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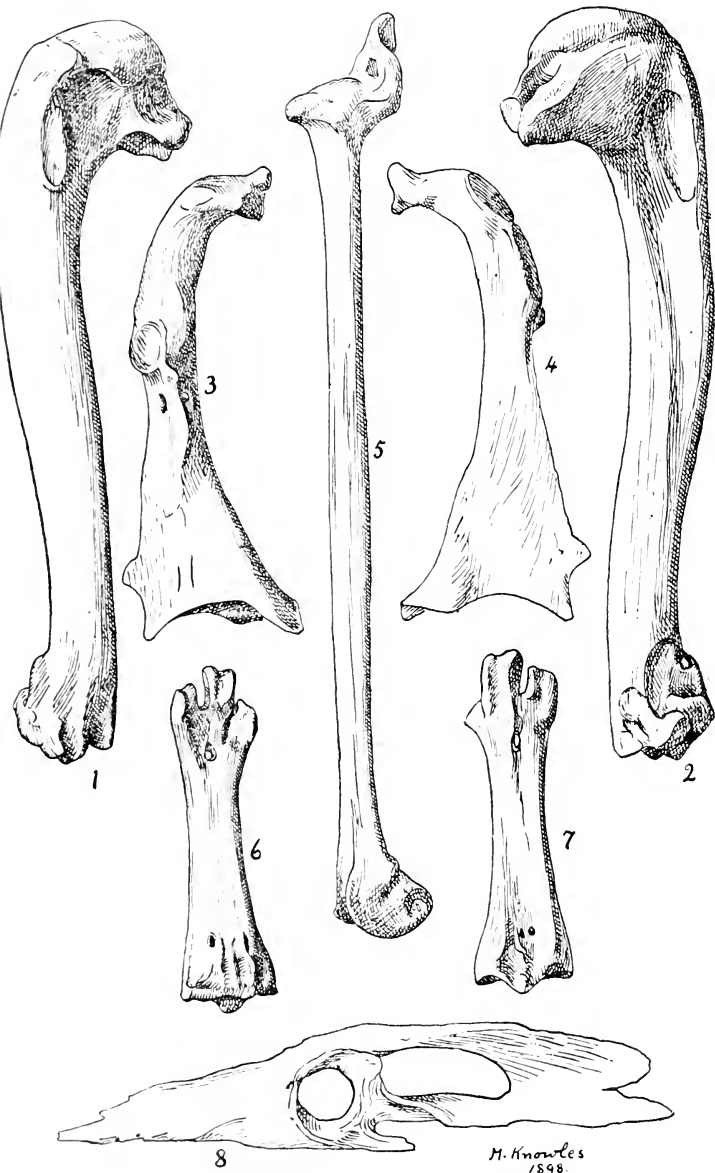
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M. Knowles
1898.

BONES OF GREAT AUK FROM KITCHEN-MIDDENS ON THE COAST
OF CO. WATERFORD.

[Natural size.]

The Irish Naturalist.

VOLUME VIII.

THE GREAT AUK, ONCE AN IRISH BIRD.

BY R. J. USSHER.

[PLATE I.]

SINCE my notice in the *Irish Naturalist* (1897, p. 208), I have made other visits to the same kitchen-middens, resulting in additions to my former finds of Great Auks' bones. These were all found strewn about on or near the old surface where this cropped up, among the bones of domestic animals and fowls and of Red Deer, of which many pieces of the antlers were also obtained. There were numerous burned stones, and charcoal in layers, and great quantities of shells of edible species, often very large, limpets, oysters, mussels, cockles, &c. I have now seventeen bones of *Alca impennis*, which have either been determined by Dr. Gadow or correspond with specimens that he has pronounced upon—eight coracoids which he assigns to six individuals, five humeri, belonging to three individuals, one tibia, right and left metatarsals and a portion of the pelvis. A right and a left humerus were found close together. In some of the bones the outer surface is well preserved, but in others it is much worn down, and the bones split from time and exposure. That my superficial searches among the sandhills, where but little of the old surface is now exposed, should have resulted in finding the remains of at least six Great Auks strewn about, suggests that these birds must have been used for food in some numbers. To obtain them access was probably available to some breeding-place of the species on the neighbouring coast; so that when Professor Newton remarked that the Great Auk obtained near Waterford Harbour in 1834 may have been revisiting the home of its forefathers, he possibly described what took place.

That the Great Auk was not equally common on all parts of the Irish coast became evident to me recently, when I visited the kitchen-middens of the extensive sand-hills at the mouth of Wexford Harbour without finding any relics of the bird.

I am indebted to Lady Blake for a copy of her article on the Great Auk in the *Victoria Quarterly* for August, 1889. In this she quotes from the unpublished journal of Aaron Thomas of His Majesty's ship "Boston," 1794, which came into her hands in Newfoundland. It speaks thus of the "Penguins" (Great Auks) on Funk Island—"The quantity of birds which resort this island is beyond . . . belief . . . As soon as you put your foot on shore you meet with such thousands of them that you cannot find a place for your feet, and they are so lazy that they will not attempt to move out of your way. If you come for their feathers you do not give yourself the trouble of killing them, but lay hold of one and pluck the best of the feathers; you turn the poor penguin adrift, with his skin half naked and torn off, to perish at his leisure. This is not a very humane method, but it is the common practice.

"If you go to the Funks for eggs, to be certain of getting them fresh, you pursue the following rule:—you drive, knock, and shove the poor penguins in heaps! you then scrape all the eggs in lumps, in the same manner as you would heaps of apples in an orchard; numbers of these eggs being dropped some time, are stale and useless. But you have cleared a space of ground . . . you retire for a day or two . . . at the end of which time you will find plenty of eggs, fresh for certain, on the place which you before had cleared.



Fig. 9. Left-sided view of pelvis of *Alca impennis*, half natural size. Shows by dotted lines the missing portions in Fig. 8 as kindly supplied by Dr. Gadow.

"While you abide on this island you are in the constant practice of horrid cruelties, for you not only skin them alive, but *burn* them *alive* also to cook their own bodies with! you take a kettle with you, into which you put a penguin or two,

you kindle a fire under it, and this fire is absolutely made of the unfortunate penguins themselves. Their bodies being oily soon produce a flame; there is no wood on the island, . .

“This skinning and taking the eggs from the Funks,” continues Mr. Thomas “is now prohibited, and they are allowed to take the birds only for bait to catch fish with. But the Funks, being such a distance from land, such a number of sunken rocks about; and in every other particular except the birds, so uninviting and desolate, that they are but seldom visited unless by pirates and robbers, to steal the feathers and eggs.

“About three years ago some fellows were detected in this kind of plunder; they were brought to St. John’s and flogged at a cart’s tail. But I am told there are quantities of feathers purloined from these islands every year.”

The latter part of this statement shows that the previous account of revolting cruelties described past times, within the writer’s recollection. Still it implies that Great Auks were still numerous on the Funk Islands in 1794, a much more recent date than has been supposed.

Elsewhere, however, this species was not finally exterminated until fifty years later, *e.g.*, on the Iceland coasts.

EXPLANATION OF PLATE I.

Bones of Great Auk from kitchen-middens on the coast of Co. Waterford.

Fig. 1. View of posterior surface of left humerus.

„ 2. View of anterior surface of left humerus.

„ 3 and 4. Two views of left coracoid.

„ 5. Side view of right tibia.

„ 6 and 7. Two views of right metatarsal.

„ 8. Left side view of pelvis, imperfect.

All natural size.

Cappagh, Co. Waterford.



REMAINS OF THE GREAT AUK FROM WHITEPARK BAY, COUNTY ANTRIM.

BY W. J. KNOWLES, M.R.I.A.

[PLATE 2.]

SEVERAL notices of finds of Great Auk bones at Whitepark Bay have already appeared¹ and it is only necessary for me now to join Mr. Ussher in bringing the information on the subject up to date. He describes in the present number his finds in the South of Ireland, and the following is a complete list of bones obtained by me at Whitepark Bay in the North, viz. :—

Humeri—4 right and 6 left, 3 of them imperfect. A side view of one is shown, Pl. 2, fig. 1.

Ulnæ—2 right and 1 left, one broken and mended, but they are all otherwise perfect. Two views of one are shown, Pl. 2, figs. 2 and 3.

Radius—1 specimen (left) shown, Pl. 2, fig. 4.

Metacarpal bone—1 specimen, left, slightly imperfect. See Pl. 2, fig. 5.

Phalanges—2 small bones. See Pl. 2, figs. 6 and 7.

Coracoids—2 perfect specimens, both left. For side view see Pl. 2, fig. 9.

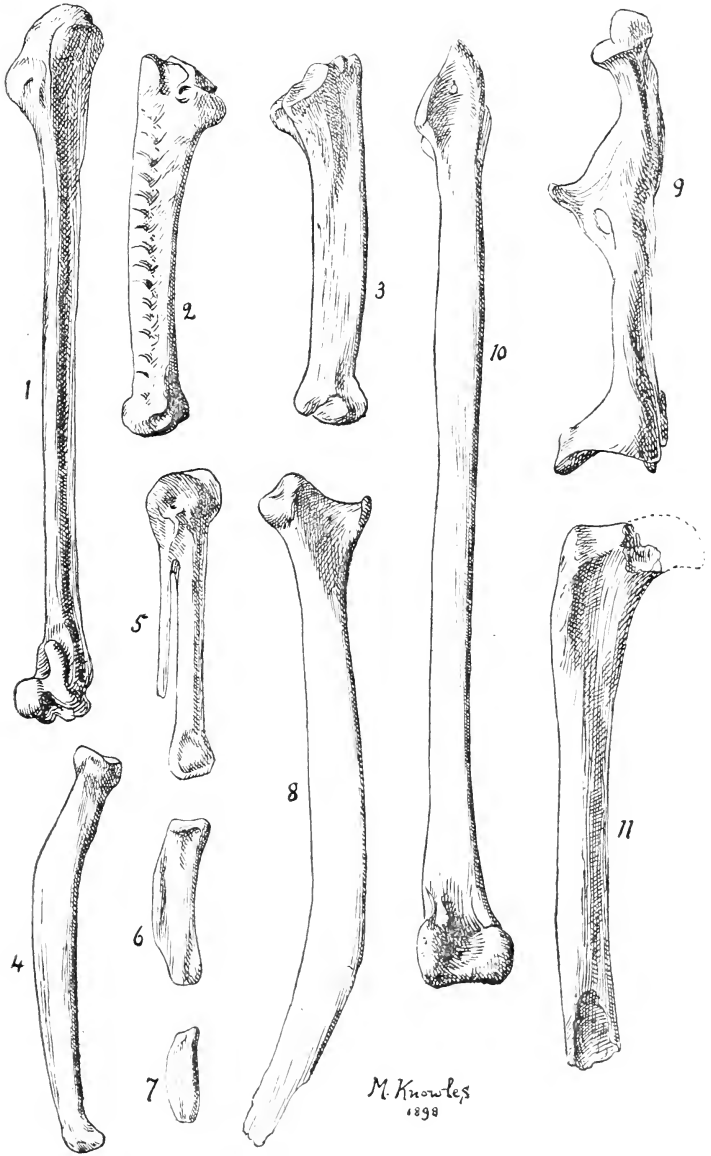
Scapulæ—3 specimens, 1 right and 2 left, one of them imperfect. A perfect example shown, Pl. 2, fig. 8.

Tibia—1 perfect specimen (right) shown, Pl. 2, fig. 10.

Femur—1 imperfect specimen (right) upper portion only shown, Pl. 2, fig. 11.

In all 24 bones. I gave either two or three humeri to the Royal Irish Academy along with other animal remains dug up at the same time. Though doubtful as to three I am certain I gave two bones to the Academy, and this number only have I included in the above total. I took no note as to whether they were right or left, but I have supposed there was one of each kind. With these exceptions the list is complete. All

¹ *Proceedings Royal Irish Academy* (3), vol. i, no. 5 p. 625. *Id.* vol. iii., no. 4, p. 654. G. E. H. Barrett-Hamilton in *Irish Naturalist*, vol. v. p. 121. Symington Greeve, *Trans. Edinburgh Field Nat. and Micros. Soc.*, July, 1897, p. 257. *Id.* July, 1898, p. 332.



BONES OF GREAT AUK FROM WHITEPARK BAY, CO. ANTRIM.
[Natural size.]

To face p. 4.]

the bones, except the four humeri first obtained, were determined by Professor Newton and Dr. Gadow, of the Museum of Zoology, Cambridge.

The first remains of Great Auk from Whitepark Bay were obtained during a careful excavation of a portion of the black layer. Remains of *Bos longifrons*, *Cervus elaphus*, Sheep or Goat, *Sus scrofa*, Fox, small form of Goose, small Gull, and a vertebra of Cod were found with them. These were determined by Mr. E. T. Newton, of London, Palæontologist to the Geological Survey. Among other bones since determined by Prof. Newton and Dr. Gadow were remains of Gannet, *Falco*, Dog or Wolf, Hare, and Little Auk. There were also associated with these remains flint-flakes, cores, hammer-stones, and flint scrapers, together with edible molluscs. On another occasion I found a humerus, ulna, radius, metacarpus, and two phalanges, which had just dropped from the old surface. At the time I could only identify a humerus, but from finding all the bones so close together, though not attached, I suspected that they belonged to the same wing, and on submitting them to Professor Newton my suspicion was justified, as they were all found to be Great Auk's bones. The scapula shown as fig. 8, Pl. 2 was observed protruding from the old surface, and putting in my trowel carefully I brought out along with it an imperfect humerus. A number of the bones were found lying exposed on the surface, some greatly weathered, and others comparatively sound. Like other bone-remains they harden after a little drying and exposure. I believe that they and all those obtained directly from the old surface are of the same age as the flint implements which were found associated with them. I have not found Great Auk remains in any of the other prehistoric sites along the coast of Ireland which I have examined. Whether the bird had breeding-places near Whitepark Bay or any other parts of the Irish coast in prehistoric times or was only a seasonal visitor I cannot give a decided opinion. Professor Newton, in a pamphlet he has sent me, supports the belief that there was a breeding-place in the Orkneys.¹

Mr. F. C. Lucas in his "Animals recently Extinct or threatened with Extinction" (1891), says that the Great Auk was confined to the North Atlantic, ranging on the European

¹ On the Orcadian home of the Garefowl (*Alca impennis*). From *The Ibis* for October, 1898.

side from Iceland to the Bay of Biscay, and on the American side from Greenland to Virginia. He says further that the positively known breeding-places are few in number, those where the bird bred abundantly being the Garefowl Skerries off the coast of Iceland and Funk Island, on the Newfoundland coast. To use the words of Mr. Lucas, the Great Auk was "slaughtered out of existence" in the cruel way described in Mr. Ussher's quotation from Lady Blake's paper; and it is now believed to be extinct, the extinction taking place about 1840, almost coincidently in Europe and America. Mr. Symmington Grieve gives a summary of existing remains of the Great Auk or Garefowl.¹

Skins,	80 or 82
Skeletons, more or less complete,	23 ,, 24
Detached bones,	862 ,, 874
Physiological preparations,	2 ,, 3
Eggs,	71 ,, 72
Ballymena.	

THE ESKERS OF IRELAND.

In *Natural Science* for September and October, 1898, there appears a well-written contribution on the subject of Irish Eskers from the pen of Dr. Thomas Fitzpatrick, of St. Ignatius' College, Galway. The paper consists chiefly of an account of the various theories put forward to explain the formation and distribution of these puzzling deposits; but the writer has personal acquaintance with many of our best examples of eskers, and his comments on the statements and suggestions of Jukes and Kinahan in Ireland, Geikie and Ramsay in Great Britain, and Hummel and Holst in Scandinavia, have therefore a value of their own. Dr. Fitzpatrick distinctly leans towards Hummel's glacier-tunnel theory; but he considers that the fact of the distribution of eskers in Ireland being almost restricted to the Central Plain is a point in favour of Kinahan's Esker-sea hypothesis. Curiously enough, no reference is made throughout the paper to the work of Winchell, Warren, Upham, Stone, Carvill Lewis, G. F. Wright, J. C. Russell, and other American geologists who have thrown so much light on the subject; and a more unnatural omission is found as regards Prof. Sollas' important Paper and map showing the distribution of eskers in Ireland²—the most suggestive contribution to the literature of the subject which has yet emanated from this country.

¹ Additional Notes on the Great Auk or Garefowl. *Transactions Edinburgh Field Naturalist and Microscopical Society*, July, 1898

² *Sci. Trans. R.D.S.* (2) v., no. 13, 1896.

NOTES ON "CYBELE HIBERNICA."

BY R. LLOYD PRAEGER, P.E.

I. SOME ADDITIONAL DISTRICT-RECORDS.

Now that *Cybele Hibernica* has appeared, it has been possible to compare the distribution of plants in the twelve botanical districts as given in that work with the unpublished matter which I have been gathering together for the purposes of an Irish *Topographical Botany*. Let me at once say that all the material which I have was freely at the disposal of the Editors of *Cybele*, and that much of it was used in that work. But a good deal remains behind, and as a consequence I can fill, now that a comparison is possible, a number of blanks in the table of distribution. A large number of new records for counties might also be given in the case of those rarer plants, the distribution of which is shown in *Cybele* in detail; but the publication of these would make the present paper so voluminous that it seems better to reserve them for *Topographical Botany*, and to publish at present only those localities which constitute new district-records. The plants were collected by myself during the last three seasons, except where otherwise stated. These notes are by no means complete, as many plants are at present in the hands of specialists, and as time did not permit of my going through a large accumulation of unclassified records from various parts of the country.

Ranunculus heterophyllus, Fries.

IV. WEXFORD—about Gorey, Rosslare, and Wexford, E. S. Marshall, 1897.

R. Lenormandi, F. Schultz.

III. KILKENNY—Brandon Hill. CARLOW—On Mount Leinster and by the Pollmounty River.

VIII. MAYO, W.—Several places on Achill

Papaver Rhæas, L.

IX. ROSCOMMON—about Athlone.

Fumaria Boræi, Jord.

IV. WEXFORD—Gorey, Macmine, Wexford, Rosslare Harbour, E. S. Marshall, 1897.

***Draba muralis**, L.

III. KILKENNY—abundant on an old building among fields east of Kilkenny.

***Viola canina*, L.**

III. KILKENNY—near Johnstown. CARLOW—boggy ground south of Carlow.

***V. tricolor*, L.**

VIII. GALWAY, W—Clonbur neighbourhood, E. S. Marshall, 1895.

***Cerastium tetrandrum*, Curtis.**

VII. TIPPERARY, N.—†Derelict railway at Portumna. KING'S—†railway north of Banagher.

***Elatine hexandra*, L.**

X. ARMAGH—Mullaghmore Lough, *I.N.* ii, 215 (1893). An omission in *Cybele*.

***Malva moschata*, L.**

IX. ROSCOMMON—†Mount Talbot. SLIGO—†Lough Arrow, and †Knocknarea glen. MAYO, E.—near Cong, E. S. Marshall, 1895

***Erodium moschatum*, L'Héritier.**

VII. KING'S—†Killeigh.

***Trifolium medium*, L.**

VII. TIPPERARY, N.—Thurles, and Portumna.

***T. fragiferum*, L.**

III. KILKENNY—abundant by the Suir above Granny. CARLOW—by the Barrow below St. Mullin's, and in a pasture at Leighlinbridge.

***T. filiforme*, L.**

III. QUEEN'S—edge of the Erkina marshes near Grantstown.

***Viola angustifolia*, L.**

III. KILKENNY—near Kilkenny. CARLOW—Bagenalstown.

VII. LONGFORD—near Longford, and on Carn Clonhugh.

†*Prunus insititia*, Linn.

IX. SLIGO—near Sligo.

†*P. Cerasus*, L.

IV. WEXFORD—about Gorey, Wexford, and Rosslare Harbour, E. S. Marshall, 1896-97

IX. ROSCOMMON—near Athlone, and by Lough Arrow. SLIGO—Lough Arrow. LEITRIM—by the coast.

***P. Padus*, L.**

III. QUEEN'S—large wood at Maryborough; †Mountrath, †Abbey-leix.

***Rubus pilcatus*, Wh and N**

IV. WEXFORD—Macmine Junction, E. S. Marshall, 1897.

***R. hirtifolius*, Maell. and Wirt. var. *danicus* (Focke).**

IV. WEXFORD—Wexford and Rosslare Harbour, E. S. Marshall, 1897.

***Agrimonia odorata*, Mill.**

IX. SLIGO—Strandhill.

Rosa mollis, Smith.

V. LOUTH—Castlebellingham.

R. rubiginosa, Linn.

II. TIPPERARY, S.—rough ground south of Thurles.

III. QUEEN'S—near Maryborough.

V. MEATH—Laytown. LOUTH—Togher and Killenchoole.

Saxifraga stellaris, L.

III. CARLOW—eastern face of Mount Leinster. The plant grows in some quantity at about 2,000 feet, extending into Co. Wexford.

‡**Sedum Telephum**, L.

III. QUEEN'S—Mountrath and Cullenagh.

***S. album**, L.

III. KILKENNY — about Kilkenny. CARLOW — Bagenalstown.

QUEEN'S—very abundant about Mountmellick.

V. LOUTH—Drogheda.

Myriophyllum alterniflorum, DC:

V. KILDARE—Nurney. LOUTH—Ardee Bog.

Callitriche vernalis, Koch.

IV. WEXFORD—Wexford district, E. S. Marshall, 1897.

Aplium nodiflorum, Reichb. fil. var. **ocreatum**, Bab.

IV. WEXFORD—near Wexford, E. S. Marshall, 1896.

V. DUBLIN—by a spring on Ireland's Eye.

Peucedanum sativum, Benth.

IX. ROSCOMMON—abundant on esker west of Athlone.

Caucalis nodosa, Scop.

III. CARLOW—Killedmond, Borris, Leighlinbridge.

‡**Gallium erectum**, Huds.

VII. WESTMEATH—meadow near Coosan Jough.

G. uliginosum, L.

III. CARLOW—near Milford and Carlow.

IV. WICKLOW—two miles north of Blessington.

‡**Valerianella Auricula**, DC.

III. KILKENNY—Inistioge and Thomastown.

Filago minima, Fries.

III. CARLOW—St. Mullin's.

Bidens tripartita, L.

VII. KING'S—Shannon Harbour.

Matricaria Chamomilla, L.

IV. WEXFORD—*Enniscorthy, casual only.

IX. ROSCOMMON—‡gravel-pit near Athlone.

***Petasites fragrans**, Presl.

IX. ROSCOMMON—Mote Park, and Boyle.

X. CAVAN—near Cavan town.

Senecio Jacobæa, L. var. **flosculosus** (Jord.)

IX. SLIGO—Sand-dunes at Strandhill.

Arctium nemorosum, Lej.

IX. SLIGO—near Sligo town.

Crepis taraxacifolia, Thuill.

VII. TIPPERARY, N.—Thurles. WESTMEATH—Athlone, and near Coosan Lough, Killinure Lough, and Twy Lough.

Leontodon hispidus, L.

VI. GALWAY, S.E.—Portumna.

Vaccinium Oxycoccus, L.

III. KILKENNY—bog at Urlingford. CARLOW—marsh near St. Mullin's. QUEEN'S—Maryborough, and east of Boleybeg Bridge.

Andromeda Polifolia, L.

II. TIPPERARY, S.—bogs at Ballinure.

Statice rariflora, Drej.

IX. SLIGO—southern shore of Sligo Bay, Aug., 1897, G. P. Farran, spec!

Myosotis repens, G. Don.

III. KILKENNY—Barleeagh Wood.

VII. TIPPERARY, N.—Templemore and Devil's Bit. LONGFORD—Carn Clonhugh.

***Linaria Cymbalaria**, Mill.

III. KILKENNY—Thomastown and Kilkenny. CARLOW—Borris, Carlow, and Bagenalstown. QUEEN'S—Maryborough and Mountrath.

Utricularia intermedia, Hayne.

II. TIPPERARY, S.—marsh between Cashel and Fethard.

Mentha piperata, L.

III. KILKENNY—†Thomastown. QUEEN'S—‡Maryborough, †Cullenagh, and ‡Mountrath.

Lamium album, L.

VI. GALWAY, S.E.—Portumna.

Littorella lacustris, L.

III. KILKENNY—Lough Cullen. QUEEN'S—near Maryborough.

V. KILDARE—near Kildare. MEATH—Lough Sheelin.

Polygonum maculatum, Trimen and Dyer.

IV. WEXFORD—*One plant on quay at Wexford, E. S. Marshall, 1896.

Euphorbia portlandica, L.

VIII. GALWAY, W.—rocks near Slyne Head.

Betula verrucosa, Ehrh.

III. CARLOW—marsh at St. Mullin's. QUEEN'S—edges of bog at Abbeyleix.

V. KILDARE—bogs between Thomastown and Edenderry. MEATH—bogs and shores of Lough Sheelin.

VIII. GALWAY, W.—Clonbur neighbourhood, E. S. Marshall, 1895.

X. CAVAN—marshes round Farnham Lake, and south end of Lough Oughter.

Betula pubescens, Ehrh.

III. KILKENNY—Thomastown. and high up on Brandon Hill
CARLOW—marsh at St. Mullin's. QUEEN'S—bogs at Abbey-
leix and Maryborough.

VII. TIPPERARY, N.—Lough Derg shores near Portumna; Barra-
curragh bog near Thurles; hill west of Devil's Bit. KING'S
—bogs at Geashill, mountain glebs of Slieve Bloom, marshes
of Lough Goura. WESTMEATH—natural scrub, Coosan
Lough and Twy Lough.

Salix triandra, L.

III. KILKENNY—Thomastown. CARLOW—swamp by the Barrow
below St. Mullin's.

†**S. pentandra**, L.

V. KILDARE—near Kildare, and in large marsh north of the
Curragh. MEATH—Enfield.

S. cuspidata, Schultz=*S. pentandra* × *fragilis*.

V. KILDARE—by the Liffey, near Kilcullen. Apparently not
hitherto recorded from Ireland, though Mr. E. F. Linton
writes me that he has seen it among Mr. Marshall's Irish
gatherings.

S. Smithiana, Willd., aggr.

III. QUEEN'S—Boleybeg Bridge near Abbeyleix.

†**S. purpurea**, L.

V. KILDARE—near Leixlip. MEATH—near Boyne monument, and
at Enfield.

VI. GALWAY, N.E.—Clonbrock.

Populus tremula, L.

III. CARLOW—appears native at St. Mullin's. QUEEN'S—wild
ground at Maryborough and Emo.

Taxus baccata, L.

VII. KING'S—Clonad wood, probably native.

Listera cordata, R. Br.

VII. KING'S—near summit of Arderin.

Habenaria albida, R. Br.

VII. TIPPERARY, N.—slopes west of Devil's Bit.

Luzula vernalis, DC.

VI. GALWAY, S.E.—Dalystown. The first station west of the
Shannon.

Typha angustifolia, L.

III. KILKENNY—plentiful in Lough Cullen.

Sparganium ramosum, Huds. var. **microcarpum**, Neum.

VIII. GALWAY, W.—Clonbur neighbourhood, E. S. Marshall, 1895.

IX. MAYO, E.—Cong neighbourhood, E. S. Marshall, 1895.

XII. DOWN—Loughinisland, Waddell (*Suppl. Flor. N.E.I.*)

Lemna polyrhiza, L.

III. CARLOW—ditch by the Barrow below Graiguenamanagh.

Potamogeton Zizii, Roth.

III. KILKENNY—in the Nore at Thomastown.

P. obtusifollus, Mert. and Koch.

III. KILKENNY—Lough Cullen, and Johnstown.

VII. WESTMEATH—near Athlone.

Zannichellia pedunculata, Reichb.]

IV. WICKLOW—brackish pools north of Wicklow.

Eleocharis multicaulis, Smith.

VII. KING'S—Geashill.

Scirpus pauciflorus, Lightf.

II. TIPPERARY, S.—Farranaleen and Fethard.

III. KILKENNY—Thomastown, Urlingford, Johnstown. CARLOW—below St. Mullin's. QUEEN'S—Rathdowney and Grantstown.

S. Tabernæmontani, Gmel.

IX. SLIGO—Rosses Point

Eriophorum latifolium, Hoppe.

V. KILDARE—large marsh north of the Curragh.

Rhynchospora alba, Vahl.

III. KILKENNY—Urlingford. CARLOW—marsh near St. Mullin's. QUEEN'S—in a number of stations.

R. fusca, R. & S.

VII. TIPPERARY, N.—bog at Barracurragh near Thurles. KING'S—bogs east of Banagher. WESTMEATH—bog near Twy Lough, west of Athlone.

Carex teretiuscula, Good.

II. TIPPERARY, S.—Fallinure, and between Cashel and Fethard.

III. KILKENNY—Johnstown. QUEEN'S—Abbeyleix, Rathdowney, Portarlinton

IV. WEXFORD—near Wexford, E. S. Marshall, 1897.

C. muricata, L.

IX. Sligo—Rosses Point.

C. curta, Good.

VII. LONGFORD—north of Carn Clonhugh.

IX. ROSCOMMON—by Lough Arrow.

C. acuta, L.

IX. ROSCOMMON—Lough Key.

C. pallescens, L.

VII. KING'S—base of Slieve Bloom. LONGFORD—Longford, and Carn Clonhugh.

C. distans, L.

III. KILKENNY—by the Suir at Granny.

C. xanthocarpa, Degl.

X. ARMAGH—boggy shores of Derryadd Lough (*Ill.*, ii., 184).
An omission in *Cybele*, where it is recorded from Cork only.

Millium effusum, L.

VI. GALWAY, S.E.—Dalystown.

***Bromus secalinus**, L.

IV. WEXFORD—on walls at Enniscorthy.

Lepturus filiformis, Trin.

III. KILKENNY—by the Suir above Granny.

Equisetum limosum, L., var. *fluviatile*, L.

II. Cos. WATERFORD and TIPPERARY, S.

III. Cos. CARLOW and QUEEN'S

IV. Co. WEXFORD.

V. Cos. KILDARE, DUBLIN, MEATH, and LOUTH.

VI. Co. GALWAY, S.E. and N.E.

VII. Cos. KING'S and WESTMEATH.

IX. Cos. ROSCOMMON and SLIGO.

X. Cos. ARMAGH (*J.N.* ii 61), and CAVAN.**Equisetum hyemale**, L.

VI. GALWAY, S.E.—Dalystown

Chara fragilis, Desv., var. *barbata*, Gant.

V. KILDARE—bog south of Kildare. MEATH—Ardee Bog.

C. hispida, L., var. *rudis*, Braun.

II. TIPPERARY, S.—near Clonmel.

C. vulgaris, L., var. *longibracteata*, Kuetz.

III. QUEEN'S—Mountrath.

var. *papillata*, Wallr.

VI GALWAY, S.E.—near Portumna.

II. MISCELLANEOUS COMMENTS.

OUT of a variety of notes jolted down at different times when dipping into the new *Cybele*, I venture to publish the following, hoping that they may be of use to Irish botanists. I have listed above any new district-records which were in my possession, and in my review of *Cybele* (*Irish Nat.*, vol. vii., pp. 273-285), have commented on one or two particular plants and their recorded stations. The following notes conclude my remarks on the excellent book which the labours of Mr. Colgan and Dr. Scully have given to us.

Any additional stations which I give below are of pre-Cybelian date. But it is worth noting that already a good deal of further botanical material has appeared. Mr. Hart's *Flora of Donegal*—published, most unfortunately, just too late to be utilized by the editors of *Cybele*—contains much additional information on Donegal plants; and the botanist must

also consult the *Proceedings* of the Belfast Naturalists' Field Club, the *Journal of Botany*, and the pages of this Journal since almost the beginning of 1898, if he wishes to make his information on Irish plant-distribution, up to the date of publication of *Cybele*, complete.

