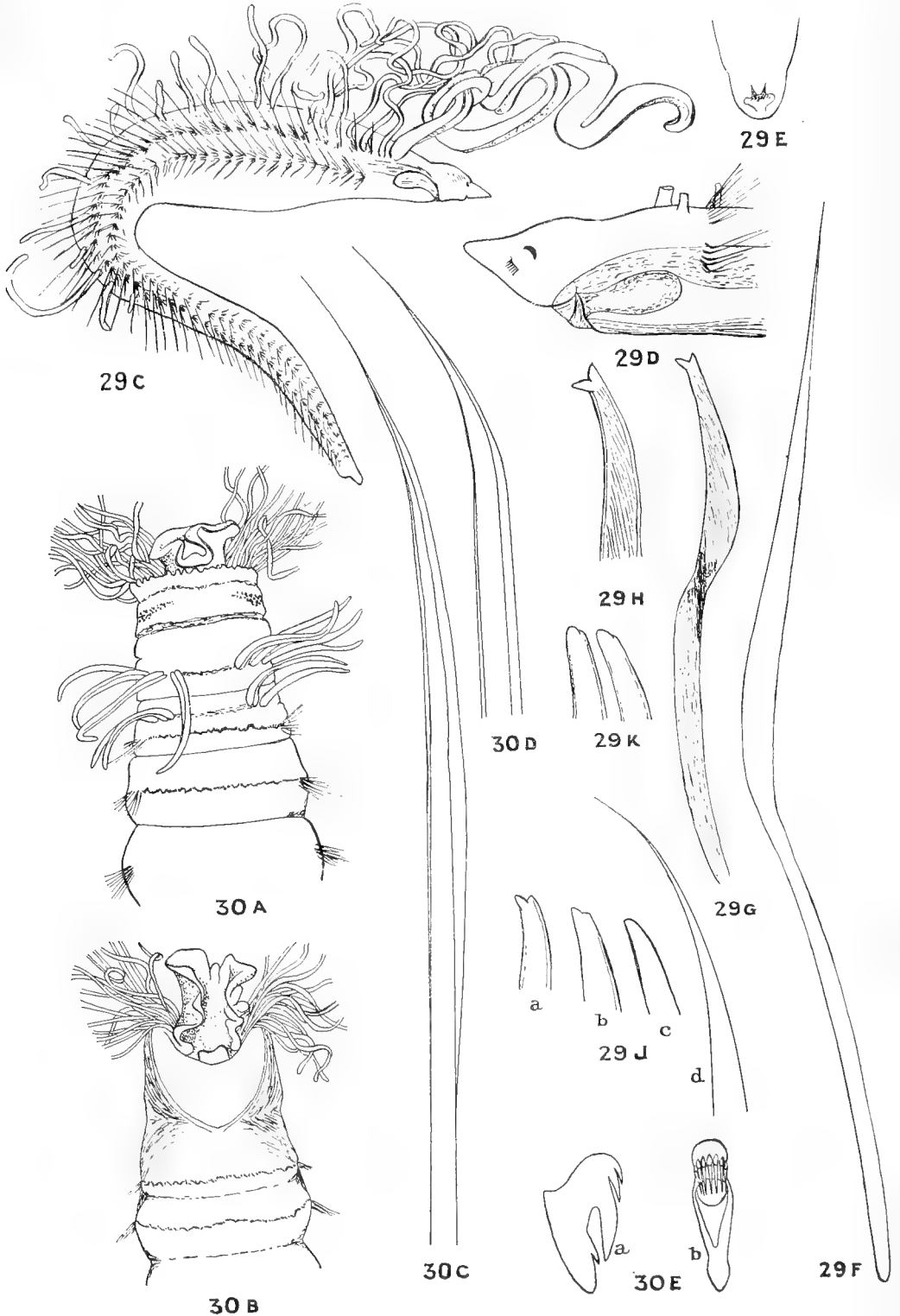






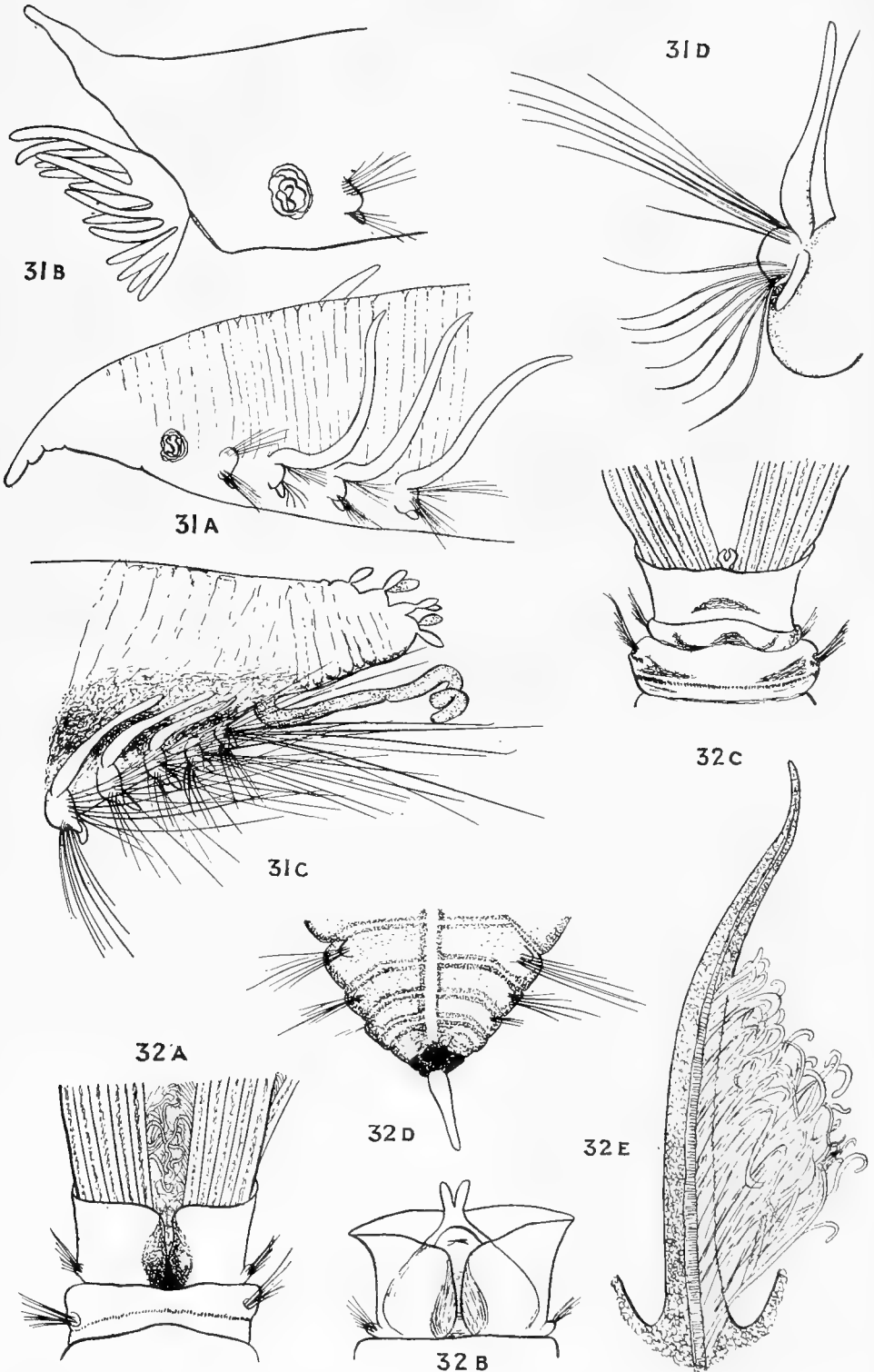