The following notes have been cut down as much as possible, and as they partake of the nature of comments on the text, they must, to be understood, be read with an open *Cybele* at one's elbow. Additional stations mentioned are from my own notes of the last three years except where otherwise stated.

p. xxiii. Corry's Clare paper was published in *Proc. Belfast Nat. Hist. and Phil. Soc.*, 1879-80.—This would be a better reference than that to the reprint which is given.

p. lx "The summits [of Mount Leinster and Blackstairs] belong to . . . Wexford."—In part to Wexford and in part to Carlow would be more correct.

p. lxvi. District X. . . . "inland, except for a few miles of salt marsh along the estuary of the Newry River." There are also the salt marshes of the Foyle in Tyrone, the home of *Cochlearia anglica*.

Ranunculus Baudotii, Godr.—V. DUBLIN—also at Portmarnock ("typical"—H. J. Groves).

Subularia aquatica, L.—XII. DERRY—can hardly be said to "now survive" on west side of Lough Beg; Mr. Stewart and I sought it in vain in 1886, and it has not been seen anywhere in District XII. since 1870.

Lychnis Githago, L.—X. "No locality available"—it is listed as one of the common plants of Co. Armagh (*J.N.*, ii., 60).

Cerastium tetrandrum, Curtis.—IX. SLIGO—summits of Knocknarea (1,048 feet) and Keishcorran (1,163 feet).

Hypericum hirsutum, L.—V. Also in MEATH—near Navan.

Vicia angustifolia, L.—Occurs inland at other places besides the Lough Neagh shores, as II. about Clonmel and Fethard; III. Bagenalstown and Kilkenny; VII. Longford; and X. Slieve Glah, Cavan.

Prunus insititia, L.—V. MEATH—in fine fruit in rough hedges near Gormanstown.

Alchemilla vulgaris, L.—The following is a contribution to the distribution of *Alchemilla* segregates in Ireland; the determinations are all due to the kindness of Rev. E. F. Linton:—

A. vulgaris, L., *sensu restricto* = *A. pratensis*, Schmidt.

V. MEATH—Oldcastle. VII. WESTMEATH—Coosan Lough. LONGFORD—Killashee. IX. ROSCOMMON—Lough Key. X. CAVAN—Lough Sheelin. TYRONE—Lough Muck, Miss M. C. Knowles. XII. DOWN—Holywood. ANTRIM—Dunboy and White Park Bay.

A. alpestris, Schmidt.

VIII. GALWAY, W.—Recess. IX. SLIGO—Keishcorran. X. TYRONE—Omagh, Miss M. C. Knowles. XII. ANTRIM—Dunseverick.

A. filicaulis, Buser.

II. TIPPERARY, S.—Fethard. III. QUEEN'S—Arderin and Grants-town. V. LOUTH—By the Dee at Kearney's Cross. VI. GALWAY, S.E.—Woodford. VII. TIPPERARY, N.—By the Shannon above Portumna. KING'S—Shannon Harbour. LONGFORD—Longford. IX. ROSCOMMON—Mote Park. X. TYRONE—Omagh, Miss M. C. Knowles. XII. ANTRIM—Knockagh.

Sedum anglicum, Huds., and **S. acre** L.—In the central counties both of these, the latter especially, are frequently deliberately planted on walls and housetops, apparently with an idea that they bring luck, as in the case of *Sempervivum tectorum*.

Slum latifolium, L.—XII. ANTRIM.—Dickie's Glenarin Park record is certainly erroneous, and might with advantage be abandoned.

Picris hieracioides, L.—By no means extinct in Ireland. Grows in profusion on railway banks east of Portarlinton, and again north of Athy; in the former station it has been abundant for the last five years.

Lobelia Dortmanna, L.—XII. Not to sea-level in Antrim. Lough Neagh is about 50 feet above O.S. datum.

Vaccinium Oxycoccus, L.—V. The only record in *Cybele* is a vague one of the year 1772; a few recent ones may be welcome:—KILDAKE—Nurney and Carbury. MEATH—Lough Sheelin, and four miles E.N.E. of Athy. LOUTH—Ardec Bog.

Hottonia palustris, L.—XII. Whitla's Downpatrick record should not be ignored. The plant extends here over a wider area than at Crossgar, and is more firmly established.

Solanum Dulcamara, L.—VII. "No locality available":—LONGFORD—thickets by canal near Woodlawn.

Calamintha officinalis, L. XII.—Was never in Glendun. A specimen of the original gathering, sent me by Rev. S. A. Brenan, is *Stachys arvensis*.

Stachys Betonica, Benth.—X. These notes are misleading. I never found the plant in Armagh, though I searched for it carefully. See *J.N.*, ii., 156.

Plantago media, L.—Has been recorded from XII. ANTRIM—At Lisburn and Larne (*J.N.*, v., 311); DERRY—Magilligan (*Proc. B.N.F.C.*, 1897-8, p. 437).

Atriplex portulacoides, L.—X. Need hardly be bracketed, as it grows in enormous profusion all along the opposite side of the river, and no doubt further plants would turn up on the Armagh bank if looked for.

Sailx Moorei, H. C. Watson.—"*S. herbacea* × *nigricans*?" The latest critical opinion on this willow, founded on a study of the living plant as well as dried specimens, places it under *herbacea* × *phylicifolia*. (Linton, *Journ. Bot.* xxxiv. 471, 1896).

- Spiranthes Romanzoffiana**, Cham.—XII. DERRY—I saw nearer 40 plants when I visited the Kilrea station in 1894, and the greater part of the field in which it grew had been ploughed up a few months before.
- Orchis latifolia**, L.—Can this be any longer excluded from the Irish list? H. C. Levinge, E. S. Marshall, and others have deliberately recorded the segregate species. Referring to its exclusion from *Cybele*, Mr. Marshall writes under date 24: 11: 98, "I have gathered *Orchis latifolia* (seg.) in Co. Wexford, and have marked it as observed in District VIII. of *Cybele*. It is very unlikely to be rare, in reality."
- Potamogeton plantagineus**, Duer.—XII. Why is this erroneous record resurrected? Stewart and Corry rightly placed it in their "excluded" list. Another record of Moore's which is repeated: "Common in ditches on the bogs among the Dublin mountains" appears equally unworthy of a place. The plant is lowland, with calcicole proclivities. There can be little doubt that both records refer to *polygonifolius* forms.
- P. flabellatus**, Bab.—VII. KING'S—Grand Canal, a mile south of Edenderry (*J.N.*, vi., 98). Omitted in *Cybele*.
- Ruppla spiralis**, Hartm.—XII. Is much commoner in this district than *R. rostellata*—see *Flor. N.E.I.* and *Suppl.* The editors need not have mistrusted these records.
- Scirpus rufus**, Schrad.—XII. All the Derry and Antrim stations are quoted, but only one of the Down localities.
- Cladium Mariscus**, R.Br.—XII. DOWN—The record of lake near Strangford (*J.N.*, vi., 219), the only station in east Ireland where the plant grows abundantly, is omitted.
- Carex filiformis**, L.—XII. Should not be bracketed—see *J.N.*, vi., 219, where the plant is recorded as growing abundantly in a lake near Strangford, Co. Down.
- Calamagrostis Epigeios**, Roth.—XII. DERRY—refound at Formoyle Hill by Miss Knowles and myself, growing very sparingly, in 1895.
- Festuca Myuros**, L.—III. Only one station (Ferrybank) given in *Cybele*. I have it from a large number of stations in Kilkenny and Carlow, and from two in Queen's County.
- Osmunda regalis**, L.—V. LOUTH—the earliest publication of the well-known Castlebellingham station appears to be *J.N.*, iv., 294 (1895), but the fine tufts of the Royal Fern which stud the bog have been familiar to botanical travellers on the G. N. Railway for many years.
- Equisetum variegatum**, Schleich. var. **majus**. Syme.—VI. The Aran record (*J.N.* iv., 252) is omitted.

NOTES ON BIRD BONES FROM IRISH CAVES.

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

THROUGH the kindness of my friend Dr. R. F. Scharff, I have been permitted to examine some bird bones from the Ballynamindra and Shandon caves, in the Dublin Museum. These bones had been identified as those of the Ptarmigan and Black Grouse, neither of which species is known to have occurred in Ireland in recent times. The following is the account given of the bones in Mr. Lydekker's *Catalogue*.

(I.) "*Tetrao tetrix*, Linn, Syst. Nat. ed. 12, vol. i., p. 274 (1766). (a.) The right humerus, wanting the distal extremity; from the Ballynamindra Cave, Co. Waterford. This specimen agrees in all respects with the corresponding bone of a recent skeleton of the Black Grouse, and is very important, as proving the former existence of that species in Ireland, of which there has hitherto been no evidence; see Yarrell's *British Birds*, 4th ed., vol. iii., pp. 62, 63 (1884). *Presented by R. J. Ussher, Esq.*"

(II.) *Lagopus mutus* (Montin). (a.) The right humerus and three specimens of the coracoid; from Shandon Cave, Co. Waterford. These specimens are noticed in the *Trans. R. I. Acad.*,¹ vol. xxvi., p. 229, where it is suggested that they may belong to females of *L. scoticus*. Their small size shows, however, that they indicate the former existence of the Ptarmigan in Ireland. *Presented by E. Brennan, Esq.*

(III.) (c.) "The imperfect mandible and a femur; from the Ballynamindra Cave, Co. Waterford. *Presented by R. J. Ussher, Esq.*"

I have, fortunately, been able not only myself to give these bones a very careful examination and comparison with recent skeletons, but also to avail myself of the advice of my friends, Messrs. E. T. Newton and W. P. Pycraft, with a result that there can be no reasonable doubt whatever that all the above bones, with one exception, have been correctly identified. The exception is the imperfect mandible from Ballynamindra Cave; and that gave a considerable amount of trouble before it could be properly named. It would probably astonish those who have not worked for themselves at bird-bones, and who may not, therefore, appreciate the difficulty in naming such specimens, if I were to give here a list of the species with which this refractory bone at first sight appeared to bear resemblance. To Mr. Pycraft, however, belongs the credit of having finally identified it as the mandible, not of any species of game bird, but of a Common Kestrel (*Falco tinnunculus*, Linn.)—a species which has, I believe, not hitherto been included in our Irish cave-fauna.

In addition to the above, the Museum possesses bones of several other species of birds from the same caves, the identification of which I take from Mr. R. Lydekker¹; we have then the following species of birds from the two caves:—

SHANDON.

Lagopus mutus.
Corvus corax.
Anser segetum.
 (†) *Bernicla leucopsis.*
Somateria mollissima.
Colymbus septentrionalis.

BALLYNAMINTRA

* *Lagopus mutus.*
 * *Tetrao tetrix.*
Fulica atra.
Falco tinnunculus.

(An asterisk is prefixed to the names of species now extinct in Ireland).

The former existence of two northern species such as the Ptarmigan and Black Grouse in the south-east of Ireland, together with that of the Great Auk² (*Alca impennis*) in the same county, is of high importance for the light it throws on former climatic conditions in Ireland.

Kilmanock, Co. Wexford.

 ECONOMIC ZOOLOGY.

Handbook of Insects injurious to Orchard and Bush Fruits, with means of Prevention and Remedy. By ELEANOR A. ORMEROD. Pp. xi. + 286, with portrait of the author and numerous figures in text. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1898.

In this handy volume, Miss Ormerod has summarised the researches of many years on the important subject of insect-depredations to fruit trees and bushes. The insects described are grouped under the particular plants which they injure, and the plants are arranged alphabetically, thus ensuring ease of reference for the practical fruit-grower. The life-history of each insect is described in sufficient detail, and the means for checking its ravages carefully discussed. The outcome of many years' experience of fruit farmers all over the country, who have been in correspondence with the authoress, will be found condensed for the benefit of the reader. It may be taken for granted, therefore, that the remedies which have been found of most practical use are brought most prominently forward. The only subject which might perhaps have been advantageously dealt with at greater length is the influence of ichneumon and other parasitic flies in keeping the noxious insects in check. The book is admirably illustrated, many of the figures being new.

G. H. C.

¹ "Fossil Mammals, Birds, Reptiles, and Amphibians in the Science and Art Museum" (Dublin) (1891).

² See *Irish Naturalist*, vol. v., p. 121; also pp. 1-3 of this number.

The Farmer and the Birds. By EDITH CARRINGTON, with Preface by Canon Tristram, F.R.S. London: George Bell and Sons, York-street, Covent Garden, 1898.

Miss Carrington writes as an avowed advocate on behalf of the birds, but her very attractive little volume is, on the whole, remarkably free from foolish exaggeration or rhodomontade, and may cordially be wished a wide circulation. Discarding appeals to sentiment, the authoress confines herself to indicating the practical value of birds to the agriculturist, which in many instances is done by means of a "balance sheet," showing in opposite columns the services and dis-services of particular species of birds, such as the Blue Titmouse, Rook, Robin, Yellow-hammer, Barn Owl, Lapwing, and Corncrake. We need scarcely add that in every case the meritorious deeds are found in the longer column. The authoress does not shrink from defending the Magpie, Wood-pigeon, Sparrow-Hawk, and Sparrow, and her vindication of each is backed by copious extracts giving the "Opinions of Authorities." We will not say that in every instance the case made out is altogether convincing. The list of "foods by consuming which a bird benefits man" is frequently enlarged by such items as shrews, frogs, earth-worms, humble-bees, and dragon-flies, which are all, to some extent (and some of them in a very high degree), excellent friends to the farmer; and if the Sparrow-Hawk is to be preserved for his services in "thinning" Sparrows, it is a little difficult to understand why the agriculturist is dissuaded from thinning them himself. To Irish farmers the question of the Redstart's food is of little moment, but it would be of great interest to know whether Miss Carrington has any grounds for including the larva of the Magpie Moth (pp. 29-31) under this heading, the generally received opinion being that *Abraxas grossulariata* is rejected by birds in all its stages. The abbreviation "Blackstart" for "Black Redstart" is a disfigurement which occurs, we think, only once, but must nevertheless be protested against: a name which, etymologically, means "black-tail," should on no account be applied to a bird whose tail is fiery red. On the whole, however, Miss Carrington has produced an excellent little book, and Canon Tristram's short but thoughtful preface should more than suffice to bespeak for it an attentive reading.

C. B. M.

The Wanton Mutilation of Animals. By GEORGE FLEMING, C.B., LL.D., F.R.C.V.S. 4to; 24 pp. and ten figures. London: G. Bell and Sons, 1898.

This is a reprint of Dr. Fleming's vigorous article in the *Nineteenth Century*, March, 1895, against the barbarous practice of docking horses' tails. Its force is greatly increased by the illustrations which have been added, and one would think that a comparison of figs. 7 and 9 with 10 would convert the most hardened advocate of mutilation to Dr. Fleming's views.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Seal from Sergeant J. M'Goldrick, a White Blackbird from the Lord Lieutenant, an African Dove from Dr. Garland, a Peacock from Mr. J. Hogg, and a Woodcock from Mr. J. C. Smith. A litter of Hunting-puppies and a Pigmy Calf have been born in the Gardens. A Black Ape and a Spider-monkey have been bought. 4,326 persons visited the Gardens in November.

DUBLIN MICROSCOPICAL CLUB.

OCTOBER 20.—The Club met at Leinster House.

Mr. HENRY J. SEYMOUR showed a thin section of a Hornblende granulite from Parry Sound, Lake Huron, Canada, which was collected by Mr. Ramage on the occasion of the visit of the British Association to Toronto last year. The rock consists mainly of dark-green hornblende crystals, usually with rounded outlines. Centric structure is well developed. Each of the aggregates is composed of a pink garnet forming a central core, round which is developed a zone of plagioclase felspars with a very little quartz. Sphene, ilmenite leucoxene, and zircons occur abundantly in the section. The sphene is present mainly in the hornblende areas, while the zircons, which are very minute in size, occur chiefly in the plagioclase zone around the garnets. Some very small granules of another, not yet determined, mineral also occur in the section.

Prof. T. JOHNSON showed a preparation of the mycelium of the dry-rot fungus, *Merulius tachrymans*, as seen in the tracheidal elements of a plank which had formed part of a flooring in an unfinished part of the Science and Art Museum. A very characteristic specimen of the fruit (hymenophore) of this highly destructive fungus was also shown. Moist still air helps and dry currents of air hinder the growth of the fungus.

Mr. M'ARDLE exhibited the following rare liverworts:—

Radula Carringtoni, Jack, with ripe capsule burst, showing spores and elaters, from Anniscaul, Co. Kerry, where it was collected on wet rocks in the mountain stream by the Rev. H. W. Lett and himself in June last, a new station.

Radula aquilegia, Tayl., showing male and female fruit; this species is remarkable in having the leaves cup-shaped at the base, hence the name *aquilegia*, "water holder"; it is rarely seen in fruit collected in the same locality as the previous species.

Bazzania triangularis, Schl., var. *innovans*, Nees, Carrington and Pearson Exs. No. 124. Found on a damp bank on Mount Eagle, Co. Kerry, in June last. A remarkable compact form more gracile than the type, with heterophyllous leaves, tridentate or plane at the apex, with a series of slender innovations and flagellæ interposed. This form is new to the Irish flora.

NOVEMBER 17.—The Club met at Leinster House.

Mr. HENRY J. SEYMOUR showed a specimen of the mineral Thorite from near Arendal, Norway. The mineral contains about 60 per cent. of Thorium, and forms the chief source of supply of this element, which is largely used in the manufacture of incandescent gas mantles. The specimen was given to him by a mining engineer who brought it, with a number of other minerals, from the same locality, to Mr. Seymour for identification.

Prof. T. JOHNSON showed a preparation of *Cladostephus verticillatus*, a common brown seaweed. The specimen was of interest in that it showed the transition from the clothed summer sterile to the naked winter fertile state. A branchlet of a sorus showed both unilocular and plurilocular sporangia.

Mr. GREENWOOD PIM exhibited *Phragmidium (Aregma) tormentille*, found at Ovoca during the visit of the British Mycological Society, and an addition to the Irish flora. This fungus is very distinct from *Phragmidium obtusatum*, which occurs on another plant, *Potentilla fragariastrum*, while *P. tormentille* occurs on *Potentilla tormentilla*.

Canon RUSSELL exhibited sections of the petiole of the leaf of *Rhus typhina* at the point of junction with the stem, showing the partial inclosure of the bud within the swollen base of the petiole. The bud appears to be really axillary; but, as Professor Miall, to whom Canon Russell sent some specimens, observes, "over-arched to a singular extent by the old petiole. The narrow air passage, as shown in the section, is defended by a crowd of hairs which would be an effective protection against the entry of water." The cavity in which the bud is formed is also fringed with hairs, which, by the time the leaf falls off, completely envelopes the bud itself as a winter covering. Professor Miall states that he sees that there is every degree of inclusion from buds which are not sheltered at all to those of the *Rhus typhina*, which is an extreme case of protection. He says—"The buds of *Robinia pseudacacia* are borne upon the scar usually flanked by two spines. They are so effectively protected they are rather hard to see."

Mr. M'ARDLE exhibited *Venturia bryophila*, Funck, Sacc. Syll. Fung. vol. i., page 395, a curious fungus which he found on the leaves of *Scapania equiloba*, one of the Hepaticæ which he collected at Anniscaul, Co. Kerry, in 1894-98. The perithicia are minute, of a dull brown colour, beset with stiff bristles arranged on the ostiolum, not unlike the spokes of a wheel. Asci minute clavate, eight-spored in two rows, spores elliptic, oblong, uniseptate, hyaline. Paraphyses none.

This species, which was identified by Mr. Masee, of the Kew Herbarium, is a native of Germany and France, and has not been reported previously in Great Britain or Ireland. Saccardo, in his grand work, places it in the section with those which are found on Monocotyledons and Acotyledons, and add that it is found in above-mentioned countries on the leaves of *Jungfermania*, *Polytrichum*, and *Diphyscium*.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

NOVEMBER 8.—The President of the Society, THOMAS WORKMAN, J.P., opened the Session with an Inaugural Address, his subject being "Incentives to the Study of Natural History." A vote of thanks was passed to the President. Some recent valuable donations were on exhibition.

DECEMBER 6.—A meeting was held in the Museum, when a paper was read by WALTER CHAMBERS, C.F. Subject—"Refuse Disposal and Sewage Purification." The paper was illustrated by diagrams, etc., and was followed by a discussion.

DECEMBER 13.—A special meeting was held when a paper was read by ARTHUR J. MARTIN, Assoc. M. Inst. C.E. (one of the Managing Directors of the Septic Tank Syndicate, Ltd., Exeter), on "The Purification of Sewage by Bacteria," illustrated by limelight views. A discussion followed.

BELFAST NATURALISTS' FIELD CLUB.

NOVEMBER 15.—The President, Rev. C. H. WADDELL, B.D., delivered his inaugural address on "Plant Societies, and the Distribution of Plants in N.E. Ireland." The lecturer said the social aspect of the life of plants is an interesting study and aid to understanding the way in which the genera and species are distributed. There is a striking parallel between the process by which the races and societies of plants have spread over the earth and the history of the races of men. An account was then given of what may be called the ethnography of plants. The flora of Ireland is mixed, not a pure race indigenous to the soil. The main stock is British, but Ireland possesses in the South-west a small but interesting group called the Cantabrians, whose headquarters is in the Pyrenees. By means of a map, which showed how Europe formerly extended its coast line north-west, and included the British Isles, it was pointed out that in this way these Spanish plants reached Ireland. A still smaller group of American plants, which include the "Blue-eyed Grass," Pipewort, and others, probably reached Ireland from the west by way of Greenland and the Faroes. The main progress of plants, however, as of animals, is westwards, and it was shown how the British flora, like the nation, consists of a mixed race of immigrants from various parts of Europe, which have now settled down into a natural plant-society. The Canadian Weed was mentioned as an instance of a colonist. A natural plant-society is one which can maintain itself. Such a community as springs up on a garden plot or along a newly made railway is unnatural, in the sense of not being a well-proportioned and self-supporting community. In a short time the weeds and casuals will take their departure if left to nature, and a natural and well-balanced community will take its place, such as we find on undisturbed ground, or in an old meadow. Environment has, of course, much to do with the character of the plant-society of a place. The bog, the wood, the mountain, have special plants of their own which we find associated. The rocks have an important influence on the flora, and North-east

Ireland has a most interesting community of plants for this reason, that it contains such a variety of rocks. Mosses are an even better guide than seed-plants to the kind of rock on which they grow, and a bryologist ought to be able to tell the kind of rock from the mosses which grow on it. There is a striking difference between the basaltic and limestone flora of County Antrim, and the Silurian or granite flora of County Down. At the close of the lecture Mr. J. H. Davies called attention to the chief features of the new *Cybele Hibernica*, an important addition to Irish botanical literature, and said that the authors are to be heartily congratulated on their successful achievement on having produced a work of great excellence, in which is set forth with care and accuracy the present state of our knowledge of Irish topographical botany. Mr. S. A. Stewart said that the very thoughtful and instructive address to which they had just listened was a type of what the address of the President of a Naturalists' Field Club should be. He was glad to see that so much interest was now evinced in the flora of the North of Ireland, and that many young and capable hands were coming forward to carry on the work of botanical research in our district.

NOVEMBER 19.—The first meeting of the Botanical section was held and was very well attended. The evening was devoted to a general introduction to the study of the grasses, the subject chosen for special study by the section this winter.

DUBLIN NATURALISTS' FIELD CLUB.

NOVEMBER 8.—Dr. N. H. ALCOCK in the chair. Forty members were present. Dr. T. JOHNSON, F.L.S., gave an account of the Irish Characeæ—a group of green algæ well represented in the Irish flora. The paper was illustrated by fresh and herbarium specimens, by lantern and microscope. The group is of some economic interest owing to the chalk incrustations of some species. It has also considerable biological interest, and was recommended as an excellent hobby for a field naturalist. We understand the paper will appear in detail in an early number of the *Irish Naturalist*. This paper was followed by a valuable discussion of the recently published second edition of the *Cybele Hibernica*. Members generally expressed their high appreciation of the value of the work, and of the painstaking care and skill with which Messrs. Colgan and Scully had edited the second edition, as left to their charge with his manuscript notes by the late A. G. More. The meeting gave fitting expression to its views in the following resolution unanimously adopted:—The Dublin Naturalists' Field Club congratulates the Editors, Messrs. Colgan and Scully, two of its oldest members, on their successful completion of the second edition of the *Cybele Hibernica*, and is convinced that this edition will have the same stimulating effect on Irish field botany as the first edition, of which the authors were the late Dr. D. Moore and Mr. A. G. More.

Mr. F. W. MOORE, M.R.I.A., in proposing this resolution, said he had only one fault to find with the work, and that was the unfortunate, but he believed unintentional, omission from the title-page of the name of one of the authors of the first edition—his father, the late Dr. D. Moore.

It was gratifying to find how little of the conscientious work of the first edition had been discarded in the second, and how stimulating its influence had been on Irish field botany, as indicated by the increased records. He was convinced that could the authors of the first edition give an opinion they would say the work was a worthy successor to the first.

Mr. R. M. BARRINGTON, F.L.S., seconded the resolution, heartily endorsing all that Mr. Moore had said. He thought the editors attributed too much to the Gulf Stream. It was, he thought, the prevalence of S.W. winds, due to the permanent Atlantic depression and the island character of Ireland, which accounted for its mild humidity. After spending some forty years in the study of field botany. Mr. Barrington could recommend it to all as a source of constant and permanent pleasure in every journey. He urged members, however, if they were to get full pleasure from the study, to work out themselves the identifications of the plants found.

Mr. T. CHANDLEE, in strongly supporting the resolution, said he had only seen one slight typographical error. Dr. JOHNSON thought they would not have long to wait for a third edition if the teaching of botany in the primary and secondary schools received due encouragement. The following were duly elected members:—J. Bowker, S. H. Douglas, Mrs. Espinasse, Miss Ladd, Miss E. M'Intosh, F. O'Brien, Miss Patten, Rev. C. K. Pooler, Miss E. M. Rhodes, Miss K. Scott, W. A. Varian. Four nominations were received. Mr. T. Chandlee showed a living specimen of a pretty white variety of the Herb-Robert.

NOTES.

BOTANY.

FUNGI.

Cordyceps militaris, Fr., on a beetle.

Early in September Miss A. E. Alexander brought me some specimens of *Necrophorus ruspator*, Er., which she had found on a dead hen. I put them into a cyanide bottle to kill them, and a day or two afterwards proceeded to set them. While doing so I noticed a growth from the right front leg of one of the beetles. At first I thought I had got a monstrosity, but a closer examination showed me that whatever the growth was it was something external. Suspecting that it was of the nature of a fungus, I submitted it to my friend, the Rev. H. W. Lett, M.A., of Loughbrickland. He pronounced it to be a fungus of some kind, but was not sure of the species. He therefore forwarded it to the Royal Gardens, Kew. The Director replied that the fungus was the corrodial condition of *Cordyceps militaris*, Fr., which used to be called *Isaria farinosa*, Fr. I understand that the occurrence of this fungus on a living insect is remarkable. Dr. Cooke says that "it is found on the dead pupæ of various Lepidoptera."

Poyntzpass.

W. F. JOHNSON.

PHANEROGAMS.

^ **Late Wild-flowers.**

Each one of the wild-flowers in the following list has been found fairly out in blossom between October 22nd and November 22nd. All these flowers were found within a few miles of the city of Waterford, and are very common in this district, excepting *Viola arvensis*, *Anagallis cærulea*, and *Mercurialis annua* :—

Ranunculus repens, *Papaver Rhæas*, *Brassica Sinapis*, *Viola arvensis*, *Polygala vulgaris*, *Cerastium vulgatum*, *Malva sylvestris*, *Linum catharticum*, *Geranium molle*, *G. Robertianum*, *Ulex europæus*, *U. Gallii*, *Medicago lupulina*, *Trifolium procumbens*, *Rubus fruticosus*, *Fragaria vesca*, *Potentilla Tormentilla*, *P. reptans*, *Daucus Carota*, *Conopodium denudatum*, *Hedera Helix*, *Lonicera Periclymenum*, *Sherardia arvensis*, *Aster Tripolium*, *Scabiosa arvensis*, *Bellis perennis*, *Chrysanthemum Leucanthemum*, *Matricaria inodora*, *Senecio vulgaris*, *S. Jacobæa*, *Sonchus arvensis*, *S. oleraceus*, *Centaurea nigra*, *Hypochaeris radicata*, *Crepis virens*, *Taraxacum officinale*, *Erica cinerea*, *Calluna vulgaris*, *Anagallis tricolor*, *Achillæa Millefolium*, *Cnicus arvensis*, *Geum urbanum*, *Heracleum Sphondylium*.

Waterford.

A. M. GREENWOOD.

Juncus obtusiflorus In the Aran Islands.

In looking over plants collected during the Galway Field Club Conference in 1895, I find *Juncus obtusiflorus* from Inishmore. This Rush does not appear to have been recorded from Aran in any previous list.

R. LLOYD PRAEGER.

ZOOLOGY.

INSECTS.

Entomological Notes from Poyntzpass, &c.

Since my last notes (*I. Nat.*, vii., p. 168) I have not done very much entomological work. At the end of June I took *Cleora lichenaria* and *Eupithecia castigata* at Scarva, Co Down.

When walking to Tanderagee early in July I noticed the web of some gregarious larva on the hedge. I searched, but failed to get anything except a couple of pupa-cases, and from these emerged *Hypnomena cognatella*. Shortly after this I went over to Loughgilly Rectory to pay a visit to my friend, the Rev. H. S. M. Harpur. In the garden I noticed some plants of *Scrophularia nodosa*, and recollecting Mr. H. L. Jameson's capture of a *Cionus* on *Scrophularia nodosa* at Loughgilly some years ago,

I proceeded to search for the beetle. No beetles were present, but a curious-looking larva and some pupa-cases. I took all I could find and forwarded the larvæ to Mr. G. H. Carpenter at the Science and Art Museum. In due time the pupæ emerged and proved to be *Cionus hortulanus*, Marsh. The larva is of very curious form; at first glance it looks more like a small slug than the grub of an insect. The pupa-cases are smooth, semi-transparent, and not unlike the large seed of the *Scrophularia*. In August I met with some more beetle larvae and pupæ, this time in my own fields. On thistles I found both larvæ and pupæ of *Cassida viridis*, F. They are very curious in appearance, both being fringed with spines, which give them a thorny look. The larvæ seem to carry their excrementa on their backs, perhaps as a protection, for there was no attempt at concealment, nor any protective resemblance. In the second case I only succeeded in getting the pupæ—these were of *Hypera rumericis*, L. I found them on a Dock plant, clustered together on the stem; the pupa-cases are of a rough kind of network and reddish in colour, assimilating very closely to the colour of the stem and seeds of the plant, and no doubt deriving protection from attack by this means.

Wasps began to be very plentiful in August, and I took *Vespa rufa*, L. and *V. sylvestris*, Scop.

Bombus smithianus, White, was present but I did not take any of the nests. *Bombus venustus*, Smith, is there also, for I took a ♂ in one of my fields on Aug. 25.

Sirex gigas has made its appearance in widely separated localities. I received three specimens all ♀, the first was captured at Acton House, the next came from Loughgall, and the third from Downpatrick. Evidently this undesirable addition to our insect fauna is making every effort to establish itself in this country. I should think the Royal Irish Constabulary might be now armed with butterfly nets for the capture of *Sirex* as well as lassoes for rabid dogs. The chase of *Sirex* would be quite as exciting and much less dangerous than that of *Canis fureus*.

W. F. JOHNSON.

Poyntzpass.

FISHES.

Black Fish at Lough Swilly.

On November 6, as I was leaving Ballymastocker strand a man (who had been kindly directed to do so by Colonel Barton) ran after me with a "strange fish." It was three feet long, black, and with a peculiar dog-like snout and remarkable fins. Never having seen one like it I brought it to book—that is to say, to "Yarrell," where it proved to be the Black Fish (*Centrolophus pompilus*). This is a very rare fish, and its great size for the species (it was perfectly fresh) is remarkable. "Couch obtained specimens thirty-two inches long, but its size is generally smaller" (*Cassell's Nat. Hist.*) I sent it immediately to the National Museum, and Dr. Scharff, who has some smaller specimens from the

West Coast, agreed with my identification. In 1881 Frank Buckland wrote:—"The Black Fish, an inhabitant of the Mediterranean, has been only four or five times seen on our coast." Generally it was captured on the Cornish coast. The appearance of this specimen within a few days of the Lesser Rorqual on the same strand is most interesting. One is typically northern in its home, and the other is typically southern. Their presence is a good illustration of the character of the fauna and flora of Donegal, combining as it does, species reaching their northern limits from the south around the west coast, and others of a high northern character.

H. C. HART.

Carrablagh, Co. Donegal.

BIRDS.

Hawfinch and Long-tailed Duck in north Co. Dublin.

On the 13th February last a mature male Hawfinch (*Coccothraustes vulgaris*, Pallas), was obtained at the Grange, Portmarnock. I have not previously heard of it been taken in this district. Mr. John Wellington, a local fowler, has kindly given me an immature female Long-tailed Duck (*Harelda glacialis*, Linn.), which he shot on the Malahide estuary on 19th October. This is the only occurrence that has come under my notice during the last ten years.

Malahide.

J. TRUMBULL.

Eider Duck in Innishowen.

On 2nd November I examined a female Eider Duck (*Somateria mollissima*), shot near Carndonagh, Co. Donegal, a few days before. This is the first time the species has come under my notice here.

Londonderry.

D. C. CAMPBELL.

MAMMALS.

Lesser Rorqual on the Coast of Co. Cork.

During the early part of May (1898), the carcass of a Lesser Rorqual (*Balaenoptera rostrata*) was found by some fishermen floating in the Bay of Clonakilty. Though in a very decomposed condition, it was towed to shore, but was found to be of no value, and, after having lain for four or five days on the beach, was again taken out to sea by order of the local coast-guards. Late in the same month the carcass was again washed ashore at a distance of about a mile from the Coast-guard Station at Ring Bar, Clonakilty. Mr. David Stewart, the Station Officer at Ring Bar, was good enough to visit the carcass on my behalf, and states that the total length was 14 feet 4 inches, and the depth 3 feet 10 inches. The extreme length of the flippers was 2 feet, and the colour of the body black above and white beneath. Mr. Stewart was also good enough to send me the jaw-bones of the animal to London, so that there can be no doubt as to the identification of the specimen. I recorded the stranding of another specimen of the same species on the coast of Co. Cork in October, 1891 (*Zoologist*, February, 1892, p. 75).

Kilmanock, Co. Wexford.

G. E. H. BARRETT-HAMILTON.

Lesser Rorqual In the Swilly.

On October 16, after a prolonged spell of heavy weather, I found a young whale on Ballymastocker strand, near high-water mark. I heard subsequently he had been there for several days. The specimen was considerably decayed, but still quite entire, and struck me as something quite unknown to me. Its comparatively small size (six feet in total length) was especially noticeable for a "monster of the deep." Having taken down measurements and prominent characteristics, I consulted "Bell's British Quadrupeds," and concluded it must be an infant "little finner" or "Lesser Rorqual" (*Balenoptera rostrata*), an Arctic cetacean of migratory habits. I have taken means to preserve the skeleton for the National Museum in Dublin, according to the instructions sent me by the Director, to whom I wired immediately. This animal appears but rarely on the British coasts, and I have no recent record of its appearance. The above identification, most probably correct, must be taken as provisional until the specimen is in the hands of a specialist.

Carrablagh, Co. Donegal.

H. C. HART.

GEOLOGY.

The Geological Structure of the Kenmare District.

In the *Irish Naturalist* for September, 1898, there is the statement that the structure of this district "is similar to that of the whole of the South of Ireland, and presents little apparent complication." Now as far as my experience goes this is far from being the case. In the first place on the Bantry Bay side of the anticlinal the synclinal is occupied by Carboniferous slate, while in the Kenmare synclinal the representatives of the normal Lower Carboniferous rocks are Lower Limestone Shale and limestone. How is this sudden change to be accounted for? Secondly, at the south of the Kenmare basin there is a regular sequence—yellow sandstone, two lower limestone shale and three limestone; but on the north side of the basin there is Old Red Sandstone (Lower Devonian), lying on the Carboniferous limestone, as indicated in the horizontal section, p. 228, *Irish Naturalist*. The overlie, however, ought to be even more than represented in the section, as has been proved in the mines.

It is now known that the major portion of S.W. Cork and Kerry, south of the great fault from Dingle Bay to Dungarvan, has been more or less over-thrusted from the south south-eastward, placing the older rocks on the younger; indeed in places north of the great fault there has also been over-thrusting as in the Limerick and Cork coal-fields. But here at Kenmare it is the reverse; as the old rocks (Lower Devonian) are now upthrust on to the Carboniferous limestone.

Who will explain these two phenomena? The sudden change from Carboniferous slate to limestone, and the upthrust of the Old Red Sandstone on the northern margin of the Carboniferous limestone.

Fairview, Dublin.

G. H. KINAHAN.

THE NATURAL HISTORY OF IRISH BATS.

BY N. H. ALCOCK, M.D.

PREFACE.

AN attempt to give a connected account of the natural history of the bats of Ireland is fraught with many difficulties. Not only are the facts in the life-history of this most interesting group of mammals difficult to observe, but the observers have been few and far between; and so, although the accounts given by Kinahan (xi.) in 1859, and Jameson (x.) in 1897, contain many valuable and interesting facts, and the masterly "Catalogue of Chiroptera" by Dobson (iv.) in 1878 is a model of all that a systematic treatise ought to be, the sum total of our information in this branch of zoology is lamentably small and deficient. So much is this the case, that it is scarcely possible to make any broad general statements about the Irish bats with any degree of accuracy. Further, although there is a certain degree of probability that most of these various species do not differ widely in their structure and habits from each other, yet it is more philosophical to ascertain the facts about each separately, rather than infer, with more or less certainty, that what is true of one is true of all, which, unfortunately, is our only resource in many cases.

It is not practicable, therefore, to give a full and complete account of all the Irish species of bats at the present time. But as many interesting observations are scattered widely throughout various books and magazines on natural history, a collection of these will at least show what remains to be done, and may possibly stimulate our Irish naturalists to fill up the gaps in our present knowledge.

It has seemed desirable to write a short general introduction, in order to answer briefly the many questions that one is immediately asked about the structure, classification, and habits of these animals. But, for the reasons given above, many of the statements made, though probable enough, rest on somewhat slender foundation, and must be regarded rather as hints to the observer than as dogmatic statements of ascertained facts. The various beautifully mythical tales that

enrich the literature of the subject are omitted, as they are familiar to every one.

A list of references will be found at the end of each paper, to which the Roman numerals apply.

INTRODUCTION.

The Order of Chiroptera, belonging to the class Mammalia is divided into two sub-orders, Megachiroptera and Microchiroptera (Dobson iv.)

The Megachiroptera are tropical or sub-tropical Bats, exclusively confined to the eastern hemisphere, feeding on fruit, and with teeth and digestive system modified accordingly. As a rule they are of considerable size. As none of the Irish bats belong to this sub-order, this account will here suffice.

The Microchiroptera are usually much smaller, and generally insectivorous. Their teeth commonly have acutely pointed cusps, and their stomachs are simple or have a cardiac pouch. Special sense organs are found in many genera, with other modifications of the cutaneous system. Members of the sub-order are distributed throughout the world.

The seven species at present recognised as occurring in Ireland represent two families of the Microchiroptera, *Rhinolophidæ* and *Vespertilionidæ*. *Rhinolophus hipposideros*, Blasius, the Lesser Horseshoe Bat, is the only member of the former family, while the remaining genera *Plecotus*, *Vesperugo*, and *Vespertilio*¹, comprising the rest of the species, belong to the latter.

The anatomy of the bats presents many interesting features which can only be briefly touched on here. The most noticeable of these is the modification of the forelimbs to form wings. This is effected, not by any new structures being added, but by the alteration of those already present, and on examining the wing closely, the same bones may be identified that we are familiar with in ourselves. The *humerus*, though proportionately larger, does not differ much from the human type, but in the fore-arm we note that one bone, the *radius*, is very much elongated and strengthened, while the other, the *ulna*, is quite rudimentary. The wrist bones are few and short, and the metacarpal bones and those

¹ On the subject of nomenclature see Miller (xiv.), and Thomas (xvi.)

forming the fingers are enormously lengthened. The whole arm thus forms a light and strong frame-work over which the skin of the body is prolonged to form the wing-membrane.

On the trunk are found powerful muscles to work the wings, and within are the large lungs and heart, to furnish a sufficient supply of pure blood over this large area.

The hind limbs are comparatively small and weak, and the knee is directed backwards, the only instance of this position in the Mammalia. The tail is of considerable length, and included in the well-developed interfemoral membrane; the tip is often free, and used in climbing.

The digestive system follows the usual mammalian type, and the points to be here noted are few. The intestinal canal is short, as a rule, and the stomach capacious. There are well-marked intestinal villi. The liver is much divided into lobes; the microscopic structure of both it and the spleen presents nothing unusual.

The nervous system and the organs of special sense will be considered later, along with some interesting questions connected with them.

The habits of these seven species are not known with accuracy in all cases.

All, as a rule, sleep during the day and come out in the evening, the time of flight varying with the species and the time of sunset, possibly also with the weather and the place. Accurate figures have usually not been given; as a mean of a few observations made in September, 1898, at Bray, Co. Wicklow, it would seem that the Hairy-armed Bat appears about 26 minutes after sunset,¹ the Pipistrelle 33 minutes, and Daubenton's Bat 54 minutes, the time being that at which the first bat was seen in the open. T. A. Coward (iii.) gives 70 minutes after sunset for Daubenton's Bat in Cheshire, this being the time when the first bat flew along the water—not necessarily the time of flight, as he remarks. Borrer (ii.) states that at Ulleswater and Grasmere this species flies by night over the lakes, and by day in the boat-houses, so burning the candle at both ends!

¹ The local time of sunset must be taken in each case. See C.V. Boys C.T.C. Gazette, November, 1898, or Whitaker's Almanac, for the necessary calculations.

The Noctule, which is not usually considered to be an Irish species, has been observed by G. Dowker (v.) to leave its residence in the roof of his house between 8 and 8.30 p.m., and to return about 9, the time of flight being therefore scarcely an hour. This is evidently a more accurate method of observation than the foregoing.

J. E. Harting (ix.) states that he has seen Natterer's Bat hunting some time before sunset, and that it appears before the other local species. The Horseshoe Bats seem to fly much later, but here again no times are recorded—perhaps some of our friends who walk by the light of Freedom's Lamp in Co. Clare can assist us?

Prof. J. R. Kinahan (xi.) in 1853 made some interesting observations on Daubenton's Bat and the Pipistrelle. He watched them as they left their home, a hole in Tankards-town Bridge, on June 23, 24, 25, and 27. He says "the bats began scrambling and fighting among themselves audibly in the hole at about 8.30 p.m., they did not begin to fly till an hour later: between 9.30 and 10.30 we counted 41 bats coming out of the hole, but in spite of the number abroad the noise inside seemed just as great as ever. The following evening we counted 29 coming out of the hole, the weather was harsh and cloudy, and growing gradually more and more tempestuous, the bats began to retire to their den about 10 o'clock."

It is plain that these various observations are too few in number to warrant any general statement on the subject.

How long in these countries any of these bats remain on the wing is not very clear, though from the accounts just quoted certain inferences may be drawn. The point is well worth accurate investigation. The fruit-eating bats in hot climates often feed all night, and return home in the early dawn. All the Irish species, at any rate, would seem to retire long before this, as no one I have met will admit having seen any bats at this time. During my own observations, which were very few, the sight of an occasional belated Pipistrelle emphasized the absence of the other species.

All these bats are supposed to hibernate during the winter months, but the exact date for each species, at which this function begins or ends, is in most cases still to be determined.

As a rule, members of the genus *Vespertilio* are said to retire sooner and come out later than members of the genus *Vesperugo*.

Thus, the Pipistrelle (in England) comes out in March, and retires in November or December (Tomes, xvii.), the Whiskered Bat appears in April and retires about September or October.

The Noctule appears on March 12 (Tomes), May 1st (Borrer); it retires on September 18 (Tomes); September 18, in Cheshire, September 22, in Devonshire, October 1st, in Surrey (Coward).

The time is apparently not always the same in England and Ireland, for instance Mr. Coward has not observed Daubenton's Bat in Cheshire after August 17; in Co. Wicklow I have seen this species as late as September 26, and Mr. E. B. Knox has seen it in Co. Cavan on September 23rd.

Many researches have been made into the cause of hibernation, and though this is still a debated point much information has been gathered. Hibernation is found among isolated members of such different groups as Mammalia, Reptilia, Insecta, and Mollusca, Aves forming a remarkable exception.

When one of these animals, a bat for instance, intends to hibernate, the following phenomena are observed. The animal retires to a secluded spot, hangs itself up, and gradually becomes motionless. Its temperature falls to within a few degrees of the surrounding air, and its breathing becomes shallow and irregular—"Cheyne Stokes" in type. If accurate measurements are taken, it is noticed that much more oxygen is absorbed than is accounted for by the carbonic acid given out, so that the animal actually gains in weight. The heart beats more slowly and less forcibly, and the activity of the nervous system is much reduced.

On awakening from this condition in the spring, these phenomena are reversed. The animal's temperature rises, sometimes as much as 31° in 15 minutes. The muscles shudder convulsively, the heart beats more strongly, and the skin, before pale, assumes a rosy blush. Respiration becomes more rapid, and there is a great discharge of carbonic acid from the lungs.

The cause of hibernation has been said to be due to the cold, to a limited supply of air, to want of food, to an auto-narcosis with carbonic acid, or to changes in the processes of the cells of the brain ; the question is still undecided.

Some hibernating animals, such as the Squirrel, lay up a store of nuts and other edible substances for the winter, which they consume at intervals. Many bats, though they store their food internally, wake up occasionally and eat whatever is to be found. Kinahan noticed this in the case of the Lesser Horseshoe Bat ; I have seen it also in the Whiskered and Long-eared species ; these, however, were in captivity. The sexes would appear to hibernate apart.

A certain amount of evidence has been adduced to prove the migration of bats. Kinahan (xii.) showed in the case of the Lesser Horseshoe Bat that the caves in which it passed the winter were deserted in the summer, and Mr. G. Dowker (v.) observed that the Noctule which inhabited his roof during the winter flew elsewhere in the months of July and August.

Dr. C. H. Merriam (xiii.) claims migratory habits for *Atalapha cinerea* and *Vesperugo noctivagans*. Mr. R. M. Barrington (quoted by H. L. Jameson, x.) finds that some species—amongst them the Pipistrelle—occur at lightships on the Irish coast. Mr. S. Grieve (vii.) suggests that Daubenton's Bat is migratory in Scotland. Other more ancient authorities are quoted by Mr. J. E. Harting (viii.). While fully recognizing the value of the evidence thus brought forward—which indeed my own observations support, as far as they extend—more light on the subject is very necessary, and it would be interesting to learn how far a bat travels when it shifts its quarters, and where it goes to ; it might be that its habits were rather “nomadic” than migratory in the strict sense of the word.

The food of our native bats has been the subject of many curious fables, some of which have been collected by Mr. E. Newman in the *Field* for 1874. It would seem that all are insectivorous when in a wild state, apparently exclusively so. Various species of insects are laid under contribution, and bats have repeatedly been seen feeding on the wing, close to the observer. In some cases the actual species is recorded : thus the Noctule is said to specially prefer the little hairy

cockchafer, *Rhizophagus solstitialis* (Harting, viii.); the common chafer, *Melolontha vulgaris*, and the Watchman beetle, *Geotrupes stercorarius* (Patterson, xv.).

The Long-eared Bat has been observed to feed on species of *Teniocampa* (Harting, ix.); and wings of various moths, such as the Yellow Underwing *Triphana*, the Silver Y *Plusia gamma*, and the Buff Ermine, *Spilosoma lubricipeda* have been found under its haunts (Aplin, i.).

Mr. G. H. Carpenter, by adopting a different manœuvre, has ascertained accurately in at least one case the food of the Hairy-armed Bat. He examined the contents of the stomach of a specimen of this species, which was placed in spirit shortly after the animal was shot. He says in a letter, dated November 16, 1898, "All the insect fragments are undoubtedly referable to Diptera, and I have found a piece of wing, a foot, and an antenna, which I can refer with confidence to *Scatophaga stercoraria*, the yellow-haired fly which one commonly finds around heaps of dung." The importance of this method is evident, and Mr. Carpenter's further researches in this direction will be awaited with interest.

It seems probable that all the bats in the British Isles breed but once in the year, and have only one young one at a time, born some time in the summer. It would follow logically that the average life of an individual bat must be over two years, otherwise the race would become extinct. Dr. G. E. Dobson states that two young at a birth is the most that he has ever observed in any species of the Chiroptera.

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Merrion, Co. Dublin.

FIELD CLUB NEWS.

The above paper is the first of a series on the Natural History of Irish Bats, which Dr. Alcock hopes to contribute to our pages during the year. An illustrated article on the Whiskered Bat will appear next month.

The Limerick Field Club is to be heartily congratulated on the success which attended its annual meeting and conversazione on January 10. The proceedings were varied and interesting, and the report submitted by the Committee spoke well for the future prosperity of the Club. The attendance of members and friends was a thing to be envied by the Clubs of Dublin and Belfast at their Annual Meetings.

The mid-winter excursion of the Belfast Club, which is now becoming a recognised institution, took place, as usual, on Boxing Day. Our naturalists are too inclined to consider that excursions can be pleasant and interesting only in summer time. The experience of the Belfast members who have devoted the day succeeding Christmas for the last three years to a long day in the open, is certainly quite the reverse.

One of the last acts of the late Lavens M. Ewart, of Belfast, was to present the Editors of the *Irish Naturalist* with a set of photo-zinco blocks for the production of a stamped design for the covers of bound volumes of this Journal, similar to that which distinguishes the covers of our monthly numbers. Orders for binding according to this new design will be received by Messrs. Eason.

THE INTRODUCTION OF THE BLACK GROUSE AND OF SOME OTHER BIRDS INTO IRELAND.

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

IN a recent number of the *Irish Naturalist* (March, 1898, pp. 69 to 76), I published some remarks on the introduction of the Brown or English Hare into Ireland. It may now, perhaps, be of interest for purposes of comparison to collect and summarise some notes on the attempted introduction of black game and of other birds into the country. It will, however, be well to first briefly indicate the grounds on which are based the claims of this bird to be included in the fauna of Ireland.

The existence of black game as an indigenous species in Ireland at any time has always been regarded as "at least doubtful," the only evidence on the subject being that collected by Thompson.¹ This consists solely of the statement of Charles Smith² that "It is uncertain if we have not the *Urogallus minor*, Raii, viz., the heath-cock or grouse of Willoughby, which I take to be the black game of England": and a statement by the same author in another place³ that "this species is frequent and needs no particular description," is followed by a description of the bird and of its haunts, which would be decisive enough, had it not been borrowed from the work of Willoughby! Templeton informed Thompson that he had heard, on good authority, that "black game is mentioned in some of the old leases of the county of Down," while Pennant wrote in 1812⁴ that "some have been shot in Ireland, in the county of Sligo, where the breed was formerly introduced out of Scotland, but I believe is at present extirpated." Were the claim of the Black Grouse to inclusion in the list of birds which have formerly inhabited Ireland to rest solely on the above statements, it would have been indeed a shabby one, but the somewhat meagre evidence of its former existence in Ireland which I have quoted above

¹ Nat. Hist. of Ireland, vol. II., p. 34.

² "History of Waterford" (1745), p. 336.

³ "History of Cork" (1750), vol. II., p. 329.

⁴ "British Zoology," 4th ed. (1812), vol. I., p. 353.

gains undoubted weight from the discovery by Mr. R. Lydekker in the Dublin Museum of Science and Art of two bones which he identified as belonging to this species, and which were obtained from Ballynamindra cave in the county Waterford¹. These bones (through the kindness of Dr. R. F. Scharff), I have myself examined and carefully compared with recent specimens. (See p. 17 of this volume).

In view then of the above discovery, the statements as to the former occurrence of black game in Ireland undoubtedly gain a weight to which in themselves they were not entitled, and we can have no doubt as to the former occurrence of this bird in Ireland, together with other northern species, such as the Great Auk,² the Ptarmigan, and possibly the Eider Duck.

It is no modern ambition of sportsmen in Ireland to add the Black Grouse to the list of game-birds of the country, for so long ago as 1752³ Pocock, in describing his visit to the county Antrim, wrote that "They often go over (to Scotland) for game: where there is a great plenty of what is called the black grouse, which Lord Antrim has brought over more than once, but could never get them to breed, or keep them long, so that probably they returned back."³

Seventy years later we have the statement of Pennant, as quoted above, that "the breed was formerly introduced out of Scotland into the county of Sligo," but, as in the last case, without any permanent success.

Later attempts to introduce the species appear to have been equally unsuccessful, but the details of some of them have been recorded at some length by Thompson,⁴ and repeated in an article on "Sport in Ireland," contributed by Mr. J. E. Harting⁵ to the *Field* newspaper some twenty-three years ago. Thus we read that in 1829 four brace of black game were turned out by Lord O'Neill, at Claggan, Co. Antrim, but died off, and so far as could be ascertained without having bred, a fate which also befell a further clutch of nine brought over from Scotland in 1832. In 1839, Mr. M'Donnell, of Glenarm Park, in the same county, sent twice to Scotland for live black

¹ "British Fossil Birds," *Ibis*, 1891, p. 392.

² See "Catalogue of Fossil Mammals, Birds, Reptiles, and Amphibians in the Dublin Science and Art Museum," by R. Lydekker (1891).

³ "Pocock's Tour in Ireland in 1752," ed. G. T. Stokes, 1891, page 29.

⁴ *Natural History of Ireland*, vol. ii., pp. 35 to 37.

⁵ *Field*, March 13 1875, p. 258.

game, and turned out (in August, 1839) first nine young birds, which were never seen afterwards, and then (in November) six brace of full-grown birds, which eventually disappeared, although some of them kept about the neighbourhood for nearly a year.

The present Lord O'Neill knows nothing about this attempt to introduce black game at Claggan, and has been informed by Major McClintock (who, it is stated, "probably would know more about it than any one else now living") "that there never were any black game at Claggan, but that an attempt was once made to introduce them at Glenarm, which entirely failed." (In letters of June 2 and 7, 1898).

With regard to a later introduction at Glenarm, Lord Antrim has been good enough to inform me¹ that in the year 1880 he "turned out 19 half-grown black game in the Deerpark . . . from Douglas Castle, Lanarkshire, N.B." These birds were seen flying about in the following autumn, and a hen which was shot by mistake in a potato field in October, proved to be in excellent condition. Lord Antrim thinks that there "is no possible doubt that black game would do here very well, but it is impossible to preserve them, as they always come down to the fields at certain times of the year; the fields are so small that men with guns are able always to command any place where black game may be in a field from some part of the wall surrounding it." Lord Antrim believes that all the 19 black game which he turned down were thus destroyed, and he heard of one having been sold in Glenarm for sixpence!

Another northern and equally unsuccessful introduction took place, according to information given to Thompson (*op. cit.*, p. 37) by John Inglis, gamekeeper at Glenarm Park, at Tollymore Park, Co. Down, some time previously to 1841. "In April, 1846, there was still a fine gray hen there, but no male bird."

According to the same informant it was about the same time (*i.e.*, in the winter of 1839-40), that six brace of Black Grouse were brought from Douglas Castle, Scotland, to the estates of the Earl of Courtown, south of Dublin.

¹ *In lit.* of 6th June, 1898.

In 1875, Mr. Walter Raleigh Trevelyan, of the Junior Carlton Club, London,¹ wrote that some years previously black game had been "introduced into Co. Wicklow from Scotland, and that they crossed over the mountains intervening between Lord Powerscourt's and the Marquis of Downshire's estates, and settled in the large plantation of firs, which runs along the road from Sally Gap to Kilbride. They there seem to have made themselves at home, although there is no birch in the coverts, and to have subsisted on the heath, berries, &c., which abound there." Mr. Trevelyan also stated that two very fine specimens of black game obtained in that locality were in the possession of Mr. Owen, of Blessington, who believed "that if the birds had been let alone, and not shot, they would have flourished and increased now as they did at the time of which I am now writing."

In a letter, dated June 9, 1898, Mr. W. R. Trevelyan was good enough to confirm the above statements, and to add that the introduction in question, which he characterises as successful, took place on the shootings of the Marquis of Downshire on the Wicklow Hills at Ballylaw, near Blessington. The chicks were brought out under Dorking hens, and successfully reared, but were all shot "by accident," either by searchers after "queer specimens of the grouse tribe," or by poachers when straying on to adjoining estates.

Mr. A. L. Owen has also been good enough to inform me that the two Wicklow-shot specimens alluded to as having been in his possession were finally destroyed by moths. He adds, that before the Black Grouse were exterminated in the country, a few of them had "nested and produced and hatched eggs."

Yet another attempt to introduce the Black Grouse into the Co. Wicklow, was that of Lord Powerscourt, who informs me,² that about the year 1868 or 1869 he obtained the permission of the Duke of Roxburghe to send his gamekeeper, Mr. James Anton (still gamekeeper at Powerscourt), to Floor's Castle, Roxburghshire, with the object of bringing over some eggs of the black game to Ireland. Although twenty-five eggs were brought over, only six hatched out, and four of these

¹ *The Field*, of Feb. 6, 1875, p. 125, quoted without acknowledgment in the *Irish Field* of Feb. 1, 1896, at p. 211.

² *In lit.* of June 2, 1898.

were cocks. The six birds were turned out in the Deer Park at Powerscourt, and Lord Powerscourt writes that he remembers that "they were often seen flying over the hills for a few years after, but there being so many cocks, they did not increase, and I am afraid they must have been shot."

Again, in 1875, Mr. W. B. Tegetmeier¹ stated, that, having in the early spring of 1875 been consulted by a correspondent of the *Field* newspaper as to the best possible means of introducing black game into the South-west of Ireland, he recommended the importation of fresh eggs from Scotland, and the hatching of them in the nests of common wild Pheasants. Accordingly, several settings of eggs were obtained from Scotland, one of which was placed under a hen Pheasant, then at liberty, although she had been reared in confinement. These eggs were hatched, and the young, to the number of seven, successfully reared. They thrived and grew to their full size. "The seven kept together, and were daily observed for a great part of the winter. Suddenly the whole escaped observation," and were found to have left the pheasant coverts where they were reared, and to have betaken themselves to the top of one of the heather-covered Limerick hills, where a cock and two hens were repeatedly observed up to April, 1876.

I am indebted to Mr. J. E. Harting for the information that attempted introductions of black game at Markree Castle, in the Co. Sligo, have likewise been a failure, in regard to which Colonel Cooper² has been good enough to inform me that more than thirty years ago he "turned down a considerable number of black game for two, if not three years in succession, but they all disappeared the following spring. A good many years afterwards, Colonel Cooper imported a good many black game from Norway" (the birds previously imported had come from Scotland); some of these Norwegian birds remained about Markree Castle for several years, but they were never known to have bred, and they eventually died out.

Lastly, I was informed by Mr. Irvine, that the late Duke of Abercorn introduced this species into the heathy mountains of mid-Tyrone, but in a few years after wandering into the neighbouring heaths it became extinct—a statement which is confirmed by Mr. J. M. Farlane, agent to the Duke of Abercorn.

¹ *Field*, of August 7, 1875, p. 158; and April 22, 1876, p. 464.

² *In lit.* of 19th Sept., 1898.

Thus, as in the case of the English Hare, I have been able to give notes of a series of attempts to introduce the black game, which took place in widely separated parts of Ireland, which met with similarly varied success, but which, unlike the case of the hare, have in no case had any lasting effect. As in the case of the hare, no unimportant factor in the extermination of the introduced eggs or birds has probably been want of care in conveying the former from Scotland, and the evil influence of poachers on the birds, even when safely reared. And it is well to note that there are no cases in which the birds, after having first obtained a secure footing amidst their new surroundings, become extinct, in which their extinction is not directly attributed to the hostile hand of man, to which their own wandering habits rendered them peculiarly vulnerable. I then fail to see why the black game should not thrive in Ireland, provided its introduction be carefully carried out and the birds properly protected in their new homes.

In connection with this subject I have brought together a few records of the introduction of other species into Ireland. These may be useful for comparison with the notes on the hare and black game, but must not be regarded (nor are they intended to be) in any sense complete.

Of game birds the Red-legged Partridge has probably been introduced as in England on many occasions, but I am not aware that any such introductions have been successful, nor have I been able to add to the matter published by Thompson (*op. cit.*, vol. ii., pp. 65 & 66), except that¹ Professor A. Newton informs me that he thinks he remembers the sending of eggs of the Red-legged Partridge from Suffolk to Ireland (? Dartrey, Co. Monaghan), but he never heard whether the result was successful or not.

Mr. H. C. Hart² has recorded an unsuccessful attempt to introduce the Ptarmigan (*Lagopus mutus*) into Co. Donegal. Mr. John Olphert³ has turned down Scotch Grouse (*L. scoticus*) near Letterkenny in the same county about the year 1889 "with very good results," but the attempted establishment of Partridges in the same locality has been a failure, as has also

¹ *In lit.* of 20th March, 1898.

² *Zoologist*, 1891, p. 379.

³ *In lit.* of 5th Nov., 1895.

been the case in my own county Wexford. Finally, attempts to reintroduce the Capercaillie in Lord Bantry's woods at Glengariffe,¹ and in those of Colonel Cooper at Markree Castle have met with no success,² and in the latter locality the introduction of seven or eight brace of Heather Grouse in the severe winter of 1879-80 was equally unsuccessful.

Colonel Cooper³ has indeed met with an extraordinary run of ill-luck in his attempted introductions of numerous species at Markree Castle, such as Hawfinches, Nuthatches, and Reeve's Pheasants. In the case of Crossbills, of which he also turned down a good many, it is possible that he has met with more success, they having "increased considerably," but it is not unlikely that this increase may have been unconnected with the introduced birds, since Crossbills have of late years become more numerous all over Ireland.

Lastly, I am informed by Lord Powerscourt that a few Nightingales were turned out by him a few years ago in his woods at Powerscourt, but none have been seen there since.

Kilmanock, Co. Wexford.

OBITUARY.