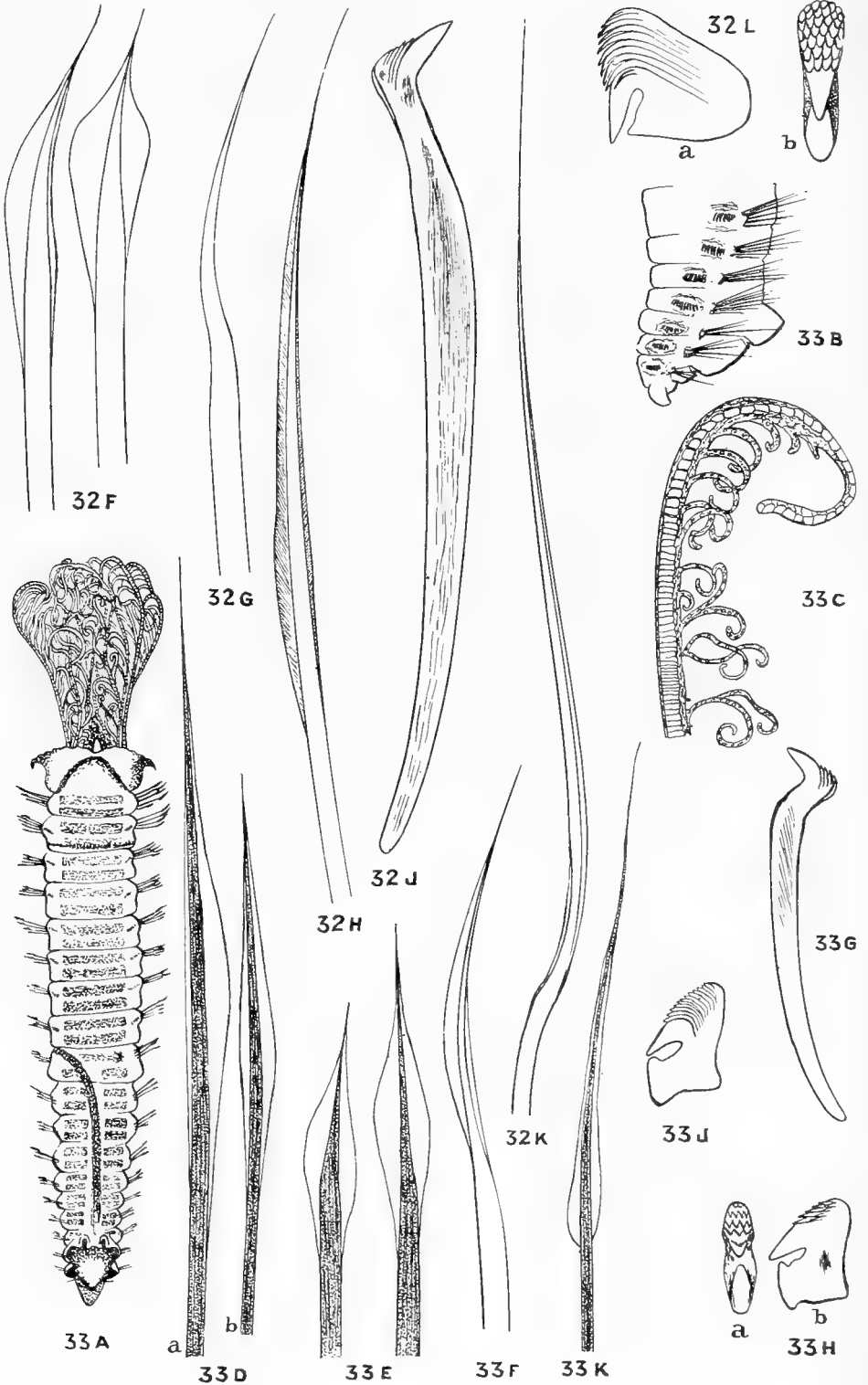
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