L. M. EWART, J.P., M.R.I.A.

Lavens M. Ewart died on December 13th, aged 53 years, and by his decease Belfast lost one of its most familiar figures. Apart from the great linen business with which the name of Ewart is associated, and the prominent part which the deceased gentleman took in municipal affairs, he was best known as an antiquary and collector, particularly in the domain of local maps and books, of which he got together an almost unique collection. Mr. Ewart was Vice-President of the Belfast Naturalists' Field Club in 1894 and 1895, and President during the years 1896 and 1897. He was a member of the Royal Irish Academy and Fellow of the Royal Society of Antiquaries, and was one of those to whom the re-starting of the *Ulster Journal of Archaeology* is due.

¹ Yarrell's "British Birds," ed. IV., vol. III., p. 51.

² Thompson, *op. cit.*, vol. II., p. 32.

³ Letter of 19th Sept., 1898, wherein Colonel Cooper informs me that in addition to the birds, he has on several occasions turned down a good many Minnows and Gudgeons, and that both these fish are now to be found in the rivers of his neighbourhood.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a number of Rudd from Mr. F. Godden, a Great Northern Diver from Mr. R. Warren, a Pheasant from Dr. A. Traill, and a Royal Python from Captain J. R. D. Robertson. Two Seals have been acquired by purchase.

4,447 persons visited the Gardens during December.

DUBLIN MICROSCOPICAL CLUB.

DECEMBER 15.—The Club met at Leinster House.

Mr. H. H. DIXON showed intracellular rhizoids of *Marchantia polymorpha*. Transverse sections of the thallus of this liverwort show intracellular rhizoids similar to those found by the exhibitor in *Lunularia cruciata*. These are formed by the ingrowth of the cells surrounding the base of the original rhizoids into the lumen of the latter. The ingrowing cells take on the form of rhizoids and are long and tubular. They may begin their development while the original rhizoids still possess protoplasmic contents. As many as four intracellular rhizoids have been found contained in one original rhizoid. When the latter is furnished with tuberculate thickenings on the cell wall the ingrowing intracellular rhizoid accommodates itself to the sinuous lumen and assumes a peculiarly irregular contour.

Mr. Dixon also showed preparations exhibiting the tetrad development of æcidiospores. Sections passing through the æcidium of *Puccinia poarum* and stained with Delafield's hæmatoxylin exhibit, on the lower side of each æcidiospore and in contact with it, a small lenticular cell containing two nuclei. This cell apparently corresponds with the "intermediate" cell in *Chrysoomyxa rhododendri* described by De Bary. Often in *Puccinia* it is divided into two wedge-shaped cells, each with one nucleus. The mother-cell of the æcidiospore is formed by the cutting off of the terminal portion of the supporting hypha. It contains two nuclei lying side by side. These nuclei soon divide and give rise to four nuclei in the cell. The poles of this division usually lie in an oblique plane in the cell. The two lower nuclei are cut off in a small lenticular portion of the cell, and often another cell-division occurs which then confines each of these latter nuclei in a single minute cell. These nuclei as the cells are shoved up in the spore-filament soon lose their staining properties, and the cells containing them, and they themselves disappear. The two upper nuclei are enclosed in the spore. They increase rapidly in size. Somewhat above the level in the spore-filament of disappearance of the two smaller nuclei, the spore-nuclei unite.

This tetrad development of the æcidiospores, connected as it probably is with a reduction in the number of chromosomes of the nuclei, and the subsequent fusion of the spore-nuclei, seems to be of great interest.

Mr. M'ARDLE exhibited *Blasia pusilla*, L., which was collected last November in the Mourne Mountains, Co. Down, by the Rev. H. W. Lett, M.A. The specimens shown bore young fruit, and the curious flask-

shaped receptacles which contain the gemmæ, some of which were forced with the mucus in which they float, through the tube of the "flask," and on each of them a well-marked root-hair was developed. Under favourable circumstances they are capable of producing perfect plants. This is one of the most remarkable instances of a sexual reproduction known among this curious family of plants.

Mr. GREENWOOD PIM exhibited *Cercospora vescale* (Fckl.), a fungus which attacks Mignonette, and sometimes causes great injury to it. The mycelium ramifies through the leaf and produces outside numbers of large cylindrical, many-septate conidia, exceedingly like those of some species of *Helminthosporium*, but *Helminthosporia* are usually saprophytic on decaying wood, leaves, &c., while *Cercospora* is a true parasite, attacking and destroying the living leaves.

Dr. N. H. ALCOCK exhibited the retina of the bat *Vesperugo pipistrellus*, Schreb., showing details in the structure of the rods and rod nuclei, with the absence of cones from the portion exhibited.

Dr. Alcock showed also a section through the cardiac glands of the Dog's stomach, stained by Heidenbain's method, showing portions of the ducts of the parietal cells.

Mr. MOORE showed *Xyleborus morigerus*, an insect which has been known in gardens in Britain for about seven years. It is known to gardeners as the "Dendrobe Beetle," and is most destructive to orchids. It is a very minute beetle and attacks orchids by burrowing into the stem to lay its eggs. The larvæ feed on the inside of the pseudo-bulbs, leaving only the hard outer cortex, and so kill the shoot. It has been found in orchids coming from East Indies, South America, and the Papuan regions. Being very minute it easily escapes detection, and increases very rapidly.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

JANUARY 10.—A meeting was held in the Museum, when a paper was read by Mr. JOHN BROWN: subject—The viagraph, a new instrument for testing road surfaces. The paper was illustrated by diagrams, and by an exhibition of the viagraph. A discussion followed.

BELFAST NATURALISTS' FIELD CLUB.

DECEMBER 20.—The second meeting of the winter session was held, when three papers were read. Mr. W. GRAY, M.R.I.A., occupied the chair. Before proceeding to the business of the evening, reference was made to the loss the Club had sustained in the death of Mr. Lavens Ewart, the late President. Several members spoke, and it was resolved to send a letter of sympathy to Mr. Ewart's family, expressing the esteem in which Mr. Ewart was held, and deeply regretting his loss. Mr. JAMES St. J. PHILLIPS (Hon. Sec.) then read some notes on the geological features of Kerry, as observed on the Irish Field Club Union's excursion. The coastline of Kerry, deeply indented by long inlets, was compared with the comparatively unbroken lines of the Antrim and Down coasts. Reference was made to the geological formations represented in a section between Bantry Bay, Kenmare, and Killarney, and

the physical geology of these traced. After the Old Red Sandstone and Carboniferous limestone had been laid down and consolidated, a series of strains in the crust of the earth passed over the South of Ireland and certain parts of the Continent. These strains left their evidences in the immense number of folds that are now found in the rocks. The two great folds between Kenmare and Glengariff on the one side, and Kenmare and Killarney on the other, were described. Detailed reference was made to the igneous rocks of the district near Killarney, and their nature, age, and occurrence explained and contrasted with the igneous rocks of Antrim. The district is of interest to the glaciologist, as many of the roadside features and much of the scenery are due to glacial action. Characteristic lantern slides were used to illustrate these.

In some Notes on the fauna of Co. Kerry, Mr. R. WELCH confined himself to those species collected during the Kenmare excursion, of rather special interest from the limited range in Ireland, or from the fact that they are found nowhere else in the British Isles but in Co. Kerry or the south-west corner of Co. Cork. Among these were—*Limnaea involuta*, Thomp., a little fresh-water shell, only found in one little mountain tarn on Cromaglan Mountain; *Succinea oblonga*, one of the species of amber shells, and an excessively rare species in Britain, of which nineteen living specimens were found by the excursion party last July; *Geomalacus maculosus*, the spotted slug of Kerry, first found there in 1842, but now known to occur also in Co. Cork and in Portugal. Slides of these and several insects were shown, including the great wolf spider (*Dolomedes fimbriatus*), the wolf spider (*Pisaura mirabilis*), making a nest for its young; the wood ant (*Formica rufa*), and its nest of pine needles and bits of grass; with the holly-boring weevil, *Rhopalomesites Tardyi*, *Pyropterus affinis*, and some other species. In some cases specimens of the insects were shown instead of slides, specimens of the more interesting shells collected were also exhibited. The next paper was read by Mr. F. J. BIGGER, M.R.I.A., dealing with the antiquities of Kerry generally, more especially the ancient church of the O'Sullivans and Killmakilloge and the O'Shea church at Feaghna. The patron held at the holy lake at the former place was graphically described, and a full history of it given. The stations and remarkable bullan stone at Feaghna were also the subject of illustration. The other places noted were Ardea castle, Ardferf abbey, Gallerus celtic church, Kilmalkedar abbey and church, and Aghadoc abbey and round tower. The different places mentioned were illustrated and explained by a series of beautiful slides taken on the Club excursion by Dr. Fogerty, of Limerick, and Messrs. Fennell, Phillips, and Welch, of Belfast.

BOTANICAL SECTION, DECEMBER 17.—A large number of members were present, and the study of British Grasses was continued. Mr. Waddell recommended Hutchinson's Hand-book as the best cheap introduction to this group. Specimens of *Hordcum sylvaticum* and *Poa nemoralis* collected in the district were exhibited by members, and a number of rare grasses were presented to the Club Herbarium.

DUBLIN NATURALISTS' FIELD CLUB.

DECEMBER 13.—The President, R. L. PRAEGER, B.A., B.E., in the chair. Eighty-nine members and friends were present. Dr. A. H. FOORD, F.G.S., read a paper on Irish fossil shells and their modern representatives, which will be published in our next issue. The author described a series of slides, some of which had been kindly lent to him by Prof. Grenville Cole, of the Royal College of Science. These consisted of characteristic fossils of the Carboniferous Limestone of Ireland, and Cephalopods of the existing seas. They included also reproductions of some of the beautiful pictures illustrating the admirable memoir on the embryonic shells of the fossil Brachiopoda, by Mr. C. E. Beecher, of Albany, in the State of New York.

Dr. C. J. PATTEN gave an account of habits of our common sea-gulls, with special reference to their variation of plumage according to age and season. Gulls were described as being widely distributed, but little affected by weather and able to fly straight into the very teeth of the storm. They are extremely uniform in structure, and admirably adapted for the capricious weather to which they are subjected. In this respect they differ from such sea-birds as Cormorants and divers, which are obliged to take refuge from high seas and furious gales. They will eat anything and deserve their name of "sea scavengers." The Common Gull is a breeder in Ireland only in small colonies of a few pairs. The nestlings are first covered with down and may not assume perfect adult plumage for some years. Dr. Patten then described the variations of plumage, and the habits of the different kinds of gulls. The lecture was illustrated by numerous lantern-slides and mounted specimens. The Vice-President, Mr. J. E. PALMER, and Dr. N. H. ALCOCK spoke on the paper, and congratulated Dr. Patten on his interesting communication. The following exhibits were shown:—Miss L. SHACKLETON, Spanish Chestnut in fruit; Miss R. HENSMAN peculiar marked birch bark; Dr. JOHNSON, Hon. Sec., a collection of fungi presented to the Science and Art Museum, by Dr. C. B. Plowright. The following were elected members:—R. Bryers, Mrs. James Crawford, Mrs. Robert Crawford, H. Bantry White, M.A., M.E. Five nominations for membership were made. The Officers and Committee for 1899 were nominated. Mr. H. K. G. Cuthbert (Hon. Treas.) gave notice of the following proposal, Rule V:—

"That the annual subscription be five shillings with an Entrance Fee of five shillings; all subscriptions shall be payable in advance, shall become due on the 1st of January, and must be paid within three months of that date, failing which the member's name shall be removed from the list. Provided always that it shall be open to the Committee to reinstate any member (upon payment) whose subscription shall be overdue for unavoidable reasons; and provided that members proposed at or after the October meeting in each year shall not be liable for the subscription of that year. Members who have formally resigned, should their subscription be not in arrear at the date of resignation, may be re-elected without payment of a second Entrance Fee."

LIMERICK FIELD CLUB.

ANNUAL MEETING.—JANUARY 10.—The sixth Annual Meeting and Conversazione was held in the Athenæum. There was a large attendance of members and their friends during the evening. Dr. W. A. Fogerty, M.A., M.D., President of the Club, occupied the chair.

A selection of lantern slides executed by the Rev. T. F. Abbott, B.D.; Mr. F. Angley, Mr. B. Barrington, Rev. H. T. Benson, M.A.; Miss Ebrill, Miss Evans, Dr. G. F. Fogerty, R.N.; Mr. Jackson Harris, Mr. R. Welch (Belfast Field Club), were shown. Around the walls were arranged a large number of photographs, chiefly of local places, and also preserved specimens of local plants. Mr. Windle exhibited cases containing geological specimens. Mr. G. Scott's case of historic medals and antique silver objects was much admired. Mr. Neale contributed butterflies and moths. Mr. Charles Jefcoat exhibited physical and chemical apparatus, including the spectroscope and revolving vacuum tubes. The phonograph, lent by Mr. A. W. Shaw, and under the direction of Mr. J. G. Robinson, was kept in constant requisition. On the table in front of the platform was a collection of photographic apparatus of the newest description. An electric motor and a gas engine were also to be seen working during the evening.

The President (Dr. W. A. FOGERTY), in opening the proceedings, welcomed those present to the exhibition, which he said showed a marked advance on the exhibition of last year. In the report of the past year they would see what the Committee had done. It was a great privilege for them to have such a Club, and a great privilege to have such a place to come to week after week. Though they had such a privilege the members did not sufficiently recognise it. They had arranged for regular meetings for the entire winter season, and the Committee had arranged a programme which would be of interest to the members. They had difficulty in getting local people to come forward to help them in their endeavours. The Club had now a membership of about 300, and the Committee should have less difficulties in their way in future.

Mr. NEALE read the Annual Report of the Committee, of which the following is an abstract:—It is again the pleasant duty of your Committee to report that the Club continues to be in a flourishing condition, as far at least as membership is concerned; also that the interest in its meetings and excursions has very decidedly increased during the year. The scarcity of working members continues to be a matter for regret. Botanical and entomological research continue to occupy the positions held by these subjects six years ago. Many additional specimens have been placed in the Club herbarium during the year, in addition to which a private collection has been made, chiefly representing some of the more peculiar forms occurring in County Kerry, where several members spent some time during the past summer. To the fauna of the district has been added a rather remarkable beetle—*Silpha quadripunctata*—two

examples of which fell into the hands of one of the Club members on Whit Monday, 30th May, in Cratloe Wood. The Irish Burnet Moth (*Zygena pilosella*), was taken in abundance beside Killone Lake, County Clare, on June 23 last, which date an excursion took place to New Hall and Killone Abbey. The Photographic section of the Club have done good work during the year, as will be shown here this evening in the lantern and on the walls. It has, however, undertaken one most useful piece of organised work—viz., to illustrate two lectures by Rev. James Dowd, B.A., on 'Historic Limerick,' for one of which, already delivered—on 'St. Mary's Cathedral'—about 70 lantern slides have been specially made, adding much to the interest of the subject handled. During the year archæology has continued to provide interesting papers for the winter meetings. Much useful work should be done by the Club in encouraging the study of history and archæology, and it is particularly desirable that members should note any items of local tradition, folk-lore, &c., which may come to their knowledge, with a view to having them recorded in the Club journal, and to save them from complete oblivion. The Committee have to express regret for the loss of the services of Mr. J. Grene Barry, J.P., during the greater portion of the year as Hon. Sec. of the section. It affords your Committee much pleasure to report the successful delivery of a course of geological lectures during November and December last by Mr. J. Fitzgerald Windle, Assoc. M. Inst. C.E., a Vice-President of the Club. About forty members entered for the course, the attendance throughout being very good, averaging well over thirty. The thanks of the Club are due to Professor G. A. J. Cole, of Dublin, and to Mr. R. Welch of Belfast, for their kind interest in the Club as a whole, and for their assistance in giving and lending lantern-slides specially intended to illustrate these geological lectures. During the summer, excursions took place as follows:—Thursday, May 5, Quin Abbey; Thursday, May 19, Sixmilebridge; Thursday, June 9, Caheroon, Kildysart; Thursday, June 23, New Hall, Ennis; Wednesday, July 6, Foynes; Thursday, July 21, Curragh Chase; Thursday, July 7 to Wednesday, July 13, Kenmare and district, County Kerry, under the auspices of the Irish Field Club Union. It is a matter for some congratulation that the programme of meetings (14 in all) for winter session of 1897-98, was carried out in full, and that of the eight excursions arranged for the summer of 1898, only one failed—to Killaloe on Easter Monday, the day being extremely inclement. Financially, the Club is in a fair way, as may be gathered from the statement prepared by your very excellent Hon. Treasurer. The Committee are, however, practically unanimous in opinion that the best interests of the Club will be served by increasing the annual subscription from 2s. 6d. to 5s. The membership of the Club was given as 214 on the 30th September, 1897, and as 240 on 31st December, 1897. It now stands at 276. The rules of the Club have not been issued for some years, and as slight revisions appear desirable a new draft will be submitted for adoption by this meeting.

On the proposition of Mr. Neale, seconded by Dr. Frost, the report was adopted.

The Mayor presided at the election of officers and committee, who were unanimously elected as follows:—President, W. A. Fogerty, M.A., M.D.; Vice-Presidents, Miss Ebrill, J. F. G. Windle, C.S.; Hon. Sec., Mr. Francis Neale; Committee, Miss Alice Doyle, Mrs. Robert Gibson, Mr. B. Barrington, Rev. W. E. Bentley, M.A.; Mr. W. Ebrill, Rev. Timothy Lee, Adm; Mr. R. D. O'Brien, Hon. Sec. Photographic section, Dr. George J. Fogerty; Hon. Sec. Archæological section, Mr. P. P. Lynch, M.R.I.A.

A vote of thanks to the officers for the preceding year was unanimously passed on the proposition of Mr. P. J. Lynch, seconded by Mr. W. De Courcey.

N O T E S .

BOTANY.

“Notes on *Cybele Hibernica*.”—A Correction.

As a certain passage in Mr. Praeger's “Notes on *Cybele Hibernica*” published in last month's *Irish Naturalist* appears to us to be likely to lead to misapprehension, we have asked the editors to give us space here for a few words of correction. The passage in question occurs on p. 7, where a lengthy list of district-records additional to those brought together in the 2nd edition of *Cybele* is prefaced by these words:—“Let me at once say that all the material which I have was freely placed at the disposal of the editors, and that much of it was used in that work.” We think that the only conclusion to be drawn from these words is this, that having had in our possession all the material from which these additional records are drawn, we capriciously declined to make use of a large portion of it. The fact is that we were quite ignorant of the existence of these additional records. Mr. Praeger informed us, indeed, that he had in his hands a large mass of botanical matter collected with a view to the preparation of a Topographical Botany of Ireland, and likely to contain some items of interest for the 2nd edition of *Cybele*; but that this material, which we were free to make use of, was in such a form that it could not be readily consulted. The only part of the material, which at any time came into our possession, was that extracted for us by Mr. Praeger himself, which, we need hardly say, we gladly made use of.

NATHANIEL COLGAN.

REGINALD W. SCULLY.

Dublin.

I gladly do my share in securing immediate publication for the above, though I do not apprehend that any one will place that uncomplimentary construction on the passage quoted which the writers fear. It was not possible for the editors of *Cybele* to know what particular records lay in my hands, nor could I tell of what particular notes they stood in need. I wrote this last sentence in my paper in last month's *Irish Naturalist* immediately after the words they take exception to, but cut it out as superfluous. So far as lay in my power, I gave the editors

all the information they asked for, or hinted might be useful; and I intimated more than once that more remained behind, in case I could be of any further assistance. Had they desired it, the whole of the material would have been placed in their hands. The sentence which they quote was penned merely with the object of showing that inter-communication existed between us, as I thought that possibly the appearance of so long a list of additional district-records might suggest that the material had been withheld from those engaged on the new *Cybele*. An accusation of caprice in the case of the preparation of that work would be absurd.

R. I. LOYD PRAEGER.

ALGÆ.

Chætomorpha crassa at Achill.

While collecting algæ at Achill Island in April, 1898, I found growing in some abundance the rare alga, *Chætomorpha crassa*, Kütz., which was kindly identified for me by Mr. E. M. Holmes. The only locality hitherto known for this plant is North Wall, Dublin. That it should flourish there, and on the west coast of Ireland, and nowhere else in the British Isles, shows how complex are the conditions determining the distribution of seaweeds.

HENRY HANNA.

Dublin.

PHANEROGAMS.

Carex punctata, Gaud., in East Cork.

On September 1st, 1898, I discovered a luxuriant patch of this very rare and interesting sedge by the side of a field overlooking the sea between Power Head and Ballycottin. This record extends the known range of the plant in Ireland eastward by about fifteen miles, and brings it into District II. of *Cybele Hibernica*.

R. A. PHILLIPS.

Cork.

Myosotis collina, Hoffm., in Co. Waterford.

This plant, which seems to be sparingly distributed in Ireland, occurs plentifully on the sandhills at Tramore, where I found it last summer, thus adding another species to the flora of District II.

R. A. PHILLIPS.

Cork.

Melilotus parviflora in Co. Antrim.

An alien, first noticed in Ireland in 1887, in Co. Down (Præger), there are in all four localities for this plant recorded in the new *Cybele Hibernica*. To these may now be added another, namely, Grove Green, Lisburn, Co. Antrim, where it occurs in ground now waste, and where, in December (1898) it was still in flower.

J. II. DAVIES.

Lisburn.

ZOOLOGY.

ARTHROPODS.

Notes of recent Captures.

I hear that *Sphinx convolvuli* has been commonly seen at Valentia Island, Co. Kerry, where members of the Rev. H. Delap's family have captured four specimens at the flowers of *Oenothera*.

The Water-spider (*Argyroneta aquatica*) has occurred in my lake at Drumreask. I have also to record the capture in Lough Gill, Sligo, of *Leptodora hyalina*, Lillieg.; this species has been found by Dr. Creighton in Upper Lough Erne, and near Galway.

Drumreask, Monaghan.

W. F. DE V. KANE.

BIRDS.

The Rufous Warbler, a bird new to Ireland.

I am happy to announce that the Rufous Warbler, *Aedon galactodes*, has been added to the Irish list. The specimen has been the supposed Nightingale, preserved for twenty years in the Museum of Queen's College, Cork, and now faded. It was shot by Mr. F. R. Rohu, at the Old Head of Kinsale, in September, 1876, and subsequently presented by him to the above Museum. Struck by the pallour of its colouring, and knowing so many rarities to have occurred at light-stations round Ireland, I suggested to Professor Hartog to take it to London for determination, and on his doing so Mr. Howard Saunders immediately pronounced it to be a Rufous Warbler. This species has now been obtained in the British Islands on four occasions. One on the 16th September, 1854, near Brighton; a second on 25th September, 1859, at the Start in Devonshire, is now in the British Museum. The Kinsale specimen was the third, and the fourth was obtained the following month on 12th October, 1876, at Slapton, in Devonshire. This last was probably driven to the British shores by the same wind or other circumstances to which we owe the Cork specimen. Mr. Saunders is to be congratulated on having within a few weeks determined two birds new to Ireland, the Woodchat Shrike, *Lanius pomeranus* (Barrington in *Ibis*, 1899, p. 158), and now *Aedon galactodes*.

Cappagh, Co. Waterford.

R. J. USSHER.

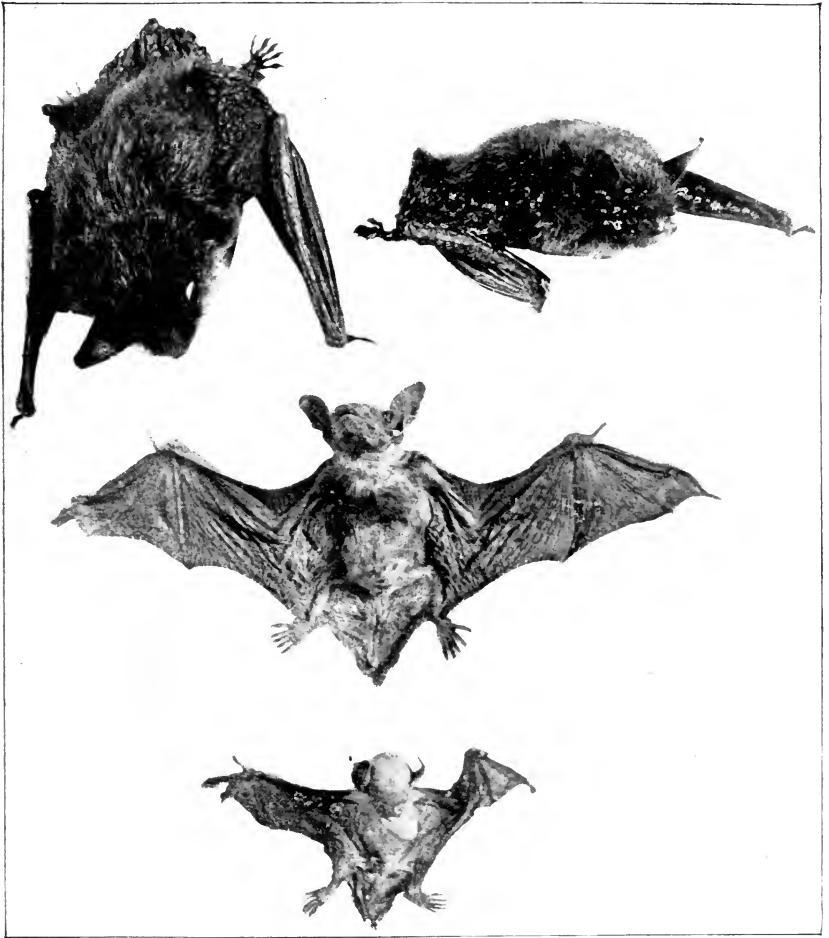
MAMMALS.

The Long-Eared Bat in Co. Waterford.

A fine specimen of this bat (*Plecotus auritus*, Geoff.) was sent to me by Mrs. E. A. Gibbon, on November 6th. It arrived quite uninjured, having evidently hibernated during its journey—a method of travelling much to be envied! Although this species is widely distributed throughout Ireland, it has not been previously recorded from Co. Waterford. Its habits in captivity have been often noted.

Dublin,

N. H. ALCOCK.



THE WHISKERED BAT (*Vespertilio Mystacinus*, Leisler).

1 & 2. Adult. 3. Young. 4. Very young.

THE NATURAL HISTORY OF IRISH BATS.

BY N. H. ALCOCK, M.D.

THE WHISKERED BAT,

Vespertilio (Myotis) mystacinus, Leisler.

[Plates 3 and 4.]

UP to the present time this little bat has been found in only four counties in Ireland, so that it may rank as the most uncommon of our native species. Belonging to the genus *Vespertilio*, it presents the characteristics of the group, the most easily recognisable of which are the narrow muzzle and the absence (fig. 1) of the post-calcaneal lobule (fig. 2, 2), on the tail-membrane. Two other bats of this genus occur with us, *Vespertilio Nattereri* (Kuhl.), Natterer's Bat, and *Vespertilio Daubentonii* (Leisler), Daubenton's Bat.



FIG. 1.
FOOT OF THE WHISKERED
BAT. 1.—Calcaneum.

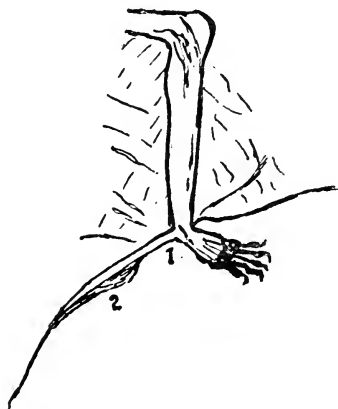


FIG. 2.
FOOT OF THE HAIRY-ARMED BAT.
1.—Calcaneum. 2.—Post-calcaneal lobule.

From the first, which it much resembles, it may be distinguished as lacking the fringe of stiff hairs along the side of the tail, so characteristic of Natterer's Bat, and from the second by the smaller size of the present species, its comparatively smaller feet, the wings arising from the base of the toes, and by the inner margin of the ear-conch (fig. 3), which is at first convex, and then straight, while in Daubenton's Bat this margin is convex throughout (fig. 4.)

This is not at all as easy to observe in the living animal as might be supposed, and the "whiskers," the fringe of stiff hairs around the muzzle, from which the specific name is derived, are even more difficult to see, though obvious in the dead specimen.



FIG. 3.

EAR OF WHISKERED BAT.

- 1.—Inner margin of conch.
2.—Tragus.



FIG. 4.

EAR OF DAUBENTON'S BAT.

- 1.—Inner margin of conch.
2.—Tragus.

The colour of the fur, though more variable than the other characteristics, is still a useful guide. The three species of *Vespertilio* agree in having fur of a rich dark brown above with light tips below, all appearing, therefore, when on the wing, to sport a "white waistcoat," Natterer's Bat having the lightest colour of the three.

The Pipistrelle and the Hairy-armed Bat, both belonging to the genus *Vesperugo*, have fur of a more or less dark brown colour both above and below, while the Lesser Horseshoe Bat, with its brownish-buff coat, is unmistakable.

The Long-eared Bat has the longest fur of all, lighter below than above, but the enormous ears of this species render it the most easily recognized of all our bats.

This outline sketch will serve to distinguish the Whiskered Bat from the other Irish species in the field, but a much more elaborate scheme is required if scientific accuracy is aimed at; this will be found in Dobson's Catalogue, pp. 284-289, and 314, 315.

The size of this bat is typically as follows:—

Length, Head and Body.	Tail.	Head.	Ear.	Tragus.	Forearm.	Thumb.
1"5	1"4	0"55	0"55	0'3	1"25	0"25
	3rd Finger. 2"1	5th Finger. 1"6		Tibia. 0'55		Foot. 0"28

The two upper photographs in Plate 3, were taken from the Co. Dublin specimen referred to later on, and show the attitude assumed when walking. They were taken shortly after its untimely death, the photographs taken during life being unfortunately much less successful.

As might be anticipated, the Irish observations on the habits of the Whiskered Bat are of the most meagre description. In some parts of England, however, this bat is much more frequently met with, and from the admirable accounts of Tomes (xvii.), Harting (ix.), and the able paper of Coward and Oldham (iii.), on the Mammals of Cheshire, many interesting facts may be learned.

In the daytime the Whiskered Bat lives in caverns, old quarries, roofs of houses, cracks in walls, and many places of this kind, apparently avoiding trees as a resting-place, only one specimen having been captured in this situation.

It is solitary in its habits, and even when many individuals frequent the same place they keep carefully apart, forming thus a complete contrast to some other species, for example the Noctule.

The earliest date in the spring that this bat has been observed, as far as I am aware, is April 15 (Hart). Tomes observed it first on April 16, and Coward on April 26, curiously enough at noon on all three occasions! No one mentions the date of retreat in the autumn; my own specimen, when in captivity, began to hibernate on October 7; this is probably later than would have been the case out of doors.

In the summer this bat comes out earlier in the evening than Daubenton's Bat, sometimes in broad daylight, as in the cases mentioned, when it has been observed hawking for insects, the species of which do not seem to have been recorded. It is said (Caton Haigh and Coward, *contra* Tomes) to fly in a more sustained and less irregular manner than the Pipistrelle, and to frequent the sheltered side of a belt of trees or tall hedge rather than the open spaces near. Whether the Whiskered Bat flies silently, or screaming as other species often do, is not stated. In captivity the voice of the Whiskered Bat is remarkably low in pitch, considerably less than 8,000 vibrations per second, as measured by Mr. Galton's whistle. What time this bat retires for the night does not appear to have been determined.

While this paper is in the press, Mr. C. Oldham (xxiv.), publishes a very interesting account of a Whiskered Bat which he kept for five weeks in captivity.

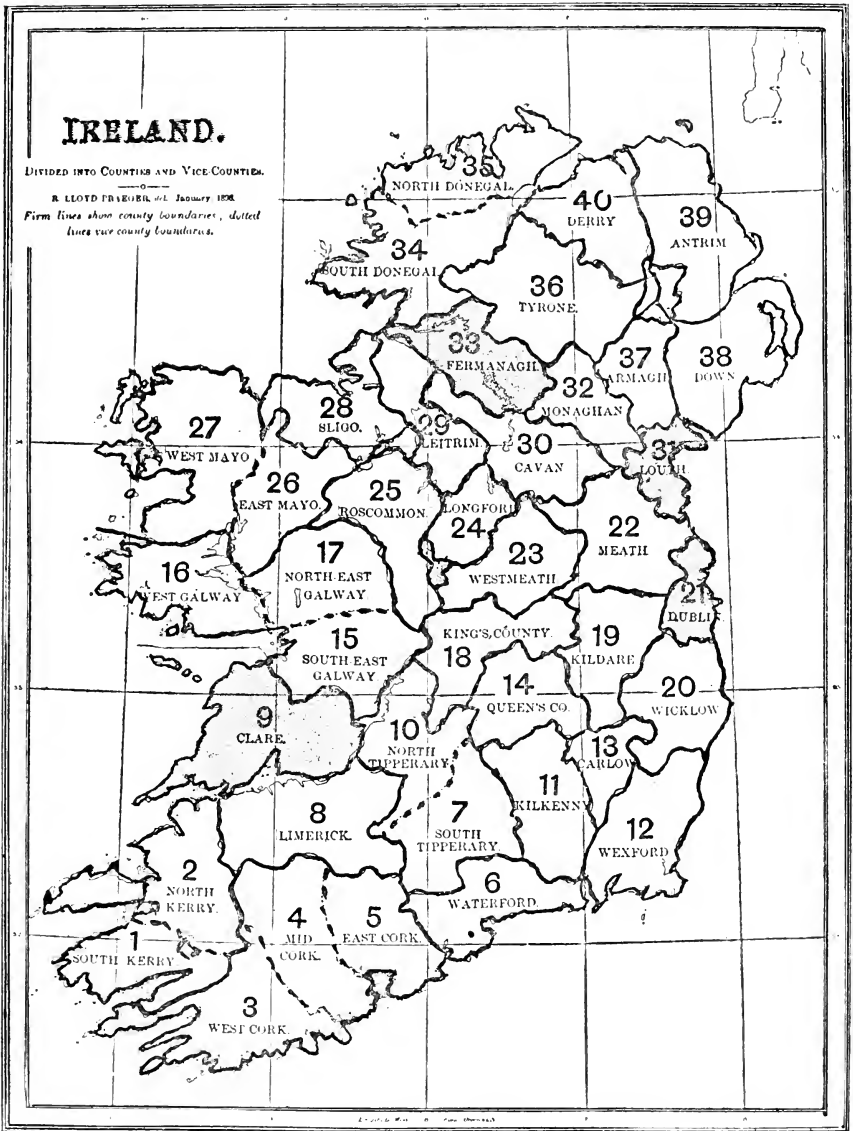
On September 30 of last year I came across a male specimen of this species in a chink between two huge stones (*J. Nat.*, p. 272, 1898), and conveyed it to Merrion, where it lived till November 1. As this is unusually long for the Whiskered Bat to survive in captivity, some details may be of interest, though it must be admitted that the habits of bats under these circumstances afford very slight indications of what happens in more natural conditions of life.

The cage in which it was kept had two compartments, a large and a small, the former with cross wires for the bat to hang from. This it never did—unlike the Long-eared Bat subsequently—but walked about this compartment when awake, preferring to sleep in the smaller, though this was barely 1 inch in width.

At first this bat was pretty lively, and exhibited an excusably bad temper, biting at everything and everybody. Raw meat it bit at and then rejected, but masticated and swallowed little morsels of raw fish. Later on it ate flies, one day it despatched two blue-bottles and sixteen other flies of various kinds, and still seemed hungry. Its method of feeding was entertaining in the extreme. It would solemnly stalk the fly round the cage, always unsuccessfully, until at length my patience would be exhausted, and I held the fly for it. It then made a frantic grab at the fly, sometimes falling over in its eagerness, and ate it openly—wings, legs, and all.

On October 7 the bat became quiet and sleepy, in the course of the next day or two passing into a very typical state of hibernation, the respirations falling from 120 per minute to 10 in 7 minutes. In hibernation as in sleep it preferred the smaller compartment as a resting-place, clinging close to the side of the cage, the tail partly drawn over the abdomen, the knees pointing forward, and the wings folded up by the side. It moved its place occasionally, and twice was aroused by the process of being photographed, waking up in the manner already described.

I had hoped to be able to keep it alive during the winter, but it was found dead on the floor of the cage on November 1st.



DISTRIBUTION OF THE WHISKERED BAT IN IRELAND.

To face p. 57.]

In England the Whiskered Bat is said by Mr. Tomes to produce one young one at a birth at the end of June or beginning of July, the exact time depending on the earliness or lateness of the season. Photographs of two very young bats are shown in the lower part of Plate 3; these were sent to me by Mr. H. Charbonnier, of Bristol.

The distribution of this bat in Ireland is shown in Plate 4, which has been kindly lent by Mr. Praeger; the shaded areas indicate the counties in which it has been found. The references for Counties Clare, Louth, and Fermanagh are from Mr. H. L. Jameson's paper (xi.); for Co. Dublin from notes by Mr. Welland (xxiii.) and myself. It is a curious fact that in all except Clare this bat has occurred more than once in the same county, though so seldom in Ireland generally.

In England, Mr. J. E. Harting (ix.) has collected records from Cambridgeshire, Northampton, Essex, Kent, Warwick, Sussex, Dorset, Hampshire, Isle of Wight, Stafford, Worcester, Cheshire, Yorkshire, and Durham. Since the date of his paper records have been published for Derbyshire, Lancashire, and Shropshire, by Mr. C. Oldham (xix., xx.), and for Cumberland by Mr. E. Tandy (xxii.), besides many additional localities for the counties already mentioned.

In Scotland this bat has been found twice, once at Rannoch, and once near Dunbar. See Evans (vi.).

In Wales the records are for Merionethshire (Caton Haigh, xviii.), and Carnarvonshire (Oldham, xxi.).

AUTHORS QUOTED. (*See also pp. 35-6 above.*)

- XVIII. CATON-HAIGH, H. *The Whiskered Bat in Merionethshire.* *Zoologist* (3), xi., 1887, p. 297.
- XIX. OLDHAM, C. *(The Whiskered Bat in Shropshire and Lancashire.)* *Zoologist* (3), xiv., 1890, p. 349.
- XX. Derbyshire (*Id.* (3), xix., 1895, p. 347).
- XXI. Carnarvonshire (*Id.* (3), xx., 1896, p. 255).
- XXII. TANDY, E. *(The Whiskered Bat in Cumberland.)* *Id.* (3), xiv., 1890, p. 99.
- XXIII. WELLAND, J. *(The Whiskered Bat in Co. Dublin.)* *Irish Naturalist*, vii., 1897, p. 272.
- XXIV. OLDHAM, C. *The Whiskered Bat in Captivity.* *Zoologist* (4), iii., 1899, pp. 49-53.
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HORDEUM SYLVATICUM IN IRELAND.

WITH NOTES ON OTHER CO. ANTRIM PLANTS.

BY JOHN ADAMS.

LAST July I was staying at Carnlough, and in company with some friends went for a ramble up one of the glens which abound in that neighbourhood. Noticing a grass which seemed new to me, I pulled a tuft and put it into my pocket, but did not find time to examine it for a day or two. On making a thorough examination, I came to the conclusion that it was *Hordeum sylvaticum*. The place where I found it agrees with the habitat as given by Hooker, namely, "copses and woods in chalky soil." I was surprised to find that the only Irish locality mentioned by Hooker was a place near Dublin, where it was not indigenous. In the new edition of the *Cybele Hibernica*, it is mentioned as occurring on the terrace at Mount Merrion, but is described as "an alien, growing in some quantity, and still persisting in the above locality, to which it was no doubt introduced." During the past few weeks my identification has been confirmed by that of Rev. C. H. Waddell and Mr. S. A. Stewart, and through the kindness of the former, I have been enabled to compare my plant with a specimen of *Hordeum sylvaticum* in his herbarium. I had also collected specimens of *H. pratense* and *H. murinum* in the neighbourhood of Cambridge, and have seen specimens of *H. maritimum* in the herbarium there, and as these are all the other British species, I think there is no doubt about the identity of the plant. It is a well-marked grass, with broad leaves about half an inch wide, and with reflexed hairs on the leaf sheaths. It would seem to be indigenous in the place where I found it, but its distribution is very limited. I went back to the same place a few days later, and did not see more than about five or six tufts altogether. It grows on wet slippery rocks overhanging the river, so as to be almost inaccessible, and this is probably the reason why it has never been discovered in this locality.

In this connection, a few new localities in Co. Antrim for rare plants, may be mentioned.

I found *Carex pauciflora* near a lakelet in the mountains above Carnlough. This little sedge was first discovered in Ireland by Mr. Lett a few years ago on the mountains above Glenariff.

Poterium officinale occurs very abundantly in a meadow at Ardclinis, about a mile north of Carnlough. This is probably not a new locality, but I mention it because it is more definite than the somewhat vague statement "near Carnlough."

Sedum rupestre occurs on the face of a rock overhanging the Glenariff river.

Galium Mollugo occurs in two places on the lawn at the Manse, Antrim.

There is an extensive bog north-east of Randalstown called Sluggan Bog (at least the name is so pronounced by the people in the neighbourhood), lying between the River Main and the Belfast and Northern Counties Railway. Here I found *Vaccinium Oxycoccus* and *V. Vitis-idea* growing side by side in one particular spot in the bog called "The Island."

NOTES.

The Belfast Club is to be congratulated on the success of its Hon. Secretary's "Introductory talks on Geology." We are glad to learn that nineteen members turned up at Mr. Phillips' first evening, and several others at the second "Talk," some of whom joined the Club for the express purpose of studying geology under Mr. Phillips' friendly guidance.

The summer excursions of the Dublin Club have been arranged as follows:—April 29, St. Doolaghs; May 27, Ireland's Eye; June 27 to 29, three days on the Shannon (Athlone as centre); July 22, Lough Bray, August 19, Kilcool; September 30, Dunran (fungus foray). The "long excursion" offers particular attractions. With the aid of the new Shannon steamers, Lough Ree and a considerable portion of the Shannon will be easily explored—a district full of interest to the naturalist, and very imperfectly known.

Through the agency of the Field Club Union, members of the northern and southern Clubs have supplied Professor Conwentz, Director of the Provinzial-Museum, Danzig, with specimens of subfossil woods from

Magilligan and Youghal. Professor Conwentz is especially interested in the history of the Yew, and recently visited Ireland to investigate the past and present distribution of that plant in this country. Further specimens of subfossil Yew are earnestly desired.

Professor COLÈ lectured in Belfast on February 9 on the subject of "The Volcanic North; how Ireland became an Island." There was a large attendance. The lecture was arranged for by the Geological Section of the Belfast Club. Mr. Praeger lectured on the same evening in Cork at a combined meeting of the Literary and Scientific Society and Naturalists' Field Club on the subject of the Kenmare Field Club Conference.

We deeply regret to record the death of an old and valued member of the Dublin Field Club—Mr. J. J. DOWLING, which took place at Foxrock, on February 2nd. An obituary notice will appear in our next issue.

ZOOLOGY.

CRUSTACEA.

Crustacea from the South-West Coast of Ireland.

In a recent paper in the *Trans. L'pool. Biol. Soc.* (vol. xii., pp. 159-172), Mr. A. O. Walker gives a list of the Malacostraca collected by him at Valencia Island, Co. Kerry, in the summer of 1896, and of certain specimens preserved in the Dublin Museum. Four species—*Janiropsis breviremis*, Sars., *Eurydice elegantula*, Hansen, *Ambasia Danielsseni*, Boeck and *Parvipalpus capillacea*, Chevreux—are recorded from British waters for the first time.

Porcellio dilatatus, Brandt, at Dundrum, Co. Dublin.

When I wrote my paper on the Irish Woodlice in 1894 (*Irish Naturalist*, vol. iii.), I stated that so far I had not seen any Irish specimens of *Porcellio dilatatus* except those obtained by the late Professor Kinahan in Dublin. For the past five years I have searched in vain for this rare Woodlouse in various parts of Ireland, but have recently discovered it in company with *Porcellio levis* (which it greatly resembles) along the foot of an old wall in my garden at Dundrum, Co. Dublin.

Since 1894 the Rev. Mr. Kibbing also discovered it in England, viz., in the Isle of Wight and in Surrey.

Dublin.

R. F. SCHARFF.

MAMMALS.

Irish Bats.

Having just read Dr. Alcock's paper on Bats in the current number of the *Irish Naturalist*, I turned up some random notes as to the dates of their appearance here after hibernation and at other times. In 1884 I saw one for the first time on 7th April; in 1885 on 3rd April; and in 1888 three or four on 14th April; in 1896 I saw two on 5th February; and in 1897 one on 19th February. In the latter year, 1897, I saw what I have noted as a "very large one" on 1st November; two or three on 18th December; and one on Christmas Day.

I have not any notes since; and in none of the above instances was there any attempt to record the species.

Holywood, Co. Down.

R. LLOYD PATTERSON.

Long-Eared Bat In Co. Waterford.

With reference to Dr. Alcock's note (*ante* p. 52), I write to say that the Long-eared Bat is common about here. A good many fly into my study during summer nights, when I have the windows open to attract moths. I have caught them repeatedly in my butterfly net, but liberated all with the exception of one, which was preserved and mounted for use by Mr. Williams. The length of the ears in this species is marvellous. No other mammal I believe can compare with it in this respect. They must be seen to be believed.

Coolfin, Co. Waterford.

WILLIAM W. FLEMING.

GEOLOGY.

Glacial Geology of Kerry.

During the Field Club Union visit to Kerry last July a most interesting day was spent in the district affected by the bog-burst of 1896, which lies to the north and north-west of Rathmore station. The celebrated quarry still shows a dark stain left by the peaty flood which surged against the precipitous face of Carboniferous limestone, subsiding to a lower level, and choking up the quarry, which was subsequently cleaned after much expense and trouble. The limestone is covered by a deposit of boulder clay about 12 feet deep, *resting on a deeply water-worn surface*. I would be glad to know if this is usual in the limestone districts in Ireland, as in our north-eastern district we invariably find glaciated rock underneath our boulder-clays. The short time available only permitted a very cursory examination of the deposit, and the collection of a few boulders from the face of the section. Amongst these are some specimens identified by Mr. Phillips as the rhyolite-andesite of Crohane Mountain and Loo Bridge, obtained by him *in situ* on the same day on which we found it as an erratic at the quarry some twenty miles N.N.E. of the parent locality. This is an interesting corroboration of Mr. Maxwell Close's observation ("General Glaciation of Ireland," in *Journ. R.G.S.I.*, i., 226, 1867), that the striæ of the Kenmare district indicate two separate ice-flows, one passing down the Kenmare Valley, the other up the Roughty Valley by Kilgarvan and Headford towards Killarney.

Belfast.

SYDNEY M. THOMPSON.

The Geological Structure of the Kenmare District.

In the *Irish Naturalist* for January, 1899, Mr. G. H. Kinahan comments on my statement that the structure of the Kenmare district "presents little apparent complication." The word "apparent" was intentionally introduced, to cover the possibility of faults and thrust-planes parallel to the axes of folding, such as one sometimes hears of in conversation with the field surveyors who have revised the older mapping.

The region must surely remain, however, an example of classically simple folding. The faults in certain places produce a repetition of features; but the broad structure is for the most part one of anticlinal ridges and synclinal hollows; the frequent overfolds cannot be said to complicate this structure. The overfolds are again and again indicated by the dips recorded on the Survey maps, but were often disregarded in the published sections. I have recently had occasion to call attention (*Knowledge*, vol. xxi., p. 77) to the inversion of strata that has taken place.

I do not understand the words "at Kenmare it is the reverse," in Mr. Kinahan's second paragraph, since the older rocks are said to be thrust over younger ones in both the cases cited. Is there really an overthrust in the Kenmare synclinal, or merely an unbroken overfold? Mr. Kinahan's statement as to the absence of the Yellow Sandstone series and the Lower Limestone shale on the north side is usefully suggestive of a thrust-plane.

The question of the substitution of Carboniferous Slate for the more normal Carboniferous series north of it must have depended on original conditions of deposition, and does not complicate the *structure* of the district. It may be conceived that the passage from the one type of deposit to the other occurred in the lost beds that have been denuded from the anticlinal mass between Kenmare and Glengariff. On the original sea-floor, there were at least fifteen miles in which the change of deposit could have occurred. Professor Barrois, in his recent study of the deposits at the mouths of the Vilaine and the Loire ("Sur les phénomènes littoraux actuels du Morbihan," *Ann. de la Soc. géol. du Nord*, tome xxiv., p. 182), has shown how the most diverse sediments may accumulate side by side on the same coast. In his special locality, the muds gather near the shore, and escape further distribution, where the water is land-locked, or where the sea-floor falls steeply from the coast. The Carboniferous Slate seems to require a land-ridge or coastline somewhere to the south; but this is a question on which I cannot speak with confidence.

GRENVILLE A. J. COLE.

Dublin.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Marmoset from Mr. E. C. Murphy, four Doves from Mr. M. W. Despard, a Badger from Mr. G. Hunter, and a Cassowary from the Hon. Walter Rothschild. A Caracal has been bought. 4,250 persons visited the Gardens in January.

DUBLIN MICROSCOPICAL CLUB.

JANUARY 19.—The Annual Meeting was held at Leinster House. The Vice-President, ARTHUR ANDREWS, J.P., in the chair.

A cordial vote of sympathy with the President, Wm. Frazer, Esq., F.R.C.S.I., in his present illness, was passed. The Officers for 1899 were re-elected, as follows:—President, Wm. Frazer, F.R.C.S.I.; Vice-President, Arthur Andrews, Esq., J.P.; Hon. Secretary, Greenwood Pim, Esq., M.A.; Hon. Treasurer, F. W. Moore, Esq., A.L.S.

The Treasurer stated that financially the Club was in a satisfactory position; £4 8s. 2d. remaining in his hands after discharging all liabilities for the past year.

It was unanimously resolved that a donation of £3 3s. be given to the *Irish Naturalist* for 1899, and that the Editor be requested to furnish to the Secretary reprints of the Proceedings of the Club for distribution amongst the members.

Mr. W. N. ALLEN exhibited some beautiful photo-micrographs recently published by E. and H. Spitta, in the *Pharmaceutical Journal*.

Dr. H. H. DIXON showed a preparation illustrating the colour reactions of nuclei. Sections of the embryonic tissue at the apex of the stem of *Ranunculus repens*, are composed of cells containing nuclei which are very sensitive to colour reactions. Very good preparations are obtained by staining with safranin dissolved in anilin-water, washing in acid alcohol and alcohol, and staining again in anilin blue dissolved in water. Sections so treated when mounted in balsam show the nucleolus of resting nuclei stained a brilliant ruby, while the chromatin substance is a vivid blue. Where karyokinetic figures are to be seen it is easy to observe that with the disappearance of the nucleoli, the chromatin elements—the chromosomes—become affected by the red stain, so that the nuclear plate and the diaster are invariably stained red. As has been before suggested this colour change offers evidence that the substance of the nucleoli pass into the chromosomes during karyokinesis.

Dr. DIXON also showed æscospores of *Tuber aestivum*. The nuclei of the young asci lie in the central vacuolate portion of the protoplasm. The outer zone of protoplasm is denser, more finely granular, and contains glycogen. These nuclei are large, and are composed of a fine ground substance, in which are embedded a number (about four or five) nucleoli. Round four or five of the nuclei in each ascus, cell-walls are developed. These latter lie very close to the periphery of the nucleus

or in contact with it; so that the nucleus completely fills the young ascospore. During the development of the wall the nucleoli divide, as far as could be made out, by simple bipartition, so that there come to be from six to ten in each spore; their colour-reaction changes from being erythrophil to cyanophil, and they assume the appearance of nuclei. In this manner each ascospore comes to possess a number (about eight) nuclei derived from the nucleoli of its original nucleus.

Mr. GREENWOOD PIM showed *Zygodemus fuscus*, a curious reddish-brown mould found on decaying wood at Ovoca, Co. Wicklow. The mycelium is thick and interlacing, provided with a curious form of "clamp cells" at the septa. The conidia are borne singly, rather large and echinulate, and orange-brown.

PROF. G. COLE exhibited, on behalf of Mr. A. Vaughan Jennings, F.G.S., a specimen from a vein cutting the dolerite of Portrush, collected by Mr. Jennings in 1898. The microscopic section shows that the pyroxene is a variety rich in soda, approaching aegirine; the abundant zeolites, already noticed in these veins by Portlock, seem to be derived from the feldspars. The rock, which is coarse in grain, seems as yet unique in Ireland; but it may be found to have some relationship to the more highly siliceous diorite described by Prof. Judd, from Rockall.

Mr. G. H. CARPENTER showed fragments of insects from the stomach of a Hairy-armed Bat (*Vespertilio Leisleri*), which he had received from Dr. N. H. Alcock for examination. All the fragments seemed clearly referable to Diptera, and a foot and a portion of a wing were shown by comparison to belong to the well-known yellow-haired dungfly, *Scatophaga stercoraria*. It would appear, therefore, that the fly must rise to some height in the air after dark, in order to fall a prey to the bat. The specimens are mentioned by Dr. Alcock, in his recent paper on the Natural History of Irish Bats (p. 35 of this volume).

Mr. H. HANNA showed specimens of the seaweed *Rivularia Biasoletiana*, Menegh., collected in Ireland for the first time on rocks, near high-water mark, at Tor Head, Co. Antrim, where it grows exposed to the dripping of fresh water. He was indebted to Mr. E. M. Holmes for kindly identifying the plant. This species is figured and described by Harvey in *Phycologia Britannica*, as *Schizosiphon Warrenia*, Harv., pl. 316.

Rev. H. W. LEFT exhibited a hepatic closely resembling *Lophocolea minor*, var. *cuspidata*, Nees, ab. E. This interesting plant was found creeping amongst *Frullania germana*, var. *flabellata*, Spruce, on trunks of trees, in Hickson's Wood, near Aniscaul, Co. Kerry, by the exhibitor, and Mr. D. M'Ardle, in June, 1898. It has the appearance of a miniature *L. bidentata*, Nees, ab. E., being not a third the size of that plant, the stems being only 10-15 mm. long; the leaf-cells are about half as large as those of *L. bidentata*, while the leaves are more distantly placed on the stem, and have their points wider apart and not so long. The under-leaf is awl-shaped, very slender, pressed to the stem, and divided into two awl-shaped segments. It is identical with specimens of *L. minor*,

var. *erosa*, Nees. ab. E., collected in Antrim, except that the points of the leaves of *erosa* are blunt and look as if they had been worn away. So far no fructification has been found on the Co. Kerry plants, and further researches are desirable to establish the record of this plant, which seems to be new to the United Kingdom.

BELFAST NATURALISTS' FIELD CLUB.

JANUARY 17.—The President (Rev. C. H. WADDELL, B.D.) in the Chair. Rev. W. F. JOHNSON, M.A., read a paper on "Irish Butterflies," in which he stated that forty-one species have been found in Ireland out of a total list of sixty-seven species for the British Islands. He then gave a concise account of the common species, detailing their distinguishing features, colour of their larvæ, &c., and stating when and where they are commonly found. The paper concluded with a tabulated list of Irish Butterflies.

Mr. GEORGE DONALDSON, one of the original members of the Club, who has been absent in Massachusetts for three years, gave an interesting paper on the Butterflies of North America. In commencing he told how on leaving Belfast, he had resolved to abandon natural history pursuits, a resolution which was only in force for half a day, when he encountered the butterfly known in North America as the Monarch (*Anosia archippus*). He described this beautiful insect and its life-history in some detail. The larva feeds on plants of *Asclepias* or Milkweed, which is common everywhere in the Northern States. The eggs are laid on leaves of the food-plant. They hatch in about four or five days, and the caterpillars commence to feed. They eat voraciously and mature rapidly, becoming often full grown in two weeks. The Danaid in question is one of the most widespread butterflies of America, being found over almost the entire continent, from Canada to Patagonia, and from the Atlantic to the Pacific. It has extraordinary powers of flight, and in autumn, when abundant, collects in vast flocks of hundreds of thousands and migrates southwards. They return north in the spring, not in crowds, but singly, the females laying their eggs wherever they may chance to be, many of the young butterflies proceeding further north as soon as they emerge. Within the last thirty years this insect is said to have spread all over the islands of the Pacific, and even to Australia and Java. In 1877 it made its way to the Atlantic coast of France, and several instances of its capture in England have since been recorded. Its occurrence in Ireland may well be expected. The reader met with one of our Red Admiral (*Pyrameis atalanta*) in great abundance, and one of the rarest British species, the Camberwell Beauty (*Vanessa antiopa*) he found in profusion in New England. Many interesting facts were mentioned concerning the various families of North American butterflies and macrolepidoptera. These details were from his own personal observation, and were illustrated by abundant and beautiful specimens of the species referred to

BOTANICAL AND GEOLOGICAL SECTIONS.—21ST JANUARY.—A joint meeting of the two sections was held, with an interval for tea and conversation between. Mr. R. L. PRAEGER, President of the Dublin Club, read a paper on Missing Plants of the North-eastern Flora. He reviewed the species, some fifty in number, which in *Flora of the North-east of Ireland* (1888) were "reported missing"—i.e., had not been seen in the district recently, many of them not for half a century. A fair proportion of these, he pointed out, had been since re-found by the labours of local botanists, but many still remained to be re-discovered. Some of them, possibly, were gone for ever, owing to drainage and reclamation. The species referred to were as follows:—Lough Neagh plants—*Lathyrus palustris*, *Carex elongata*, *C. Buxbaumii*, **C. filiformis*, *Calamagrostis stricta*, *Tolypella nidifica*. Plants chiefly of the Lough Neagh basin—*Subularia*, *Rhamnus catharticus*, **R. frangula*, *Sium latifolium*, **Cladium*, **Carex stricta*, *Lastrea Thelypteris*, *Pilularia globulifera*. Marsh and lake plants—**Elatine Hydropiper*, *Epipactis palustris*, *Cephalanthera ensifolia*, *Potamogeton plantagineus*, **Eleocharis uniglumis*, **Carex teretiuscula*, **C. limosa*. Peat-bog plants—**Drosera intermedia*, *Andromeda*, **Vaccinium Oxycoccus*, **Utricularia intermedia*, *Eriophorum latifolium*, **Lastrea spinulosa*. Mountain plants—*Pyrus Aria*, *Arctostaphylos Uva-ursi*, *Pyrola secunda*, *Taxus*, **Festuca sylvatica*, *Polypodium Dryopteris*. Meadow plants—**Leontodon hirtus*, *L. hispidus*, *Gentiana Amarella*, **Orchis pyramidalis*. Wood and hedgerow plants—**Hypericum hirsutum*, *Adoxa*, **Calamagrostis Epigejos*, **Poa nemoralis*. Seaside plants—*Geranium sanguineum*, *Trifolium striatum*, *Chenopodium rubrum*. Those marked with an asterisk have been re-found in the district since *Flora N. E. I.* was published. Specimens of the plants were shown, and their characters and likely localities for their re-discovery pointed out.

Later in the evening Miss S. M. Thompson read a paper on glacial geology, with special reference to recent work in Spitzbergen, and Mr. Praeger contributed a paper on glacial fossils, pointing out what we may learn concerning the conditions prevailing during the Ice Age from the character, distribution, and condition of the molluscan remains found in the deposits.

DUBLIN NATURALISTS' FIELD CLUB.

JANUARY 10.—Annual General Meeting. The President, R. LLOYD PRAEGER, B.A., B.E., in the chair. The reports of the secretaries and treasurer for 1898 were adopted on the motion of Dr. A. H. Foord, seconded by Mr. L. Shackleton. The officers and committee for 1899 were elected as follows:—President, R. L. Praeger, B.A., B.E.; Vice-President, J. E. Palmer; Hon. Secretaries, Prof. T. Johnson, D.Sc., F.L.S., and Dr. N. H. Alcock; Hon. Treasurer, H. K. Gore Guthbert; Committee, G. H. Carpenter, B.Sc., Prof. G. A. J. Cole, F.G.S., G. P. Farran, Miss Hensman, J. N. Halbert, H. Hanna, M.A., Miss Mahaffy, Dr. C. J. Patten, H. J. Seymour, B.A., Miss Singleton, Mrs. Tatlow, Miss M'Intosh, B.A.

Votes of thanks were unanimously passed to the Royal Irish Academy for the use of the house for the meetings of the Club, to Lord Powerscourt, K.P., Lord Annesley, Lord Howth, and others, for permission to explore their demesnes, and to the Dublin Press, on the motion of H. G. Cuthbert, seconded by J. E. Palmer, Vice-President. The following were elected members:—J. Curran, B. Edwards, G. Fay, Miss Foddy, Miss Massy, and one candidate for membership was proposed. A new rule as to subscriptions was adopted, on the proposal of H. K. G. Cuthbert, seconded by Prof. Cole, F.G.S.

At the close of the formal business, Mr. G. COFFEY, M.R.I.A., read a most interesting paper, entitled "Some neglected Fields in Irish Natural History work." He referred more particularly to the Palæolithic and Neolithic remains found in French and English cave-deposits and river gravels, along with bones of the cave bear, sabre-toothed tiger, and woolly rhinoceros, and dwelt on the possibility of similar discoveries in Irish caves, pointing out the vast field of work that lay open to Irish naturalists in this neglected field of research. Lantern slides of the bone and ivory carvings and flint instruments, found in caves, accompanied the paper.

FEBRUARY 14—The President, R. LI. PRAEGER, B.A., B.E.—later, Mr. GREENWOOD PIM, M.A., in the chair. Fifty to sixty members and their friends were present. After the signing of the minutes of the last meeting, Mr. H. K. G. CUTHBERT read a letter from a continental expert bearing on Mr. Coffey's paper on the investigation of Irish caves, in which the writer, for reasons given, expressed the opinion that Palæolithic man could never have existed in Ireland. Mr. PRAEGER contributed a paper entitled "A Botanist in the Central Plain," which will appear in our next issue. The paper was fully illustrated by specimens collected by the author, and several geological maps and sections lent by Professor Cole, from the Royal College of Science, who, with Mr. Greenwood Pim, discussed the paper. Dr. T. Johnson expressed the belief, that in a few years time, such was the importance now being attached to the introduction of science into the schools, Mr. Praeger would find correspondents in every direction prepared and able to help him in his topographical botany work.

Dr. T. JOHNSON, F.L.S. (Hon. Sec.), next gave an account of "The Highland type plants of the new *Cybele Hibernica*." The paper was illustrated by specimens and lantern slides. An account of the characters of alpine plants, and of the explanations of their presence in the mountains of Ireland, was given. It was stated that the set of plants shown, and others of other types of Irish plants, were being prepared for exhibition in the Botanical rooms of the Science and Art Museum, and would be very useful to teachers of botany and their classes.

Mr. PIM then showed a fine series of lantern slides of various natural history objects; Mr. Henry J. Seymour, B.A., showed several geological maps, and stated that new "Solid Geology" and drift maps would shortly be published by the Geological Survey. Miss A. Marks was elected a member.

THE BRACHIOPODA AND MOLLUSCA
OF THE CARBONIFEROUS ROCKS OF IRELAND.