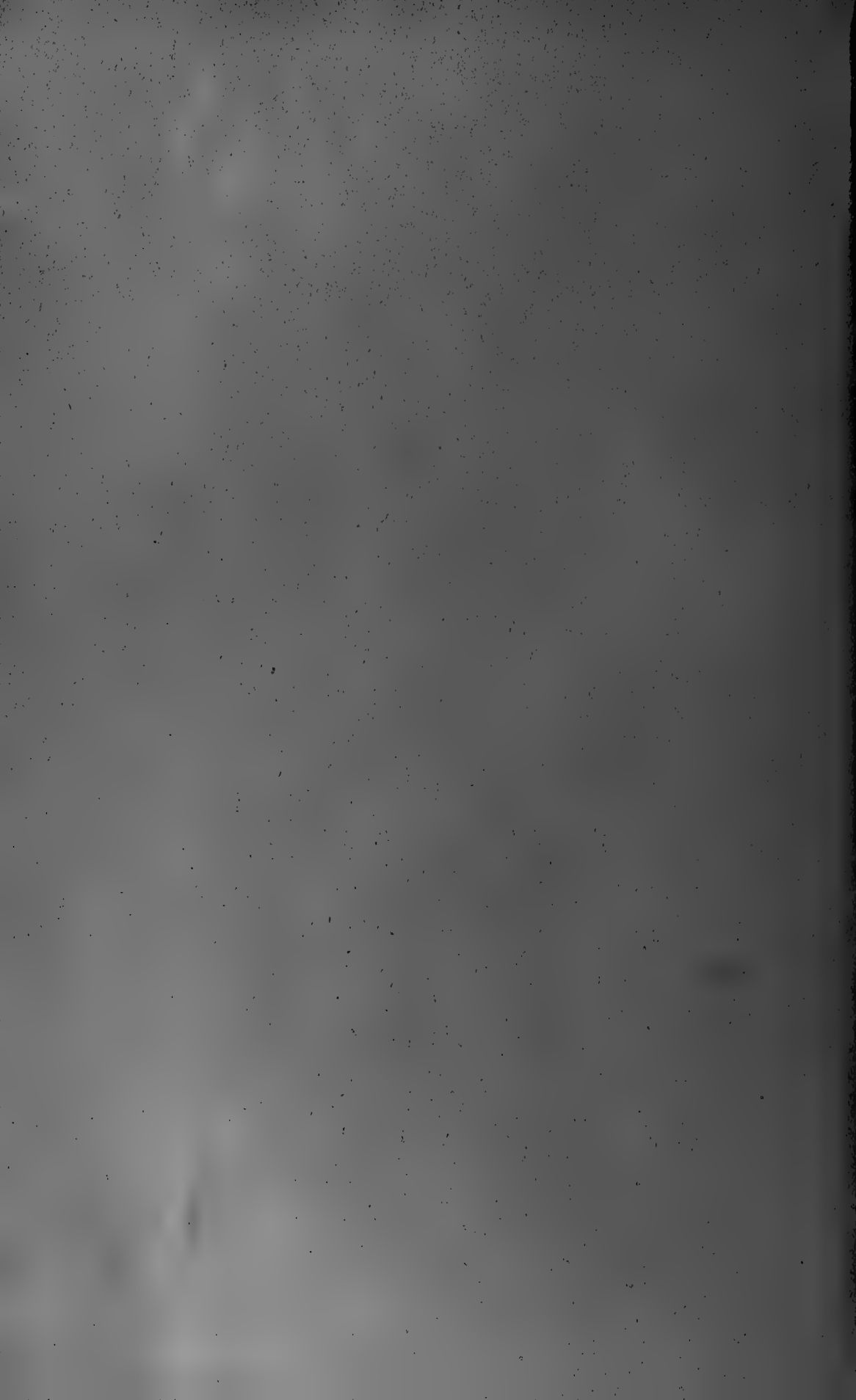
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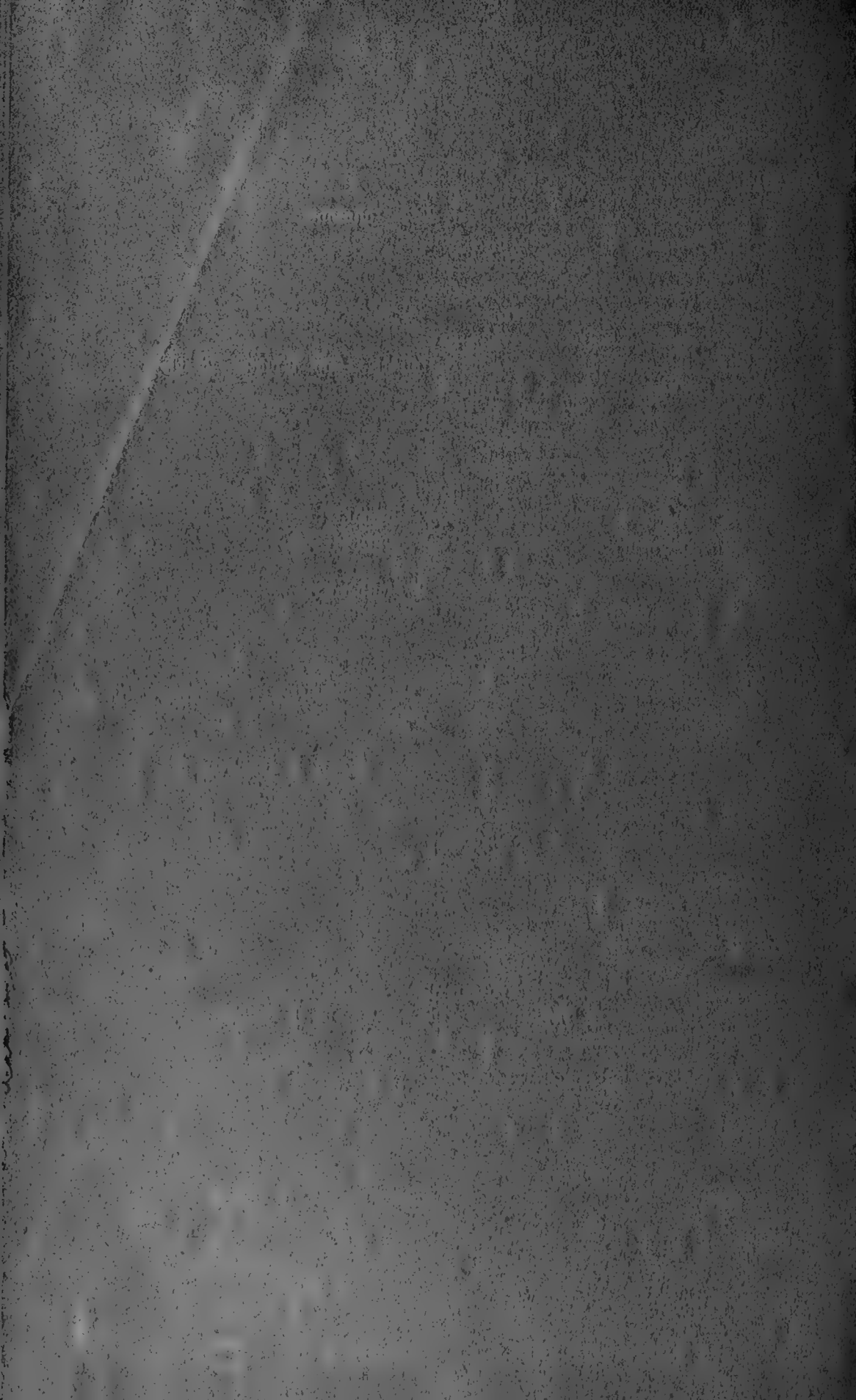
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CLARE