IRISH FOSSIL SHELLS AND THEIR MODERN
REPRESENTATIVES.

BY ARTHUR H. FOORD, PH.D., F.G.S.

(Plate 5).

(Read before the Dublin Naturalists' Field Club, December 13, 1898).

UNDERLYING the more superficial deposits of clay, sand, gravel, or peat, is an immense area, about one-half of that of the whole of Ireland, occupied by the sedimentary and other rocks belonging to the Carboniferous system, which represents, together with the Permian, the uppermost division of the great Palæozoic group.

I may shortly explain that the sedimentary or aqueous rocks were derived from the waste of the land, that is of older rocks, and were laid down in the sea as sediments, the agents in this process being the waves, rivers, frost, and other disintegrating forces, operating through incalculable periods of time.

The chief distribution of the Carboniferous system in Ireland is in the great central plain, the rocks there being mostly limestone, but the system extends also to the coasts both south and west, and, in a more limited degree, north and east.

Three divisions are generally recognized in it, the uppermost of which is termed the Coal-measures, and consists of sandstones, shales, and coal seams. The lowest is the Carboniferous Limestone, in England called the Mountain Limestone. The middle division, a coarse sandstone, is known as the Millstone Grit; this last forms the frowning cliffs of the rock-bound coast of Clare, of which county it occupies a considerable area, extending also into Limerick, Kerry, and Cork. The Coal-measures in Ireland are unfortunately represented by only a few isolated patches in Tyrone, Tipperary, and Kilkenny, any extension of these, if such existed, having been completely denuded away. These different types of rock, when their derivation is considered, throw much light upon the geographical conditions of the

period in which they originated. Thus, the limestone represents the sediments, almost wholly organic, deposited in a great open sea, like a Mediterranean, bordered by the older Palæozoic rocks and extending from the west of Ireland, through England, the north of France and Belgium to Westphalia. This Carboniferous sea covered large areas in Russia also, and, going outside Europe, in Africa, North America, China, and Australia.

Subsequently, during the latter part of the Carboniferous Period (I am here referring to the whole system) new physical conditions set in, the sea became shallower, and sandy and muddy deposits were accumulated by the waste of the neighbouring land; lagoons were formed in the more contracted area, and, under favourable climatic conditions, a luxuriant marsh vegetation sprang up upon the newly elevated land. Then there came a subsidence of the land, the forests were submerged and sandy detritus spread over them, and this process of elevation and subsidence was repeated again and again till immense thicknesses of alternating beds of sandstones, shales, and coal seams were formed. These events required of course a vast period of time for their accomplishment. In endeavouring to account for such a great thickness of sedimentary rock as that of the Carboniferous Limestone, we must again invoke earth-movements on a large scale; its accumulation (it exceeds 3,000 ft. in thickness in the south-west of Ireland) can only be explained on the assumption that the oceanic area in which it was deposited was a gradually and slowly subsiding one, and that the process of subsidence was greatly prolonged, since otherwise so considerable a thickness of homogeneous rock could not have been deposited. Movements involving the subsidence and elevation of the land are attributed to different events, all having their origin in the constitution of the interior of the earth. One of these is the secular contraction of the earth's crust in the process of cooling from its primitive molten state, another is that the weight of a vast quantity of sediment derived from the waste of the land may have caused a sinking of the area to which it was conveyed, while a corresponding elevation would take place in the one from which it was removed. Proofs of earth-movements are to be

discovered in the tilting-up of the older stratified rocks, and in their frequently folded and contorted condition, though they were, naturally, as sediments, laid down horizontally.

Evidence of such oscillations of level is of world-wide occurrence. Upheaval is shown in the fossil remains of marine animals found in rocks, now far from the sea, such as those under our feet, and in the more superficial layers of clay or sand, often at great heights above the sea-level, these layers sometimes containing the remains of animals belonging to species still existing in the neighbouring ocean. Subsidence may be caused either by secular movements of the crust, as aforesaid, or by volcanic disturbance. Proofs of depression are to be found in the fjords on the coasts of Norway, Scotland, and Ireland, and other countries, which are nothing more than submerged valleys or glens; and that the west coast of Greenland is also sinking is shown by the sea having risen over ancient buildings and islets within historic times. As an instance of elevation and depression of limited extent the area on which the Temple of Jupiter Serapis stands at Pozzuoli in the Bay of Naples, is one of the best known. The columns of this ruin, at a height of 10 feet 5 inches above the base, show perforations made in the marble by boring Molluscs (*Lithodomus*, &c.), whose shells have been extracted from the cavities they made, proving that the temple had sunk down below the level of the sea. Inscriptions show that it was in existence in the year 194 A.D. It was ascertained to be slowly sinking again in the early part of the present century.¹

We may now ask how fossils became embedded in the rocks. The prolonged and gradual subsidence of the sea-bottom during the earlier part of the Carboniferous Period resulted, as we have shown, in the accumulation of a great thickness of sediment, in the piling-up of which the shells of molluscs, and brachiopods, and the calcareous plates of

¹ Those who wish for more detailed information concerning this remarkable ruin, interesting alike to the archæologist and to the geologist, should consult the following:—"Observations on the Temple of Serapis," by C. Babbage *Quart. Journ. Geol. Soc.*, vol. iii., 1847, p. 186. "Principles of Geology," Lyell. *Geological Magazine*, June, 1892, p. 282; J. E. H. Thomson, in a letter to the editor on "The Temple of Jupiter Serapis in Puteoli (Pozzuoli)."

crinoids or sea-lilies, as well as the hard parts of corals and foraminifera, played a most important part. It was this sediment, ultimately raised above the sea and gradually consolidated and altered, partly by the pressure of its own weight and partly by chemical and other agencies, that was transformed into the hard and compact limestone as we now see it in quarries or other rock-cuttings.

Fossils have been compared with the covers of books that have had their leaves torn out, but, as with books, there is generally sufficient in the title on the cover to guide us as to their contents; so with fossils, the shell, though devoid of its constructor, often contains marks by which we may trace its life-history, and it is here that zoology and palæontology go hand in hand; we compare the extinct with the existing type, and we are often surprised to find how little they differ from each other. Thus, if a *Lingula* from the Silurian rocks be compared with one from the shores of New Caledonia, there is nothing to distinguish them externally save their colour.

The principal structures in the Mollusca, both internal and external, will now be treated of, and the comparative method adopted, thereby avoiding some repetition, as many parts correspond more or less in the different members of the group. I shall lay particular stress upon those which are important in discriminating fossil shells.

MOLLUSCA.

The Mollusca, or soft-bodied animals are divided into four classes—the Lamellibranchiata, or Acephala (*i.e.*, headless molluscs),¹ the Scaphopoda, the Gastropoda, and the Cephalopoda. The name of the first is taken from the prevailing form of the gill-filaments, which grow together into lamellar, or plate-like organs; the others derive their names from the contractile, muscular disc, known as the foot, which serves as a locomotor organ in the Lamellibranchiata and Gastropoda, and probably as a burrowing, or digging organ in the Scaphopoda. In the Cephalopoda it is represented by the “funnel.”

¹ Called also Pelecypoda by some, thus bringing the nomenclature of the group into harmony.

The Mollusca belong to a pretty high type of animal organization, and some naturalists still bring them close up to the Vertebrata in the scheme of classification, which is doubtless raising them too high, and I am sure Sir John Lubbock does not approve of their taking precedence of his wonderful socialistic communities of wasps, bees, and ants. The Mollusca are bilaterally symmetrical, unsegmented animals, *i.e.*, they are without jointed appendages such as the Crustacea and Insects have. The body is covered with a soft, slimy skin which in the Lamellibranchiata and Gastropoda is protected by a shell, the tougher integument of the Cephalopoda, preserved even in fossils, not requiring this. The Mollusca are mostly aquatic, especially marine animals, though many (Gastropoda) are terrestrial, but even these generally seek damp situations. Breathing is effected in the aquatic kinds by gills, the water entering the mantle-cavity by a small orifice, the edge of which may be drawn out into a tube or siphon, hence called the respiratory siphon—this is obviously useful in the burrowing Molluscs. The second siphon has excretory functions. In the pulmonate Gastropods as the name implies, respiration is carried on by the mantle cavity, acting as a lung. The habits of life of the Mollusca are various; they may be fixed by their shell-substance to foreign bodies or other shells, as the Oyster, or by silky threads—the byssus—as the Common Mussel, or they may be pelagic *i.e.*, free-swimming in the open sea, as the Cuttlefishes, or creeping as most Gastropods, or again burrowing in sand or mud, or even boring in rock and wood. Among the latter is the well-known ship-worm *Teredo navalis*, which bores into ship's bottoms, wharves, and other submerged wood-work. As to feeding, the Lamellibranchs, sedentary or sluggish as they generally are, must have their food brought to them, it is therefore mostly in the shape of microscopic organisms and particles drawn into the mouth by currents set up by the rapidly moving hair-like cilia of the gills. The Gastropoda, especially those with a respiratory siphon and notch for its passage, are carnivorous, as the Whelk (*Buccinum*); others, as the Periwinkle (*Littorina*), are sea-weed eaters. The Cuttlefishes are well known as animal feeders, their long tentacles, armed with suckers, enabling them easily to capture

their prey, consisting of fishes and crustacea whose shells they crush with their powerful, parrot-like beaks. The foot, I have already referred to. Another important organ is the mantle, or pallium, which secretes the calcareous shell, when present, and encloses the viscera; the mark left by this organ, hence called the pallial-line, seen on the inside of many Lamellibranch shells, is of importance, as its outline when stretching without interruption from one muscular impression to another indicates that the animal inhabiting the shell was not possessed of respiratory siphons, while if it is interrupted by a sinus or indentation, these siphons were present. As the pallial line is often preserved in fossil shells, it is thus of some assistance in classification. The shell, almost the only part of these animals preserved in the rocks, varies, as might be expected, greatly in shape. In the Lamellibranchs it consists of two pieces or valves, round or oval in shape, and held together by the elastic "ligament" which may be internal or external. Where the semicircular or concentric lines on the surface are smallest there is a more or less prominent hump; this is called the beak or umbo, and represents the oldest part of the shell; beneath this, inside the shell, there is a shelly plate bearing prominences called teeth with corresponding depressions into which they fit in the opposite valve; the whole is called the dental plate or hinge. When closed the valves completely enwrap the animal; in those forms, however, which are siphonate, the valves often "gape" at one end, the posterior, or that farthest from the umbones. This is especially the case with the burrowing tribes, in which the siphons are often extended far beyond the shell. The substance of the shell itself is made up of three layers, the internal, laminated layer, called the nacreous or mother-of-pearl layer; the middle or prismatic layer, and the outer or horny layer—periostracum—which protects the shell from the dissolving action of water. The first is secreted by the surface of the mantle, the other two by its free edge, which produces all the various kinds of ornamentation, ribs, nodules, striations, spines, &c., upon the surface of the shell, to effect which its outline undergoes changes of a like protean character.

The shell in the Scaphopods is shaped like an elephant's

tusk (*Dentalium, e.g.*), and is open at both ends. *Dentalium* is a tolerably common fossil in the Carboniferous Limestone, but it is difficult to extract it from the rock except in fragments.

The shell in the Gastropods is typically conical in outline, consisting of a spirally coiled, expanding tube, or simply of a more or less elevated cone, as in the full-grown limpet; the young has a spiral shell. Perforations, or slits in the shell, of classificatory importance both in recent and fossil shells, indicate corresponding structures in the mantle-fold. These are met with in *Pleurotomaria, Haliotis* (the common "ear-shell"), and in *Fissurella*, the "key-hole" limpet.

A notable exception to the ordinary plan of the Gastropod shell is encountered in the *Chiton* ("coat-of-mail" shell) whose shell consists of eight flattened and slightly arched transversely oblong valves, partly or entirely embedded in the mantle. Fossil Chitons are found in the Carboniferous Limestone of Belgium and Ireland.

Lastly, in the Cephalopoda there is only one living member of the class, that is *Nautilus*, that has a complete external shell, secreted by the mantle. An imperfect form of this kind of shell, consisting only of the pearly layer, exists in a small dibranchiate cuttle-fish called *Spirula*; but in this the shell is practically internal.

The structure of the shell in *Nautilus* (a tetrabranchiate or four-gilled Cephalopod) merits a little more explanation, as it elucidates that of a very large group of fossil Cephalopods which includes the Ammonites of the Mesozoic rocks and their predecessors, and the Goniatites of the Devonian and the Carboniferous rocks. In the latter the Goniatites are common in Ireland. The shell of *Nautilus* is a rapidly expanding cone, spirally coiled, with the coils touching one another, all but the outer coil being generally hidden by the succeeding ones. There is a minute perforation at the commencement, where the first turn took place, which, however, in some fossil forms is very large owing to the wider curve described by the first whorl and the slight amount of overlapping of the succeeding ones. Stretching across the shell at frequent intervals is a series of arched transverse partitions or *septa*, dividing the shell into chambers, of which the last and largest is occupied by the animal, and is hence called the

body-chamber. Through these chambers by means of a central, or nearly central perforation there passes a delicate, tubular, cord-like process, the siphon or siphuncle, which proceeds from the dorsal end of the body. The functions of this tube are unknown, but it is a distinguishing feature in all Cephalopod shells.

Thus is built up a structure which is matchless for strength and lightness and beauty of form. Let us close this description of the shell of the *Nautilus* with the well-known lines of the poet-philosopher :—

“ Year after year beheld the silent toil
 That spread his lustrous coil ;
 Still as the spiral grew
 He left the last year’s dwelling for the new,
 Stole with soft step its shining archway through,
 Built up its idle door
 Stretched in his last-found home, and knew the old no
 more.”

The siphuncle is very large in some of the straight-shelled Cephalopods of Palæozoic times, as in *Actinoceras*, a gigantic species of which is found in the Carboniferous Limestone of Ireland, the largest coming from Castle Espie (Comber), County of Down.

The coiled shells of the fossil Cephalopods, though varying greatly in detail, are constructed upon the same general plan as the shell of *Nautilus*. In the Goniatices, another extinct type of Cephalopods, having close-coiled shells, the edges of the septa, as seen in casts from which the shell is removed, are of a zig-zag form and a very definite pattern which has been relied upon in dividing this group into genera and other larger divisions.

And now a few words as to those internal organs not yet dealt with.

In most of the Mollusca (except the Lamellibranchs) there is on the floor of the mouth an organ called the radula or lingual ribbon, on which are rows of innumerable, delicate, chitinous teeth whose points project backwards, its function being to break up the food as it passes over it into the gullet. The *vascular* system is generally well developed, although the blood flows partly through spaces among the organs. The heart consists of *one*, or of *two* auricles (in *Nautilus* *four*,

corresponding to the four gills), into which the blood flows from the gills (or the pulmonary chamber in the air-breathing Gastropods), and a ventricle which receives it from the auricles and drives it into the body. The venous blood collects in one or more large spaces which supply the respiratory apparatus.

The nervous system consists of a number of nerve-centres or ganglia joined together by bands and sending out threads to the different organs; thus there are the cerebral, or else buccal, pedal, and pleural nerve-centres. In the Cephalopods, the highest member of the molluscan group, there is a concentration of these nerve-centres approaching a veritable brain.

The eyes of the Mollusca vary greatly, ranging from the simple, pigmented spot with optic nerve, merely susceptible to the impression of light and darkness, to one in which a lens is developed, as in the Dibranchiates, or cuttles. The Gastropoda have usually, and the Cephalopoda invariably, two eyes upon the head, or the head region, but in the first of these groups *Chiton* has eyes curiously scattered over the surface of the shell,¹ sometimes promiscuously, sometimes in regular rows. Among the Lamellibranchs *Pecten* has eyes disposed at regular intervals on the two edges of the mantle.

A curious organ in the Dibranchiates, of protective function, is the ink-sac; it is connected with the excretory parts and emits a dark fluid which discolours the water and thus enables the animal to escape from its pursuers. The ink-sac, still distended with its desiccated contents, is often found preserved in a fossil state in the Lias (Mesozoic era) of Lyme Regis, Dorsetshire. Dean Buckland,² the famous geologist, had a drawing made from this fossil pigment, which an artist to whom it was shown supposed had been executed in sepia obtained from an artist's colourman.

Lastly, the Scaphopoda are an aberrant group of simple structure, having neither head nor eyes. Their nervous system is fairly developed, but there is no heart, the blood circulating in the spaces contained in the body-cavity.

¹ This brilliant and interesting discovery was made by the late Professor H. N. Moseley, of Oxford. (*Quart. Journ. Micro. Sci.*, vol. xxv., 1885, p. 37, with plates).

² *Bridgewater Treatises*, VI.

BRACHIOPODA.

I have associated the Brachiopoda with the Mollusca, not because there is any connection between the two groups, which are widely separated zoologically, but because they are, like the Molluscs, of great importance as fossils, and well represented in the Carboniferous fauna.

To the naturalist the Brachiopoda have an archaic and quaint air about them which, I think, gives them a peculiar interest. They have hitherto foiled all attempts to ascertain their exact position in the animal kingdom, but this mystery as to their origin does not rob them of their attractiveness. They were called "lamp-shells" by the old naturalists of about a hundred years ago, on account of a fancied resemblance in their shells, when lying on the larger valve with the beak upwards, to an antique lamp.

The Brachiopoda constitute an isolated tribe or phylum of the animal kingdom having no affinities with the Mollusca, which they simulate in their bivalved shell, and with which they were originally united by Cuvier. One or two striking differences may be pointed out between the two groups; there is nothing comparable in the Mollusca with the tentaculated "buccal groove," forming the characteristic "spiral arms" of the Brachiopoda, whose calcareous supports are sometimes preserved in the fossil state. Moreover, the shell is dorsal and ventral to the animal's axes in the Brachiopoda, left and right in the Lamellibranchiata, the group they most resemble externally. Nor is there any relationship between the Brachiopoda and the Polyzoa (or Bryozoa—"moss-animals," whose remains are found abundantly in the Carboniferous Limestone) from which they differ in having a vascular system, setæ (bristle-like organs) embedded in the skin, a bivalved shell, and in being of a solitary habit, instead of forming aggregations or colonies like the Polyzoa. On the other hand, recent researches point to the relationship of the Brachiopoda to the Annelida, but to discuss the ground for this connection would lead us beyond the scope of the present communication. Like many other classes of invertebrate animals, the Brachiopoda existed in the very earliest age of animal life known to the geologist, that is, the Cambrian, and they flourish still, though in much diminished numbers.

It is a fact to be carefully noted that the most ancient types of these fossils bear the impress of an organization as high as that of their descendants now living. It has been remarked in particular that the specialisation of the muscles, as indicated by their scars in the shells of the earliest genera—*Lingula* e.g.—points to a remote ancestry in pre-Cambrian times of which no traces have been, or, it may be added, are ever likely to be found.

The Brachiopoda reached the acme of their numerical development in the Ordovician and Silurian seas, and after that they gradually declined, though in the Carboniferous period they were still fairly numerous. At present there are very few species, and these are distributed in all seas, tropical, temperate, and arctic. I have myself dredged the Parrot's-bill Rhynchonella (*R. psittacca*), an arctic species, in the Gulf of St. Lawrence.

There are two divisions of the Brachiopoda—those having hinged valves, or Testicardinate Brachiopoda, as *Rhynchonella*, and those having hingeless valves, or Ecardinate, as *Lingula*. A few words as to the animal. The body, which is bilaterally symmetrical, is comparatively small; two folds or flaps, constituting the mantle, spring from it; chitinous bristles (*setæ*) are often implanted in its thickened edge, and from the posterior end (the narrow end in the shell) the stalk or peduncle arises by which the animal attaches itself to rocks or other hard substances on the sea-bottom; and in the case of *Lingula*, this organ is used to draw the animal by its sudden contraction rapidly into its burrow when disturbed. The animal has well-developed muscular, nervous, and vascular systems, but sight is wanting, except in the larva, which has "eye spots." But that these animals are sensitive to light is shown by what Lacaze-Duthiers has related of them. He was watching a vessel containing *Thecidium* (Testicardinates) when, as his shadow fell upon them, they all closed their valves, which had before been gaping open. The shell, calcareous in the hinged Brachiopods, chitinous in some of the hingeless ones, consists in the former of two pieces or valves which are symmetrical in themselves, but one (the ventral) is usually larger than the other (the dorsal), behind which it projects with its pointed or beak-like apex. The beak is perforated, or there is in any

case an aperture above the hinge through which the short stalk or peduncle passes. Internally the hinge at the hinder end of the ventral valve consists of two teeth which fit into corresponding sockets in the smaller valve, and enable the animal to open its shell to a limited extent. Attached to the dorsal valve is a beautiful apparatus consisting of thin calcified "processes," which support the tentaculated and ciliated food-procuring "arms." These arms may be flattened parts of the general body-wall, or the outgrowths of it in the shape of long processes which are coiled or twisted in a remarkable way in different genera, and rest upon their calcified supports. In *Lingula* and *Rhynchonella* the animal can protrude its arms from the shell. The supports or processes generally form a complicated loop, folded back upon itself, as in the existing *Waldheimia* (Testicardiate). The loop is reduced to a much more simple form in *Rhynchonella*, in which the upper part or crura only is developed. In fossil Brachiopods these loops are of great service in classification, but they are often difficult of development. In *Spirifera* and other genera common in the Carboniferous Limestone, the brachial apparatus reaches a highly complicated form of structure, known as the "spiral-cone type." A brachial apparatus does not exist in the hingeless section of the Brachiopods (*Lingula*, *Discina*, &c.)

There are several pairs of muscles in a Brachiopod serving to open and close the valves and to control the movements of the spiral arms. As they leave more or less distinct impressions upon the interior surface of the valves they are of importance to the palæontologist; they are distinguished by names suggestive of their functions; adductors for closing the valves, divaricators for opening them, and so on. Vascular markings are also often seen on casts of shells which are suitably preserved. Davidson figures all these structural marks in his splendid work on the British Fossil Brachiopoda,¹ indispensable to all students of this group. As to their habits, the Brachiopoda are all stationary when adult, but while some attach themselves, as I have said, others, as *Lingula*, form burrows in the sand. Their food consists of minute fragments of animal and vegetable matter, but chiefly diatoms.

¹ Palæontographical Society, 1851-1886.

The range of depth of some species is extraordinary, that of *Terebratula vitrea* (Testicardinate), which has an almost cosmopolitan distribution, being from 5 to 1,450 fathoms. This great vertical range may perhaps be accounted for on the assumption that it was brought about gradually; in some cases perhaps, in slowly sinking areas of the ocean bed, so that the organism had time to accommodate itself to an abyssmal habitat. The Brachiopods are abundant to a depth of about 500 fathoms, beyond this they become scarce, but it must be borne in mind that the amount of the sea-bed explored by the dredge is infinitesimal compared with its whole area.

Among Carboniferous Brachiopods the following are important and characteristic:—*Productus*, *Spirifer*, *Athyris*, *Terebratula*, *Rhynchonella*. First of these in the number and variety of its species is *Productus*, which is an invariable accompaniment of the Carboniferous Limestone wherever this rock may be found. So abundant is it in some beds as to give its name to them; the “*Productus Limestone*” of the Salt Range of the Punjab is a case in point, though it should be stated that this particular deposit forms part of a system of rocks—the Permian—which was laid down subsequently to the Carboniferous, containing, however, fossils (*Productus* amongst them), which are clearly the descendants of Carboniferous species.

The great local accumulation of one kind of shell in the case referred to, and it is not an isolated one, indicates a condition of things not dissimilar from that which is met with at the present day in the vast oyster and mussel beds of our shores.

In the species *Productus giganteus* we have the largest known Brachiopod, some individuals measuring as much as eight inches across. *Productus semireticulatus* is the commonest species, and is easily picked out from among its fellows by means of the beautiful system of thread-like lines covering the surface of the shell and forming a net-work on the upper half (hence the name), where the lines radiating from the beak are crossed by those added to the margin of the shell as it grew, called the “*lines of growth*.” The larger (ventral) valve is convex, the smaller (dorsal) valve concave, leaving apparently very little space for the animal between

them. In *Spirifer* the most striking feature is undoubtedly the spiral cones, already referred to, attached to the smaller valve. These are but rarely seen, though they may sometimes be developed by the rough and ready method of filing away the shell of the *larger* valve. Only shells filled with crystalline calcite will yield good results, to attain which both patience and skill are required.¹ Externally *Spirifers* are generally radiatingly ribbed, but there are also smooth species. The large valve has a median depression, and there is a corresponding elevation in the small one. This is a feature common to many Brachiopod shells. *Athyris*, like *Spirifer*, is a “spire-bearer,” and its spiral cones are similarly constructed, except as to certain details of their loop-like supports. None of the three genera—*Productus*, *Spirifer*, *Athyris*—now exist. *Terebratula* and *Rhynchonella*, however, are represented, though perhaps sparingly, in modern seas; the ancient shells differ but little from their modern descendants. In both these genera the brachial supports are of more simple construction than in *Spirifer* and *Athyris*, consisting only of the loop-like structures.

To geologists the Brachiopods are of great importance, as they not only indicate the marine origin of the beds in which they are found, but also by the persistence of certain species in similar beds enable widely separated deposits to be correlated. The *Stringocephalus* Limestone (Devonian) of the Eifel, for example, derives its name from a Brachiopod which is found in great abundance in it, and by means of which this deposit may be recognized wherever it occurs.

Passing now to the Mollusca, some of the most prevalent genera of Lamellibranchs in the Carboniferous Limestone are *Pecten*, *Aviculopecten*, *Cardiomorpha*, *Conocardium*, and *Edmondia*. The first of these has retained its distinguishing features from its early appearance in the Devonian seas to the present day, and is familiarly known as the “comb-shell” or

¹ An elaborate method of developing the brachial apparatus of Brachiopods was invented and practised with much success by the late Rev. Norman Glass, in which a file, a knife, and some dilute acid were the agents employed. The process is described in the *Memoirs of the Palæontographical Society*, vol. xxxvi., 1882, *Foss. Brach.*, Suppl. vol. v., part I.; copiously illustrated.

“scallop.” Its symmetrical form and beautiful fan-shaped markings led to its use in decorative art from an early period, and it served in the middle ages as a badge for pilgrims to the Holy Land, whence originated *Pecten Jacobæus*, “St. James’s shell.” The hinge-line extends beyond the beaks on either side, forming the so-called “ears,” one of which is generally notched beneath for the passage of the byssus. *Aviculopecten*, whose dual name implies resemblance on the one hand to the earlier form, *Avicula*, and on the other to *Pecten*, belongs to a large group of smooth, or elegantly ornamented shells, the latter generally having radiate sculpture as in the modern shell. Colour-bands are sometimes preserved in these shells, such markings being met with more frequently among fossil shells than is probably commonly supposed. *Aviculopecten* is tolerably abundant in the Carboniferous Limestone of this country.

Cardiomorpha and *Conocardium* have both a certain likeness to the cockle-shell of our shores, hence the word *Cardium* (“heart,” or “cockle-shell”) appropriately enters into the structure of their names. In the first of these the position of the beaks, almost overhanging the anterior end of the shell is a characteristic feature. It is a common shell in the limestone quarries. *Conocardium* is distinguished by a long, shelly, spine-like process, said to have served as a sheath for the siphons, projecting from the posterior end of the shell, or what is, on this hypothesis, held to be such. Without much care the spine gets broken off and left in the rock, from which it is difficult to extract it. The shell is often beautifully and delicately sculptured. Very large specimens have been obtained, usually much crushed, in the rock-ledges on the shore between Malahide and Portmarnock in the County of Dublin. The best preserved specimens have been collected in the County of Limerick; a fine series of them is to be seen in the Museum of Science and Art, Dublin.

Among the Gastropoda *Euomphalus* is very characteristic, abundant, and usually well preserved, its arched construction and rather thick and smooth shell greatly favouring the operation of removing the rock from it. Its neatly coiled shell recalls *Planorbis*, the “pond-snail,” but its whorls have angular, not rounded, margins, and they form on the under side of the spire an unusually deep, funnel-shaped cavity, the

“umbilicus,” caused by the spiral growth of the shell coupled with the very slight overlapping of the lateral portions of the whorls. This construction is well exemplified in a recent shell, well known to conchologists—the *Solarium* of the eastern seas.

In *Pleurotomaria* we have a survivor from the earliest marine fauna long supposed to be extinct till some years ago it was dredged alive off Tobago and in the Japanese seas.¹ This shell has an elegant, conical spire, and there is always a deep notch, or slit in the margin of the aperture corresponding with a band (the filling up of the notch) which encircles each whorl, and is a useful distinguishing mark in the fossil shells. *Naticopsis*, a shell, as the name implies, something like the *Natica* of the present oceans, is often met with in the Carboniferous Limestone. The spire is proportionately very small, and the body-whorl very large and of a rotund form. The shell is generally thick, and is often extracted from the rock intact and showing the most delicate surface markings, as if the shell had just been taken out of the sea. In *Laxonema* the shell has many whorls, very gradually increasing in size, thus giving it a steeple-like aspect. Most of the species have distinct S-shaped lines of growth crossing the whorls obliquely. These suggested the generic name.

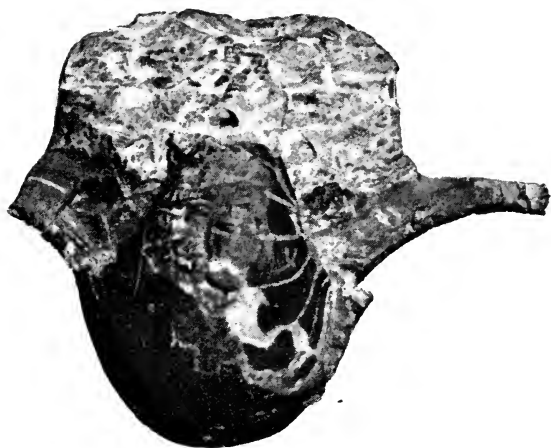
The fossil Cephalopod shells that we are concerned with may be roughly divided into the *uncoiled*, including straight and curved ones, and the *coiled*. Among the former *Orthoceras* is characteristic; its type of structure is essentially that of the *Nautilus* shell, which, if it could be uncoiled and straightened out would match very well the more bulky conical forms of *Orthoceras*. Hence, shells of the class under discussion are called nautiloid, and they belong to a great group or sub-order called the *Nautiloidca*. The salient feature in this group is the simplicity of the “suture-lines,” that is, the edges of the septa where they abut against the walls of the shell. These lines, as seen on a cast from which the shell has been removed, may be more or less distinctly curved, but they never form zigzags, or foliations, as in the group of the *Ammonoidca*, or Ammonite-like shells, presently to be referred to.

¹ A fine specimen of this shell from Japan was exhibited about twelve years ago at the British Museum.

Scarcely less abundant than *Orthoceras* in the Palæozoic seas, and as ancient in its origin was *Cyrtoceras*, whose shell has always some degree of curvature, especially in the younger or apical part of it, and generally expands more rapidly than that of *Orthoceras*. The siphuncle too, instead of forming a simple tube from septum to septum, as in the latter, swells out between them, looking like a string of large beads.