ISLAND SURVEY

PART 45

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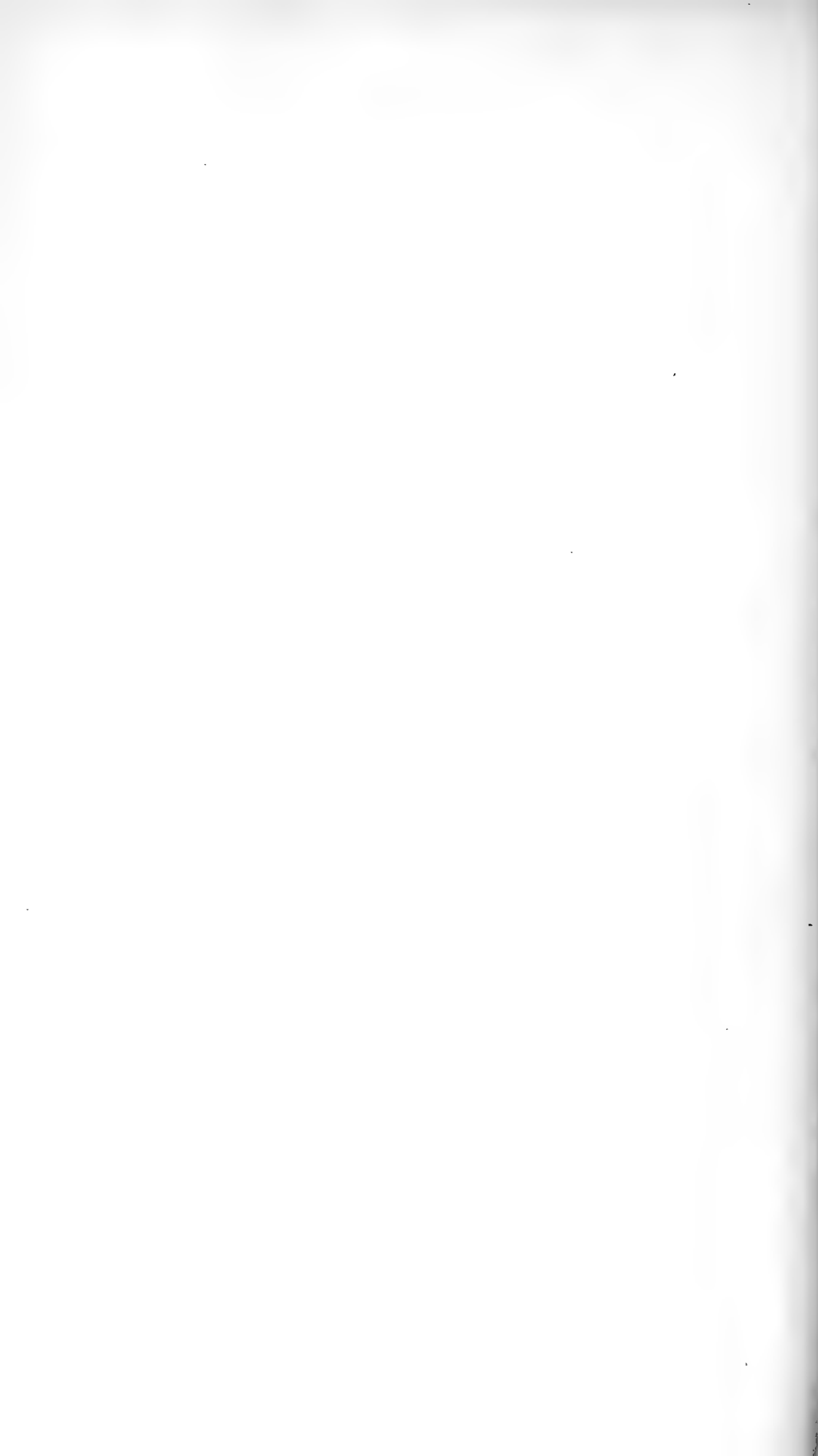
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