Of the coiled shells there are some that closely resemble the *Nautilus*, with which they were until recently classed. They are now separated under various names which need not be enumerated here. One of them, however, is so interesting and remarkable that an exception must be made in its favour. Let the reader suppose that he has before him the familiar form of the *Nautilus* shell, and that it belongs to the species in which the inner whorls are not quite covered by the outer ones, and hence form a deep cavity on each side of the shell already described as the umbilicus. Let him further suppose that the outer margin of this cavity has a thickened rim, and that this rim is prolonged at the lower edge of the aperture on each side of the shell into a strong flattened spine which juts out at right angles to the shell, giving it quite a formidable aspect. This then with some divergences would stand very well as a picture of our shell which I have called in another place *Acanthonautilus bispinosus*¹ in allusion to its spines. The photographs (Plate 5) will give, however, a better idea of the shell than any description can do. They were taken from the original, which is contained in the Museum of Science and Art, Kildare-street (Annex Room III.) I was under the impression at the time I wrote my description of it that the specimen found at Clane was unique, but it afterwards transpired that the discovery of it in Ireland had been anticipated by several years by a Russian palæontologist who found a similar one in the Carboniferous rocks of the neighbourhood of Moscow, but belonging, as I considered, to a different species from the Irish one. This was a little disappointing, but it added greatly to the interest of the discovery

¹ *Geological Magazine*, Decade 4, vol. iv, April, 1897, p. 147, "On a new genus and species of *Nautilus*-like shell (*Acanthonautilus bispinosus*), from the Carboniferous Limestone of Ireland." For the loan of the figures (Plate 5), I am indebted to the kindness of my friend Dr. H. Woodward, F.R.S., Keeper of Geology in the British Museum (*Nat. History*.)



ACANTHONAUTILUS BISPINOSUS, Foord.
Carboniferous Limestone of Clane, Co. Kildare.



in extending the geographical range of this peculiar Nautiloid and in linking together, as it were, the two most widely separated members of the Carboniferous rocks of Europe.

A variety of coiled shells, some disc-shaped, such as *Discites*, others of an inflated form, such as *Cælonautilus*, accompany those above described, and testify to the richness of the Cephalopod fauna in the Carboniferous seas of the European area, and this holds good also for the American.

Though beginning in the period preceding that of the Carboniferous, viz., the Devonian, the Goniatites are well represented also in the former, and the Irish rocks of this date have a fair share of them. They died out in the Permian period.

The Goniatites are all closely coiled shells of varying form, but essentially disc-like. They possess the zigzag (not simple) suture-line which is one of the distinguishing marks of the *Ammonoidea*, to which great group they belong. The chief interest in them from the palæontological point of view centres in the well founded assumption that they were the precursors, through intermediate types, of the Ammonites which flourished in such vast numbers in the Mesozoic era.

The preceding brief account of some of the commoner types of Brachiopoda and Mollusca found in the Carboniferous Limestone will, it is hoped, lead to a reawakened interest in a branch of science the pursuit of which in this country has been long neglected. There is no part of the United Kingdom which gives better promise of important palæontological results than does Ireland, if the limestone quarries so thickly dotted over the country were duly laid under contribution by local workers and their treasures thoroughly investigated. What has been done in past years may easily be observed by paying a visit to the Museum of Science and Art, in which the Geological Survey, "Griffith," and other collections of Irish Carboniferous fossils are displayed and stored. These represent gatherings from all parts of the country, as a glance at the localities on the labels will show. Valuable additions may be made to these collections by those who will take up the subject and work at it *con amore*. There are several groups that need revision; among them I may mention the Polyzoa, a difficult but very interesting group, and one that will repay

the labour bestowed upon it. There is a certain zest engendered in the hunt for fossils hardly to be realized by those who have not taken part in it. There is the ever present expectation of some new and interesting form being discovered which may open up fresh channels of enquiry relating to the fauna of the district or may even have a relevancy reaching far beyond it. Considerable practice with hand and eye, and some book knowledge are among the most essential equipments of the successful collector. As to books, M'Coy is indispensable; his "Synopsis of the Carboniferous Fossils of Ireland," though defective through the lapse of time, is a storehouse of information, and has become a classic in its way. Published in 1844 under Sir Richard Griffith's inspiration and guidance it reflects the utmost credit upon patron and author. Phillip's "Illustrations of the Geology of Yorkshire, Part II.—The Mountain Limestone" (1836), also contains descriptions of many Irish species. Among foreign works De Koninck's splendid monograph upon the fossils of the Carboniferous Limestone of Belgium¹ must be constantly in the student's hands, as it contains many species found in Ireland, and is admirably illustrated. But to enumerate even the most important works and papers at any length would occupy far too much space.

It will doubtless interest the members of this Club to learn that some progress is being made towards monographing Irish Carboniferous fossils anew. I have myself undertaken the Cephalopoda, by way of making a beginning, and my work is being published by the Palæontographical Society of London, which devotes itself to the publication, with ample illustrations, of the fossils of the British Isles.

¹ Faune du Calcaire Carbonifère de la Belgique, 1880–1885. (*Annales du Musée d'Hist. Nat. de Belgique*, tom. ii, v., vi., viii., xi.)

A BOTANIST IN THE CENTRAL PLAIN :
 BEING NOTES ON FIELD-WORK IN 1897-98.
 BY R. LLOYD PRAEGER, B.E.

(Read before the Dublin Naturalists' Field Club, February 14th, 1899).

DURING the two past summers I have been able to carry out a good deal of the botanical exploration required for the projected Irish Topographical Botany, and this portion of the scheme is now within measurable distance of conclusion. Two more seasons of work, with a continuation of the generous assistance which I have received from various quarters, will, I trust, sufficiently advance the completeness of the county-lists to warrant publication. Meanwhile I would again remind my fellow-botanists that any one of them can render most useful service by sending me definite records of *any* plants from *any* county, with localities, finder's name, and as recent a date as possible. Perhaps a brief account of my last two seasons' work may be of interest to readers of the *Irish Naturalist*. Portion of the results, so far as they affect the question of plant-distribution in the twelve Districts of *Cybele Hibernica*, has already appeared in these pages (*ante*, pp. 7-13). If some of these records are repeated below, it is with the object of emphasizing the features of the flora of the districts traversed, and of conveying an idea of the fortunes that attend the botanist in those regions. My object was to obtain, with the smallest possible expenditure of time, a comprehensive list of the flora of each county or vice-county. Every kind of ground, therefore, which was to be found in each division—wood, pasture, bog, gravel, swamp, mountain, river, cliff, or lake—had to be sampled. Promising ground, needing careful working, had often to be passed over with merely a preliminary examination. The result was (as indeed was required) long lists of plants, but including few rarities.

1897.

The season of 1897 opened with a preliminary visit in May to Carlow and Kilkenny, a day being spent in the granite country at Bagenalstown, and a day on the limestone at Kilkenny.

Vicia angustifolia, very rarely seen away from the sea, turned up at Bagenalstown, and near Kilkenny *Draba muralis*, growing luxuriantly on a ruin in the middle of a pasture field. A ramble by the Nore below the town showed *Carex pendula* and *C. paludosa* growing very tall, *Ranunculus pseudo-fluitans* in the river, and *Campanula Trachelium* under thickets of Dogwood, which looks quite wild here, growing among Hazel, Guelder-rose, and Spindle-tree. The season was too early for the making of long lists, and the result of the two days was 232 species for Carlow and 225 for Kilkenny. A couple of days were next spent in the Clonmel neighbourhood, to check off the spring plants of Waterford and South Tipperary. Working from Clonmel towards Fethard, *Linum angustifolium* and *Geranium columbinum* were seen on limestone rocks, and *Potamogeton coloratus* in pools. At the picturesque little town of Fethard the var. *crenatum* of the Scale Fern was particularly fine; *Torilis nodosa* grew by roadsides, and the pastures were purple with the immense profusion of *Orchis Morio*, which occurred in every tint from deep purple to white, the pale pink forms with light green veins being particularly beautiful. From this pretty and interesting limestone country I passed next day into the Old Red Sandstone hills of Waterford, on the opposite side of the Suir. The flora here was much poorer, and my list smaller by a hundred species than that made the previous day.

June 5 found me at Loughrea, where *Cystopteris fragilis* grew by the roadside, and *Chara polyacantha* in the lime-saturated waters of the lake. The woods of Dalystown were explored in company with the Hon. R. E. Dillon, and yielded among other things, *Festuca sylvatica* and *Luzula vernalis*, both new to District VI., also *Habenaria albida*, and *Equisetum variegatum* var. *majus*. The lake near Marble Hill, where we stayed, was fringed with *Cladium* and *Carex filiformis*—characteristic plants of the Central Plain swamps.

Three June days were passed at Mountrath, working the southern slopes of Slieve Bloom. The first, spent along the fertile banks of the Nore, yielded little that was uncommon. The second, a day of storm, mist, and rain, was devoted to a 35-mile tramp across the range into King's County and back. Entering the mountains by the Killeen River, the influence

of the hills soon made itself felt in the appearance of *Lastrea Oreopteris*, *L. æmula*, *Habenaria albida*, *Botrychium Lunaria*—also in torrents of rain. The valley narrows in the upper part, forming a fine mountain glen, with steep sides scored by ravines. Here several welcome mountain plants turned up—the Welsh Poppy, in profuse flower, the Beech Fern, and Wilson's Filmy Fern, the second new to District III. The ascent of Arderin (1,733 feet), the highest point of Slieve Bloom, was made in dense mist and driving rain. *Listera cordata* was found in both Queen's and King's Counties, being an addition to the flora of VII. I was glad to get down into the glens on the King's County side, where *Betula glutinosa*, unrecorded for VII., grew native. Thence a stream was followed down to Longford, and I went along the northern base of the mountains (noting *Equisetum hyemale* on the way) to Kinnity, where a remarkably picturesque road led steeply upward into the hills again, and back across the wide moors of Slieve Bloom to Mountrath. The third day was spent northward of Mountrath, where some interesting *Carduus* hybrids turned up, and *E. hyemale* again; also *Festuca Myuros* growing abundantly on a wall on the outskirts of the town.

Three days later I took up my head-quarters at Boyle, to explore the group of lakes—Lough Key, Lough Arrow, and Lough Gara—which lie around that town, in the counties of Roscommon and Sligo. This was done at Mr. Colgan's suggestion, in answer to a question as to what region I could most usefully examine for the purposes of the new *Cybele*. My especial enquiry was directed towards the possible occurrence in these head-waters of the Shannon of any of the remarkable plants which characterize its lower course—*Inula salicina*, *Teucrium Scordium*, *Chara tomentosa*, &c. I may say at once not one of these was seen. The first day was spent in a circumambulation of the lovely Lough Key. The best ground found was a mixture of swamp and wood at the northern end, where grew *Thalictrum flavum*, *Lathyrus palustris*, *Myriophyllum verticillatum*, *Valeriana Mikanii*, *Utricularia intermedia*, *Cladium*, *Carex acuta* (new to IX.), *C. filiformis*, and *C. paludosa*. Next day an early train was taken

to Ballymote, and I turned my steps towards where Keishcorran (1,163 feet) towered over the plain. Limestone cliffs on the ascent yielded *Cornus sanguinea*, unrecorded from District IX. Nearer the summit were *Asplenium viride* and *Cystopteris fragilis*, and on the crowning carn grew *Draba incana*, *Geum vivale*, and *Saxifraga hypnoides*. Most of these were seen on Keishcorran by F. J. Foot some forty years ago. I pushed on over the most interesting mountain of Carrowkee (1,062 feet), intersected as it is with huge parallel cliff-walled ravines, and every eminence crowned with a chambered carn. Here most of the above-named plants turned up again. Thence down steeply to Lough Arrow, which lay spread like a map below; but its western shores yielded little, and I crossed the boggy Curlew Mountains and descended into Boyle with its rushing river and beautiful abbey. A long day was next spent round Lough Arrow, with no startling results. *Carex curta* was added to the flora of District IX. Lough Arrow is a lovely lake, with exquisite surroundings and water of wonderful clearness. Finally I tramped down the western side of Lough Gara, a desolate sheet of water, bordered with poor arable land and with vast bogs, where *Carex limosa* and Cranberries grew. *Galium boreale* was the only interesting lake-side plant. The lake is curiously shallow, though extensive, and the water impure. Crossing a little corner of E. Mayo, a very primitive ferry took me over the Lung River into Roscommon, where a deserted road led across a vast bog—a green line through the brown wilderness, with a rank luxuriant fringe of *Carex teretiuscula* filling the drain on each side. I found shelter that night under the hospitable roof of Dr. Douglas Hyde, and next day worked back along the eastern or Roscommon shore to Boyle.

On July 18–19 I worked at my Kildare list, the district visited being the neighbourhood of Kildare itself—not an inviting country, yet it proved distinctly interesting. Walking southward from Kildare I entered a region of flat swampy ground, with a peculiar flora. Orchids were present in enormous profusion—sheets of *Habenaria conopsea* and *Orchis maculata*, filling the air with their perfume, and less abundantly *O. incarnata*, *O. pyramidalis*, *H. bifolia*, *H. viridis*, and *Epipactis*

palustris. *Juncus obtusiflorus* was also present in immense quantity, and the pools in which it grew harboured *Utricularia intermedia* (a good addition to District V., being very rare so far east in Ireland), *Ranunculus Godronii*, and *Chara polyacantha*. Further south, near Nurney, *Rhamnus catharticus*, *Trifolium medium*, and *Ranunculus Drouetii* were gathered, and as I approached Athy in the evening *Stachys ambigua*, *Potamogeton densus*, and *Chærophyllum temulum*. After a night spent in one of the worst hotels I ever came across in Ireland, I took an early train to Kildare, and walked over the Curragh—a barren place for the botanist, but on the race-course near the grand stand *Trifolium filiforme* was detected growing in the short turf, and *Cerastium tetrandrum* in gravelly places. I made for the great gravel-pit through which the main line of the G. S. W. Railway runs, and here an interesting lot of colonists and casuals awaited me. Among them were *Arenaria tenuifolia* in abundance, not previously found in Ireland; *Orobanche minor*, *Linaria viscida*, *Calamintha Acinos*, *Coronopus Ruellii*, *Alyssum calycinum*. After an hour spent under a railway wagon owing to a torrent of rain, I went on to explore the extensive marsh that lies to the north of the gravel-pit. I had often looked at this from the train, and wondered what gave it its dark brown colour. Great was my surprise to find that this was caused by hundreds of fruit-stems of *Cladium*, which grew in a forest five feet or more high over an area of half a square mile—a larger quantity of it than I have ever seen in the west, where it is common, whereas so far east as Kildare it is very rare. With it and equally abundant was *Juncus obtusiflorus*, and among the undergrowth *Galium uliginosum*, also very rare so far east, *Epipactis palustris*, and the rare *Eriophorum latifolium*, new to District V.

The following week-end was spent at Ardee, working up the Louth flora. One day was devoted to Ardee bog, and one to the bog at Braganstown. Walking from Castlebellingham station southward, *Orobanche minor* and *Diplotaxis muralis* were seen by the railway-line. Braganstown bog, well known as sheltering the largest colony of the Royal Fern to be found on the eastern side of Ireland, proved rather poor. *Potamogeton coloratus*, rare off the limestone, and here near the northern

limit of its range, was noted, and *Carex paludosa*, with many commoner plants; *Valerianella Auricula* grew in cultivated land hard by. By the River Dee at Kearney's Cross a group of marsh plants included *Stellaria palustris*, *Cenanthe fistulosa*, and *Lysimachia vulgaris*. Ardee was reached late in the evening. Ardee Bog, visited next day, used to be very extensive, but much of it is now cut away. An arm of it extends into Meath, and here *Cladium* turned up. On the Louth side grew *Carex teretiuscula*, rare in east Ireland, and in the numerous drains *P. coloratus*, *Myriophyllum verticillatum*, *Cenanthe fistulosa*, and quantities of the Frog-bit in full flower. Louth is essentially the head-quarters of that plant in Ireland. A patch of limestone close to Ardee betrayed its presence by *Centaurea Scabiosa* and *Orchis pyramidalis*, the former here reaching its northern limit in Ireland.

August 1 saw me tramping southward from Maryborough towards Cullenagh, the highest (1,045 feet) of the hills of southern Queen's County. *Eleocharis acicularis* and *Drosera intermedia* turned up on the way, the latter an addition to the flora of District III. A wooded glen on the northern slope yielded *Festuca sylvatica*, another addition to the flora, and the only plant of interest on the hill. I descended into the quaint village of Timahoe, with its esker-ridges and round tower, and north of it found *Cynoglossum* in a gravel-pit—a plant which very seldom appears inland in Ireland. Stradbally furnished me with excellent quarters for the night. Next morning I worked north-east, struck the Barrow canal near Ballymanus, and followed it northward. Near Grattan aqueduct *Carex Edecri* and *Potamogeton densus* grew, the former a new record for III. The weather was stiflingly hot, and at Monasterevan the temptation to botanize in the clear waters of the canal was irresistible. Thence I followed the canal westward towards Portarlinton, getting the usual bog and canal flora of the Central Plain. A detour was made to the G. S. W. R. line to gather a Hawkweed-like plant that I had observed on more than one occasion growing in abundance on the banks and cuttings, and it was a surprise to discover that this was *Picris hieracioides*, a plant not seen in Ireland for many years, and hitherto occurring only as a casual. It grows in profusion here for a distance of two miles along the railway.

An odd day a week later was spent in the extreme north of Meath, between Nobber and Kilmainham. *Valerianella Auricula* and *Galeopsis versicolor* grew in cultivated land at Cruicetown; these, with *Sparganium affine* and *Lysimachia vulgaris* at Whitewood Lough, were the only noteworthy plants observed.

On August 14 I went to Sligo, and had several very pleasant days botanizing along the coast, the flora of which was but little known. What remained of the day of my arrival was spent in working from Sligo to Rosses Point, with fair results, *Arctium nemorosum*, *Scirpus Tabernaemontani*, and *Carex muricata* being found for the first time in District IX. On the 15th I cycled to Bundoran, and returning carefully listed the maritime plants of Leitrim, which has a coast line of just three miles. The dunes and salt-marshy meadows at Mullaghmore added a good many species to my Sligo list, and a halt at Drumcliff in the dusk added *Trifolium fragiferum* to the flora of IX. Next day the falls of Ballysadare were visited, and a course made along the salt-marshes that surround the muddy head of Ballysadare Bay. Working along the northern shore, the flora included *Enanthe Lachenalii*, *Juncus obtusiflorus*, *Scirpus rufus*, *Potamogeton flabellatus*, and *Ruppia rostellata*, the last two being additions to the flora of IX. *Ruppia* grew not only in brackish pools, but out on the fore-shore, where it covered several acres of tidal mud-flats—an unusual habitat. Further west, on an ivy-covered rock that rose on the edge of the beach, *Orobanche Hederæ* was flourishing. Pushing on between the towering cliffs of Knocknarea and the sea, *Festuca rostelloides* was noted on a wall near Culleenamore House, and a couple of hours were spent on the desolate sand-hills, not much brightened by the rayless variety of the Ragweed, which face the Atlantic below Strandhill. There is a striking difference between the maritime flora of the east and west coasts. Here in Sligo we find no Sea Holly, Sea Bindweed, Horned Poppy, or Sea Spurge. No Viper's Bugloss brightens the dunes with its brilliant blue; no Houndstongue fruit seeks the friendly shelter of one's stockings. The despondency consequent on absence of plants and the

presence of heavy rain drifting in off the Atlantic was lightened by the arrival of Mr. G. P. Farran, in whose company I came back through Strandhill—gathering *Agri-
monia odorata*, new to IX.—and climbed the northern cliffs of Knocknarea; and after a brief losing of bearings on the flat summit, owing to heavy mist, we duly arrived at the stupendous caru. *Sesleria cærulea* was abundant on the way up, and on the caru grew *Draba incana*, *Cerastium tetrandrum*, *Geum rivale*, *Saxifraga hirta*, the last-named being new to District IX. Mr. Farran subsequently sent me *Aplenium viride* from the mountain. Being now both of us well drenched, I willingly accepted my companion's proffered hospitality, and passed the night at Culleenamore. Next morning I visited the remarkable limestone fissure S.E. of Knocknarea, where *Festuca sylvatica*, new to IX., grew among groves of Hart's-tongues three to four feet in height. A second ascent of the mountain yielded nothing of special note, and an afternoon train was taken for Dublin.

The botanizing season was now nearly over. A day spent at Wicklow yielded *Zannichellia pedunculata*, previously known in Kerry alone, and *Potentilla procumbens*, new to Wicklow; and a few days at Dunmore in Waterford brought work to a close.

1898.

A stormy Easter spent on Achill Island enabled me to list 120 species for West Mayo, including *Ranunculus Lenormandi*, new to the province of Connaught, and three days in May spent in arranging the Field Club Conference excursions at Kenmare supplied a list for South Kerry. On the evening of June 11 I went to Longford, and next day covered twenty-five miles to the north of the town, including a visit to Carn Clonhugh (912 feet) the highest hill of this flat and uninteresting county. *Botrychium* and *Lycopodium clavatum* were the only uncommon upland plants observed; *Myosotis repens*, *Carex acuta*, and *C. pallescens*, all additions to District VII., grew near its base. *Crepis biennis* was perhaps the rarest lowland species. Next day I worked southward along the canal, and back across an extensive bog at Trilliekacurry. *Sagittaria*

was in the canal, and in marshes near by a good characteristic flora, including *Carex teretiuscula*, *paniculata*, *stricta*, *laxigata*, and *paludosa*. The bog yielded its unvarying complement—*Drosera anglica*, *Vaccinium Oxycoccus*, *Andromeda*, and *Rhynchospora alba*. As regards the formation of a county-list—my sole object—the trip was not unfruitful. 294 species were listed on the first day, and 42 additional on the second, which, adding plants brought home for examination, gave a list of about 350 species for two days' work. I doubt if 100 species are definitely on record for the county as I write.

On June 18 I opened a pleasant and interesting ten-days' work in the Shannon basin. The first day was spent west and north-west of Athlone, in Roscommon. There is a good deal of gravel here, which yielded such plants as *Papaver Argemone*, *Arabis hirsuta*, *Cerastium tetrandrum*, *Arenaria tenuifolia*, *Matricaria Chamomilla*, *Carduus pycnocephalus*, *Crepis taraxacifolia*, and *Linaria viscida*. On a small bog near by *Rhynchospora fusca* was abundant, and on bog-margins *Ophrys apifera*, *Cladium*, *Carex teretiuscula*, and *C. Pseudo-cyperus*. I struck the Shannon just where it widens into Lough Ree, and here came immediately on the characteristic flora of that great river—*Lathyrus palustris* in beautiful flower and great abundance, *Lastrea Thelypteris* (not included in Barrington and Vowell's Report on Lough Ree), *Galium boreale*, *Epipactis palustris*, *Teucrium Scordium*, *Carex filiformis*, *C. stricta*, *C. vesicaria*, *Chara tomentosa*, &c. Next day I took the Westmeath side, and worked along the margins of Coosan Lough and Killinure Lough, both being arms of Lough Ree. *Lathyrus palustris* turned up again a little above Athlone, and in fields *Lithospermum arvense* and *Galium erectum* (new to VII.). The shores of Coosan Lough yielded very fine *Lastrea Thelypteris*, *Galium uliginosum*, *Hydrocharis*, *Ciuta*, *Chara tomentosa*, and many other good plants. Killinure Lough proved less attractive, but here again were quantities of *Lastrea Thelypteris*, and all the other plants of Coosan Lough. I came back by an inland road, and on a bog near Twy Lough got plenty of *Rhynchospora fusca*, a valuable addition to the flora of District VII. This day supplied a list of 350 species for Westmeath. Next morning I joined Mr.

Kane and Mr. Dillon at Attymon, and we went to Loughrea, but a day round the lake there was much interfered with by rain. The evening found us in the gamekeeper's lodge at Dalystown, six miles to the southward. The 21st was devoted to the Dalystown woods, visited last year. Some additional plants were obtained, including *Milium* and *Equisetum hyemale*, neither previously known in District VI., and *Thalictrum collinum*. Early next morning I drove to Woodford, and started down the river towards Lough Derg. *Sisyrinchium angustifolium* put in an appearance almost immediately, and further on whole meadows were painted with its blue starry blossoms and yellow-green foliage. The Lough Derg shores were worked from the mouth of the Woodford River to the north-western corner, where a large and sluggish stream flows in. The flora was interesting and characteristic. *Thalictrum collinum*, *Drosera anglica* and *intermedia*, *Rhamnus catharticus*, *Galium borcale* and *uliginosum*, *Myriophyllum verticillatum*, *Inula salicina*, *Utricularia intermedia*, *Juniperus communis*, *Ophrys apifera*, *Epipactis palustris*, *Rhynchospora fusca*, *Carex filiformis*, *Cladium*, *Sesleria*, *Chara tomentosa*, and so on. Coming back, *Rhamnus Frangula* and *Prunus Padus* occurred in a wet wood a couple of miles east of Woodford. Pushing on to Portumna, next day was spent on the Galway bank of the Shannon above the town. Here grew *Lathyrus palustris*, *Stellaria palustris*, *Sium latifolium* (common all along the Shannon), *Galium uliginosum*, *Lcontodon hispidus* (new to VI.), *Ophrys apifera*, *Hydrocharis*, and many other characteristic plants. On the following morning I broke ground for the first time in North Tipperary. Crossing the Shannon, the terminus of the derelict railway was passed, where *Arenaria tenuifolia* and *Linaria viscida* were flourishing. The river-bank along by Portland House yielded the usual flora, and a double to the south brought me to Friar's Lough, where *Rhamnus Frangula* grew in profusion, also *Ophrys apifera*, *Tragopogon pratense* (rare so far west), and other plants. Reaching Lough Derg near Ballyeiragh, the full lake-shore flora at once appeared, including *Geranium sanguineum*, *Inula salicina*, and *Sesleria*. On June 25 I took steamer to Banagher, and started eastward for Lough Goura,

King's County. On the way *Linaria viscida* and *Erysimum cheiranthoides* were noted by the roadside, and *Rhynchospora fusca* turned up again in abundance. Lough Goura proved to be an extensive and promising swamp, which I waded slowly across, adding many plants to my King's County list, such as *Galium uliginosum*, *Epipactis palustris*, *Cladium*, *Utricularia intermedia*, *Carex limosa*, *C. filiformis*, *C. stricta*. Next day I worked northward along by Shannon Harbour. *Arenaria tenuifolia* grew on the railway line, *Rhynchospora fusca* on the bogs, *Stellaria palustris*, *Galium uliginosum*, *Bidens tripartita* (new to VII.), *Carex Pseudo-cyperus*, &c., &c., in the swamps, *Eleocharis acicularis* and *Tolypella glomerata* in the canal. The morning of the 27th brought me home again. My impressions of the Shannon valley were very pleasant. The great expanse of country, with a distant rim of hills—the broad slow river with its high fringe of reeds—the rich flat meadows, tinted with Purple and Yellow Loosestrife, and Meadow-Sweet and Meadow-Rue—the great brown bogs, where Curlews and Plovers called incessantly—the grand lake-like expanses of Ree and Derg, with their stony limestone shores decked with rare plants—all combined with cool weather, and summer showers hanging like grey curtains in the bright sky, formed memories that will not be easily effaced.

On the morning of July 3 I went to Ballybrophy, to finish my survey of Queen's County by walking fifty miles eastward across the southern portion of the county. Passing Rathdowney, *Equisetum hyemale* was the only uncommon plant observed till I reached the extensive marshes of the Erkina River above Durrow. There I waded and floundered for some time, but with unexpectedly poor results, and the best plant was *Trifolium filiforme*, found as I sat on the edge of the marshes wringing the water out of my clothes. Passing a mile north of Durrow, *Festuca Myuros* was found growing abundantly on a roadside wall, and a tramp in the dusk brought me to the comfortable inn in the pretty village of Abbeyleix. A pre-prandial stroll next morning revealed *Ophrys apifera*, *Filago germanica*, and *Linaria viscida* in the neighbourhood, the last named on railway ballast, as usual. My route on this day lay over the high cultivated Coal-

measure country to Carlow—a striking change to the extensive woods and marshes of the Erkina valley, traversed the day before. The Coal-measure flora proved exceedingly poor, as was expected; but *Salix Smithiana* was an addition to District III., and several calcifuge species were noted that filled blanks in my county list. The descent from the Coal-measure plateau into the rich valley of the Barrow, with the Wicklow mountains beyond, offers one of the loveliest prospects in Ireland. I arrived at Carlow in time to complete a thirty-mile day by pushing northward along the Queen's County bank of the Barrow, where *Chærophyllum temulum*, not previously in my list, grew in wonderful profusion mile after mile, and *Rhamnus catharticus* was noted in the hedges. At Maganey I caught the evening train to town.

The arranging and carrying out of the Field Club Conference at Kenmare now made a serious interruption in botanical work, but on July 16 I got away, and did a long tramp through the central part of Kildare, by Rathangan and Robertstown—not an interesting country. *Ranunculus circinatus*, *Myriophyllum verticillatum*, *Galium uliginosum*, *Potamogeton densus*, and *Tolypella glomerata* were the best plants found.

On July 17 I took up quarters at Thurles for a brief survey of both divisions of Tipperary. The first day was spent in working some marshes and bogs lying north of the town, in lightning and awful downpours of rain, which did much damage in the district. The usual Central Plain marsh flora turned up, and on a bog at Barracurragh *Rhynchospora fusca*. Next morning I took train to Goold's Cross, and went S.E. towards Fethard. *Galium uliginosum* and *Myriophyllum verticillatum* were seen as I crossed the Suir; and then, through Cashel, with its famous ruins, and for many miles beyond, the route lay through country tilled beyond all hope for the botanist, so that a small marsh near the road was eagerly pounced upon. It yielded *Utricularia intermedia* and *Carex teretiuscula*, both new to District II., *Chara polyacantha*, and many other additions to my South Tipperary list. The picturesque little town of Fethard was reached as darkness fell. Next day I went north, getting very fine *Potamogeton densus* by the railway, and a pass led through swelling hills out into a vast stretch of bog country, where my list was

speedily reinforced by the full bog-flora, including *Andromeda*, new to District II. *Erysimum cheiranthoides*, growing by the roadside far out in the bog, was an unexpected addition. As I pushed on, the country assumed by degrees a sylvan aspect, and Thurles came again in view. *Sparganium affine* was gathered in the river close to the town. The fourth day I worked from Templemore over the Devil's Bit and Knockanora—ribs of Old Red Sandstone that break through the crust of Carboniferous rocks. The cliffs and slopes yielded a calcifuge flora of ordinary type, with a few upland species, such as *Habenaria albida* (new to District VII.) and *Lastrea Orcopteris*.

Next I turned my attention to the fair county of Kilkenny, and chose Thomastown as a centre—a quaint and interesting place, situated on a pretty bend of the Nore. The flora here, where the Nore winds through undulating limestone and slate county, was clearly richer than that of the Central Plain. I was in the home of *Campanula Trachelium*, which lightened the copses by the river. *Verbena*, *Stachys arvensis*, *Erigeron acre*, *Malva moschata*, *Allium vineale*, *Orobanche minor*, *Cornus sanguinea*, *Euphorbia exigua*, *Potamogeton densus*, now put in an appearance, many of them in abundance. The first day was spent within a few miles of Thomastown. *Potamogeton Zizii*, *Valerianella Auricula*, *Salix triandra*, *Scirpus pauciflorus* represented additions to the flora of District III. The woods on the steep river-banks yielded *Orobanche Hederæ* and *Milium*. *Festuca Myuros* was abundant on every old wall. On the second day I took train to Mullinavat, and made for Lough Cullen, apparently the only lake in the county. I was well rewarded by a large access of plants to the Kilkenny list, including *Typha angustifolia*, which had no station south of Co. Down, though it formerly grew near Dublin. *Nasturtium palustre*, *Apium inundatum*, *Bidens cernua*, *B. tripartita*, *Sparganium simplex* and *minimum*, *Potamogeton obtusifolius*, *Scutellaria minor*, *Pinguicula lusitanica*, represent the flora of the marshes and ditches around the lake. Then I cut across for the River Suir, and worked its banks for a few miles above Granny. A full salt-marsh flora was listed, including *Cochlearia anglica*, *Cenanthe Lachenalii*, *Apium graveolans*, *Trifolium fragiferum*, *Carex distans*, *Lepturus filiformis*, the last three additions to District III. *Dipsacus* was abundant on

dry banks, and *Calamintha officinalis* on a limestone bluff. Next day I went through oak woods down the lovely Nore valley to below Inistioge, and then across an upland slate country to the granite mass of Brandon (1,694 feet), the highest hill in Kilkenny. On the ascent *Hypericum elodes*, *Jasione*, *Scutellaria minor*, *Eleocharis multicaulis*, *Osmunda*, were noted, and higher up *Ranunculus Lenormandi*, new to District III. The summit yielded nothing of interest—except a view of wide and varied beauty—and I descended to Graiguenamanagh. Recrossing the range of hills to Thomastown, *Myosotis repens* (new to III.), *Lastrea Orcopteris*, and *L. æmula* were noted at Barleeagh Wood. Next day I went by train and car to Urlingford, in the extreme north-west corner of the county, for there alone, maps told me, did bog occur. South of Urlingford are wide marshes, northward extensive bogs. Both yielded their quota of plants; the former (adding some boggy ground near Johnstown subsequently explored) *Viola canina* (new to III.), *Myriophyllum verticillatum*, *Epipactis palustris*, *Juncus obtusiflorus*, *Carex teretiuscula* (new to III.), *Selaginella*; the latter *Drosera anglica*, *Andromeda*, *Vaccinium Oxycoccus*, *Rhynchospora alba*, *Lastrea spinulosa*—all additions to my Kilkenny list. The rate of progress of this, a typical county list, may be of interest to those engaged in similar work:—1st day (May 19, 1897), 225 species; 2nd day (July 30, 1898), 125 additional; 3rd day (July 31), 65; 4th day (Aug. 1), 34; 5th day (Aug. 2), 20; total for five days' work, 469 species, to which must be added twenty or thirty critical plants not yet named. Were a list of equal size in existence for each county-division, *Topographical Botany* might be published almost at once.

A week later I went to Carlow—like Kilkenny, a county almost devoid of bogs or marshes, lakes or mountains; and consisting chiefly of tilled, granite country. I had the fortune to light on a strip of marshy ground on the limestone south of Carlow town, which yielded a number of desiderata—*Viola canina*, *Myriophyllum verticillatum*, *Galium uliginosum* (new to III.), *Epipactis palustris*, *Juncus obtusiflorus*, *Sparganium minimum*, *Potamogeton coloratus*, *Cladium*, *Carex filiformis*, *C. paludosa*. A gravel-bank added *Erigeron acre*, *Gentiana Amarilla*, and *Calamintha*

Acinos to these. At Milford *Linum angustifolium* was seen, and *Arenaria tenuifolia* and *Linaria viscida* on the railway. Near Leighlinbridge *Cynoglossum officinale*, very rare inland, was abundant on a gravel ridge; *Calamintha officinalis* by the roadside, with *Caucalis nodosa* (new to III.), *Orobanche minor* in fields, and what was more unexpected, *Trifolium fragiferum* in a pasture by the canal. Proceeding to Borris early next morning, on the road for Mount Leinster *Papaver Argemone*, *Stachys palustris* × *sylvatica*, and near Killedmond *Cystopteris fragilis* and *Orobanche minor*, with very fine crenatum forms of *Ceterach*, were seen. Mount Leinster was swathed in cold, heavy mist. I noted *Lastrea Orcopteris*, *Ranunculus Lenormandi*, *Hypericum elodes*, *Pinguicula lusitanica*, &c., near the base, and stumbled up through the thick clouds to the summit (2,610 feet). Examining the steep eastern slope, plenty of *Saxifraga stellaris* was found, an alpine missed here by previous explorers, and a very satisfactory addition to the District III. flora. The plant grows on both the Carlow and Wexford sides of the county boundary. Next day I went by train to Ballywilliam, and worked down the Pollmounty river, which here bounds Wexford and Carlow, through a fine glen to the Barrow. *Scutellaria minor*, *Osmunda*, *R. Lenormandi*, *L. amula*, grew in both counties. On the Carlow side, where this stream joins the Barrow, were *Stellaria palustris*, *Trifolium fragiferum* (the only sign of tidal influence), *Cenanthe fistulosa*, and *Salix triandra*. Thence the lovely scenery of the Barrow solaced me to near St. Mullin's, where a welcome patch of bog added to the Carlow list *Andromeda*, *V. Oxycoccus*, *Rhynchospora alba*, *Carex limosa*, *Lastrea spinulosa*. At St. Mullin's grew *Filago minima*, unrecorded for District III., and by the river above it *Campanula Trachelium*, *Milium*, and *Equisetum hyemale*. Pushing on up the Barrow, *Lemna polyrrhiza*, new to District III., was seen in a ditch, and *Lysimachia vulgaris*. An evening walk back to Borris finished my Carlow trip.

Carlow and Kilkenny differ from the typical country of the Central Plain in their undulating surface and steep river-escarpments, in the presence of slate and granite, and the rarity of bogs and marshes. The flora varies accordingly. Characteristic Central Plain species, such as *Myriophyllum*

verticillatum, *Epipactis palustris*, *Juncus obtusiflorus*, *Potamogeton coloratus*, *Scirpus pauciflorus*, and *Carex teretiuscula*, are very rare, and instead a number of plants of dry soils make their appearance—*Arabis hirsuta*, *Coronopus didymus*, *Malva moschata*, *Centaurea Scabiosa*, *Verbascum Thapsus*, *Ononis arvensis*, *Cotyledon*, often in abundance. The feature of the flora most deeply impressed on my mind is certainly the abundance of the rare *Festuca Myuros*. In the new *Cybele* the only record for District III. is Ferrybank (the extreme southern corner), Marshall and Shoobred, 1896. It is strange how this grass so long remained unnoticed. It is common in many places from end to end of both counties.

The totals as regards list-making in Carlow followed closely those for Kilkenny, 232, 123, 44, and 27 species for four days' work; total 426, plus critical plants. I look forward to publishing *Topographical Botany* when 500 species or over are on record for each of the forty Irish vice-counties.

I took advantage of the Dublin Field Club excursion to Enniscorthy on August 13 to list a couple of hundred plants for Wexford, and on the 14th put in my last day's work along the ridge of low hills that divide Kildare from Wicklow, near Blessington. A group of calcifuge species that flourished here, *Spergula*, *Digitalis*, *Lepidium hirtum*, *Jasione*, *Aira flexuosa*, *Athyrium*, &c., were additions to the Kildare list; and the last find of the season was the addition of *Galium uliginosum* to the flora of Wicklow and of District IV.

POSTSCRIPT.—Since the above was written, I have received from Messrs. Groves and Arthur Bennett a number of critical plants collected on the trips referred to above, which they have kindly named for me. Among them, the following appear to constitute new district-records:—

Fumaria confusa, Jord.—III. KILKENNY—Granny.

F. Boræi, Jord.—III. CARLOW—near St. Mullin's.

Potentilla procumbens, Sibth.—II. S. TIPPERARY—by the Suir near Goold's Cross. III. CARLOW—Killedmond.

Valeriana Mikaniæ, Syme.—VII. KING'S CO.—Lough Goura.

Myosotis collina, Hoffm.—III. CARLOW—on walls at Bagenalstown. With the exception of the Lough Neagh shores (where several maritime plants grow) the only inland station in Ireland.

- * **Euphorbia cyparissias**, L.—V. KILADRE—several large patches on railway banks at the Curragh, far from any house.
- Potamogeton flabellatus**, Bab.—III. CARLOW—in the Barrow below Graiguenamanagh. IV. WEXFORD—brackish pool north of Courtown Harbour; this was recorded under the aggregate name of *P. pectinatus*, L., in *Irish Naturalist*, III., 241.
- Carex muricata**, L.—VII. N. TIPPERARY—near Friar's Lough, Portumna.
- Chara vulgaris**, L., var **longibracteata**, Kuetz.—III. KILKENNY—pool near Granny.
- C. fragilis**, Desv., var. **barbata**, Gant.—III. KILKENNY—Urlingford. QUEEN'S CO—Rathdowney. V. KILDARE—canal east of Rathangan.

NOTES.

The following resolution was passed by the Cork Naturalists' Field Club at their meeting on February 2:—That the best thanks of the C.N.F.C. be given to the Editors of the second edition of *Cybele Hibernica* on the completion of a volume so necessary to Irish Botanists.

We would refer our readers who desire an illuminating discussion of important points connected with the structure of this country to the series of articles from the pen of Prof. Cole which have appeared in *Knowledge* during the latter half of last year.

The Belfast Club has inaugurated a "Science-gossip half-hour" on each night of meeting, preceding the formal business. This furnishes an opportunity for informal discussion, for inquiry, and for interchange of ideas, and should prove most beneficial. The same object is served by the tea half-hour at the Dublin Club.

We have received the Reports of the Moss Exchange Club for 1896, '7, and '8. This Society, founded by the President of the Belfast Field Club, appears to have embarked on a prosperous and useful career, and we congratulate Mr. Waddell on the success of his undertaking. The formal reports are accompanied by critical notes on many of the plants sent in.

The only item in the recently-issued *Report and Proceedings* of the Belfast Natural History and Philosophical Society for 1897-98 bearing on Irish natural history is an abstract of Mr. Robert Young's paper on some recent deep borings for water at Belfast. Records of this kind are of much importance, and are far too often overlooked. Mr. Young gives the results of fourteen deep borings, mentioning the strata passed through, and the amount of water obtained. Unfortunately the borings were not watched over constantly by a scientific man—it is difficult to arrange that they should be—and in consequence the geological information is often of a scanty and vague description.

OBITUARY.

GEORGE JAMES ALLMAN, M.D., F.R.S.

Though personally unknown to the present generation of Irish naturalists, so distinguished a native of the country as the late Prof. Allman must claim recognition in the pages of this Magazine. Born at Cork in 1812, Allman graduated at Dublin and Oxford, and was appointed to the botanical chair of the former University in 1847. In 1857 he moved to Edinburgh, where he held the Regius Professorship of Natural History in the University, and the Keepership of the Natural History Museum. In 1870 he resigned these positions, and retired first to London and afterwards to Parkstone, Dorset, where he passed away on November 24, 1898. "He will be ranked," to quote the words of Prof. Howes (to whose article in *Nature*, of December 29. we are indebted for the above particulars), "among the earlier pioneers in the study of the marine zoology of Britain His greater reputation rests upon his monumental investigations into the classification and morphology of the Cœlenterata and Polyzoa, upon which he has left a mark for all times." His monographs of the Freshwater Polyzoa (1856), and the Gymnoblasic Hydroids (1872), and his Reports on the 'Challenger' collection of Hydroids are among the classics of zoological literature. Material from Irish waters contributed largely to his work on these subjects, and his discovery of *Geomalacus* in Co. Kerry in 1843 was the first step towards the recognition of the "Lusitanian" element in the land fauna of Ireland.

J. J. DOWLING.

Local ornithology has sustained the loss of an earnest student in the death of Mr. Joseph J. Dowling, which took place at his residence, Fox-rock, on 2nd February. A native of Co. Limerick, he held for many years a responsible position on the staff of the Irish Local Government Board, and often regretted that his official duties left him so few opportunities for making observations and notes. An enthusiastic sportsman from boyhood, and a keen observer, he had collected a vast fund of knowledge of the habits of our wild birds and mammals, and it is to be regretted he found time to publish so little.

However, his activities may be judged by his numerous contributions to the *Field*, and *Land and Water*, during the past twenty years. In 1887 he joined the Dublin Naturalists' Field Club, and from 1890 served on the Committee, till failing health compelled his resignation in 1896. He read a valuable paper on the Wild Ducks and Allied Birds of the Dublin district before the Club in the Winter Session of 1892, and often contributed notes and exhibits of photographic apparatus, in which he was keenly interested.

In 1889 he was elected a member of the British Ornithologists' Union, and the following year a foreign member of the kindred French society. An equally keen votary of rod and gun, he was one of the founders of the Dublin Anglers' Club, and his cheery good nature and helpful kindness will long be missed by a wide circle of friends.

H. G. C.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Gazelle from Miss E. MacManus, an Angora Rabbit from Mr. J. H. Greene, Ducks from Mr. A. R. French and Capt. H. Despard, and a Badger from Mr. T. Mousou. A male Lion (from Nubia), a Great Kangaroo, and a Great Wallaroo, have been bought. A young Camel was born in the Gardens on the 6th March, but unfortunately it died when little more than a week old.

7,500 persons visited the Gardens in February.

DUBLIN MICROSCOPICAL CLUB.

FEBRUARY 16.—The Club met at Leinster House. Mr. W. N. ALLEN in the chair.

Mr. J. N. HALBERT exhibited a group of about thirty eggs of a local plant-bug *Eurygaster maura*, L., showing freshly emerged nymphs, from Kenmare, Co. Kerry. The eggs which were firmly attached in regular rows to the under side of an oak-leaf, are white, oblong in shape, with well-defined net-like markings over the surface. In every case the young nymph had made its escape by forcing off a perfectly symmetrical piece from the free end of the egg.

Dr. H. H. DIXON exhibited a section through the æcidia of *Puccinia poarum*, showing nuclear fusion taking place in the æcidiospores. When the spores are being detached from the spore-producing filament two nuclei are present in each. A minute nucleolus is present in each nucleus, very little chromatin can be made out. As the spores are set free, the chromatin increases in bulk and the nucleolus disappears. One nucleus usually becomes crescent-shaped and partially encloses the other and then completely fuses with it.

Mr. H. HANNA showed *Elachistea Areschougii*, Crouan. This rare and interesting alga was found growing on the receptacles of *Himantalia lorca*, the common Sea Thongs, at Murlough Bay, Co. Antrim, at very low water, July, 1898. It is a true parasite as shown by M. C. Sauvagean in the *Journal de Botanique* for 1892. The previous records for this alga are those of the brothers Crouan who discovered the plant at Brest, but in the figure published by them in their "Florule du Finistere," 1867, pl. 24, gen. 187, they fail to indicate the lower portion of the thallus immersed in the tissues of the host plant, in reality usually filling up one or more of the conceptacles of the host. Dr. Bornet subsequently found it in 1877 at Croisic, and more recently Mr. E. A. L. Batters gathered it at Berwick (1884), and at Cumbrae, on the Clyde (1891). Through the kindness of Mr. E. M. Holmes who identified the Murlough specimens as identical with Crouan's plant, another locality for the species is established. It was found while collecting for the Flora and Fauna Committee of the Royal Irish Academy. The material collected was preserved in 3 per cent. formal, and is in such good preservation that the exhibitor hopes to be able to trace the course of

the entophytic filaments so as to decide if the plants on one host are isolated or put into organic connection by means of these filaments, which pass from the basal region of the cushion and traverse for some distance the tissues of the host plant. This is of interest as bearing on the propagation of the parasite.

Mr. W. N. ALLEN showed drawings of *Radula Carringtoni* and *Radula Holtii* which he made for Messrs. M'Ardle and Lett's paper on Rare Hepaticæ collected at Torc Waterfall, Killarney, in 1897. The figure of *Radula Carringtoni* is interesting on account of the perianth and capsule being previously unknown, the plant never having been found in fruit before; there are figures of one of the amentæ which bear the antheridia $\times 20$, branches showing the peculiar lobule, and a portion of leaf $\times 250$, showing cells. The drawing of *Radula Holtii* shows the plant natural size, and the same magnified 20 diameters showing the inversely cone-shaped or trumpet-shaped perianth, mode of branching, and leaves with rounded lobules one-eighth the size of the lobe, which is sharply divergent from the fold of the lobule; the latter character is unique among European *Radulæ*.

Mr. G. PIM showed a section of an aerial root of *Cereus triangularis* growing under abnormal conditions in a damp hot-house in the Trinity College Gardens. To the naked eye, the living root was in places covered with apparently a mycelium of some fungus, but the microscope did not confirm this view. The section showed a curious growth external to the cortex of the root proper, and consisting of two or three layers of large spongy cells, rather thick-walled, and readily breaking away from each other and from the cortex forming a *velamen*. From the outer cells of the velamen in places there was a dense growth of very delicate hairs, which gave rise to the apparent mycelium, and which occasionally "felted" together contiguous strands of the root. By way of comparison a section of root of *Anthurium* was shown; this was densely tomentose, but the hairs distinctly originated in the external cortical layer, and there was nothing at all comparable with the velamen of the *Cereus* root.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

MARCH 14.—A Lecture was given by J. LORRAIN SMITH, M A. M.D. on the subject, "Pathogenic Bacteria, with special reference to the Typhoid Bacillus." The paper was illustrated by actual specimens and by lantern views.

BELFAST NATURALISTS' FIELD CLUB.

FEBRUARY 22.—Professor Symington, F.R.S.E., of Queen's College, Belfast, delivered a lecture on "Whales; the significance of their structure and development in connection with theories as to their origin." The Professor stated that in their struggle for existence numerous mammals belonging to widely-separated orders have been driven to

spend a portion of their lives under water. Such was the case with seals, water-voles, beaver, and hippopotamus. In other groups the adaptation to aquatic life is complete, and the animal has lost the power of maintaining itself on land and spends its whole life in water. To this group the whale belongs. The lecturer showed lantern views of the principal kind of whales, and pointed out their leading characters. Certain anatomical peculiarities were then pointed out, which lead Professor Kukenthal to believe that the toothed whales and whalebone whales have a different origin. The toothed whales have sprung from some primitive mammals, whose backs were covered with a hard exoskeleton, while the ancestors of the whalebone whales were land animals with a hairy covering for the skin. The flippers of whales are modified fore limbs of mammals, with adaptations and modifications to suit aquatic life. In the number of bones in the flipper the whale closely resembles the extinct *Ichthyosaurus*. This is not a conclusive proof that both have sprung from a common stock, though it may be fairly assumed that both represent a modification of different types as an adaptation to the same mode of life. The hind limbs are not to be detected on the surface of the body, but embedded in the trunk are certain bones, rudimentary hip, thigh, and in some cases leg bones, but of a very small size. The significance of their presence supports the theory that the Cetacea were originally four-limbed animals. Many facts about the teeth of whales were then stated. In dealing with the tail as an organ of locomotion, the lecturer said there are no data to decide the relative efficiency of a whale's tail as compared with a modern screw propeller, but there is at least one point in which the tail has an advantage—its internal structure is specially adapted to its function, its fibres run in the direction to give the maximum of strength with the minimum of material. The lecturer discussed the various theories as to the origin of whales. He favoured the view that the toothed whales were a more ancient group, and differed more from ordinary mammals than the whalebone whales. The attempts to prove that the whales have descended from the Carnivora or the Ruminants had not been very successful. On the whole, the facts at present known favoured the hypothesis that both groups of whales departed at a very remote period from the primitive mammalian stock, the evidence at present available being too incomplete to justify any dogmatic assertions. In conclusion, the Professor expressed his indebtedness to Miss Clara Patterson, a member of the Club, for assistance given in the preparation of the numerous illustrations.

FEBRUARY 9.—GEOLOGICAL SECTION.—Prof. G. A. J. Cole lectured on "The Volcanic North; how Ireland became an Island." He briefly outlined the geography of Palæozoic times when a great continent existed to the north of the British Isles, he indicated the changes in geography till the beginning of the Tertiary period, and then dealt in detail with volcanic phenomena in Tertiary times, tracing the connection of local activities

with the great mountain-making movements to which the Alps and Himalayas owe their origin and elevation above the sea-level. He showed how these movements of elevation determined the present lines of Europe, and traced the progress of the vanishing continent, illustrating each point by apt lantern illustrations.

MARCH 4.—GEOLOGICAL SECTION.—The practical value of grouping together, as a section, members who may be interested in any special study has been demonstrated by the keen and increasing interest in botany and geology shown at present in the Belfast Club. More than twenty members turned out under Mr. Phillips' guidance to visit Scrabo, the President (the Rev. C. H. Waddell) and a few botanists being present. The excursion was arranged as a practical demonstration of Mr. Phillips' geological "Talks." It is to be hoped that in future somewhat similar courses for special study may be arranged for other branches of natural history.

CORK NATURALISTS' FIELD CLUB.

FEBRUARY 9.—In the Large Hall of the Assembly Rooms, Mr R. LLOYD PRAEGER delivered a lecture, under the joint auspices of the Cork Literary and Scientific Society and the Cork Naturalists' Field Club, on the recent visit of the Naturalists' Field Clubs to Kerry. Mr. J. L. COPEMAN, President of the Cork Naturalists' Field Club, occupied the chair. The lecturer traced the history of the growth of Naturalists' Field Clubs in Ireland, which at present possessed four, at Belfast, Dublin, Cork, and Limerick. A series of excursions was arranged some years ago, and that with which he was about to deal was the second of the triennial gatherings decided upon. The excursion was made to Kenmare early in the July of last year. Having touched on the geological formation of the south-western portion of Ireland, Mr. Praeger went on to detail the characteristics and peculiarities of certain species of plants and animals which the excursionists had an opportunity of finding during their stay in Kerry. Many of these were not to be found elsewhere, except in parts of Spain and Portugal, and the sub-arctic regions of North America. Some capital slides, by Mr. Robert Welch, of Belfast, were exhibited by the lecturer, depicting the various plants and insects discovered, and the many places of interest which were visited.

THE WOODCOCK AS AN IRISH-BREEDING BIRD.

BY C. B. MOFFAT.

IN 1786 the Irish Parliament passed an "Act for the preservation of the Game," whereby a forfeiture of £5 was imposed on "every person who shall wilfully destroy the eggs of any pheasant, partridge, quail, land-rail, moor-game, heath-game, or grouse, wild duck, widgeon, plover, or snipe." The significant omission of the Woodcock's name is, I think, a convincing proof that no Irish landowner of that day had the least cause to suspect that any Woodcocks nested on his property.

Nor is it possible that, as has sometimes been suggested, the breeding of the Woodcock in Ireland was merely an unobserved fact in days when less attention was paid to natural history. Where Woodcocks breed freely, as they now do in nearly every part of the country, their nests and young are stumbled on every year in the most perfectly accidental manner, while the play of the old birds over the tree-tops is, during the nuptial season, one of the commonest sights of evening.

To what, then, is the increase of the Woodcock, as an Irish-breeding species, attributable? The cause usually assigned is the recent spread of plantations, but this appears to me obviously insufficient. Oak-woods, not fir-woods, are the Woodcock's favourite nesting localities, and remnants of our old natural forest are, therefore, better calculated to attract the bird than the cover afforded by new plantations, consisting as these chiefly do of coniferous trees, whether larch, pine, or spruce. All the Woodcock's nests which I have seen have been in oak-woods, or woods largely consisting of oak, and since the latter have been so extensively cut down in Ireland during the past hundred years, I question whether the suitability of the country as a home for the Woodcock has not rather diminished than increased.

Perhaps it is a mistake to look solely to the conditions of our own island for an explanation of the change. The Woodcock may, like the Brown Rat a century sooner, have found

its former area too restricted, and so simply bowed to necessity in extending its range westward. The newer immigrant is, at any rate, much more welcome than its precursor.

One of the most interesting facts in the nesting economy of the Woodcock is its habit of carrying its young. On this subject much has been written since Gilbert White cast doubts on Scopoli's statement, "*fugiens ab hoste pullos rostro portat:*" observing that the bill of the Woodcock seemed singularly ill-adapted for such an exploit. Later witnesses to the fact of the bird actually carrying its young have, in the majority of instances, said that this was done with the feet or legs,¹ but a glance at the most recent text-books shows that the exact method is, at any rate, still far from settled. Mr. A. H. Evans, in the Cambridge Natural History series, says "The young are often carried by the parents between the thighs, the *bill probably aiding* to steady them." Mr. Aflalo, in his "Natural History of the British Islands," also says "Between the legs, and *pressed with the bill,* 'tis, I believe, the usual manner." These writers, however, differ from the conclusion arrived at by Mr. Harting (*Zoologist*, 1879, p. 440), that in the majority of instances the bill is not used at all.

It is noteworthy that Thompson on this subject quotes a gamekeeper who believed the whole story to be due to optical delusion, produced by the drooping of the tail and ventral feathers as the bird flew. Though Thompson does not expressly adopt this view, he evidently attached some importance to it, and it is possible that scepticism on the subject, encouraged by such an interpretation of the evidence, may be yet not wholly extinct. Among the witnesses to the fact are, however, some few naturalists of well-known accuracy, including Mr. H. C. Hart.²

I once witnessed the spectacle myself, under circumstances which lead me to think that there should be no difficulty in collecting a much greater mass of evidence on the subject than yet exists.

In the spring of last year I was shown a Woodcock's nest which had been found by a little boy in the woods at Bally-

¹ For an account of the different methods of transport ascribed to the bird, see an article by Mr. Harting in the *Zoologist* for 1879, pp. 433-440.

² *Zoologist*, 1888, p. 454.

hyland, on the 31st of March. The bird, at that date, had already begun hatching on her full complement of four eggs, of which, however, one was soon afterwards removed and transferred to a collection. From April 12th I frequently visited the nest, wishing to note the date of emergence of chicks. On the 17th, at 6 in the evening, the three eggs were still in the nest, and showed no signs of being near the hatching-point; and the 18th was so wet that I omitted to pay my customary visit. On the morning of the 19th April, the female, as I approached, sat closer than had been her wont, and on her rising I was almost immediately struck with a curious yellowish object that seemed to hang from between her legs. The bird's flight was slower than usual, and her long bill was plainly seen to be directed forwards, in the ordinary attitude, and not in any way used to steady or support the object carried. Having flown about 60 yards, she dropped with her burden among the brambles and bracken. I then looked into the nest. There, in place of the three eggs, sat two downy Woodcocks, each covering so as to completely conceal the shell from which it had emerged; and beside them was the shell of the third egg, empty and flattened whose chick I had just seen the parent carrying away.

Other engagements prevented my awaiting the bird's return, but at night I revisited the nest, and, striking a light over it, saw only the three squashed egg-shells. The young had all been removed, and the nest was never occupied again.

Most previous observations of the Woodcock carrying her young seem to have been casual, but it would appear from the foregoing instance that anyone with opportunities of daily visiting a nest might reasonably count on seeing the process.

The parental care of the old birds does not cease when their family are fledged, though it is difficult to accept some statements as to the age at which the chicks continue to be carried. A good observer of birds told me that in the beginning of June, 1894, he saw an old Woodcock, whose young could fly, tumble on the ground before him, "screaming like a hawk," while the young made off. I have not seen this habit elsewhere attributed to the Woodcock.

That genuine lover of nature, Charles Kingsley, lapses, I think, into something like an error where, in "Westward Ho," he describes a scene "under the Hunter's Moon," and introduces "woodcocks, which, chuckling to each other, hawked to and fro, like swallows, between the tree-tops and the sky." The performance here ascribed to the Woodcock in *October* seems to be really that of its breeding season, the so-called "chuckle," being, in fact, a part of the bird's love-song, and seldom if ever heard after June. Uttered at dusk, or during moonlight, as the bird flies over the trees, the song in its perfection is certainly a very curious specimen of avian art, a deep, constantly repeated croak—"croho croho"—varied at regular intervals by a shrill screech—"chizzic"—which follows every fourth croak so rapidly as to be nearly simultaneous with it. In February, however, when Woodcocks begin to tune up, their song consists of the shrill part only. From about the first of March the croak begins to be audible, and it is possible that a few birds may then commence laying. My friend Mr. Rutledge, of Coolbawn Cottage, in this county, assures me that he has seen young Woodcocks on the wing at the end of April. By the middle of June most of the old birds are silent, though a few keep up their weird orchestra to the month's close.

I do not know that it has been noticed that while Woodcocks play about of a spring evening two may frequently be seen to dart alongside of one another for a few hundred yards, chirruping loudly and excitedly, as if in defiance. The noise at such times uttered reminds one of the ceaseless twittering of a flock of sparrows. Possibly this is when one male bird trespasses upon the beat of another; at any rate, it seems to be a peculiarity of the season of love and combat.

Ballyhyland, Co. Wexford.

POA NEMORALIS, P. COMPRESSA, CALLITRICHE
OBTUSANGULA IN THE NORTH OF IRELAND.

BY S. A. STEWART, F.B.S. EDINB.

POA NEMORALIS seems to have escaped observation in the north for a long period; the most recent authorities which could be quoted by the compilers of the *Flora of the North-east of Ireland* dating back about half a century. It is, therefore, very satisfactory to be able to state that it has been refound in Antrim, District 12, and discovered in County Tyrone, thus extending its range into District 10. Rev. C. H. Waddell has just detected in his herbarium a specimen collected in the woods at Muckamore in May, 1893, but which had remained unexamined until now. Similarly Miss M. C. Knowles, of Ballymena, finds amongst her plants some specimens of the same grass found on a wall near Cookstown, in July, 1897. This latter locality is in District 10, but on the very margin of District 12. *Poa nemoralis*, though not rare in Great Britain, is undoubtedly one of the rarer grasses in Ireland. The first notice of it in this country which I can find is the following, by John Templeton:—"On the walls and under the shade of the trees on the roadside near Lucan—northern road, 1799." On the 21st July, 1809, Templeton met with it in County Antrim, on rocks at a little waterfall on the Glenariffe River. Two years ago I examined this spot, but did not find the plant. It should, however, be looked for with every hope of success amongst the bushes of that magnificent glen. In 1804, when Wade's *Plantæ Rariores* appeared, the station at Knockree, County Down, was added to those already known for this plant. This discovery is attributed to John White, a contemporary of Templeton. I once made a brief, but unsuccessful visit to this place. Had I, at that time, known that the exact habitat of the plant at Knockree was on a wall I might, perhaps, have been more fortunate. In the *Cybele*, White is credited with finding *Poa nemoralis* at Rostrevor, and also at Garron Point, Co. Antrim. White is said to have supplied the localities for the *Irish Flora*, but it is curious

that in that work the only locality given for this plant is Templeton's station at Lucan.

There does not seem to be any good reason why *Poa compressa* should in the *Cybele* be relegated to the *Appendix*, and stigmatised as an interloper in Ireland. What is there suspicious about it save that, in this country, it is a rare grass, and fails to increase and spread? These are scarcely sufficient reasons for depriving the plant of its citizenship. It is not a species which is likely to be imported with seed, being scarcely to be reckoned as a fodder plant. That it held its place for so long a period on the walls of Derry is remarkable, seeing that the station is entirely in the heart of the city. It is extremely rare there now, if indeed it be not extinct, but Dr. Dickie, in 1864, said it was rather plentiful on the south wall.

In Ireland *Callitriche obtusangula* seems to have altogether escaped observation until very recently. It was not mentioned in the first edition of *Cybele Hibernica*, being indeed at that time unknown in Great Britain. In the second edition it has several stations in the south and west assigned to it, but none farther north than Westmeath. That it has been overlooked by us, in the north, is certain, as it grows in the City of Belfast. The exact locality is a brackish ditch in Victoria Park, close to the County Down shore of the bay. Mr. G. C. Druce, who is familiar with the plant in England, pointed it out to me one day last August, and I have subsequently found it in a similar brackish ditch at Killough, Co. Down. The northern limit, stated in the *Cybele* as $51\frac{1}{2}^{\circ}$, must therefore be extended to $54\frac{1}{2}^{\circ}$. Now that attention is directed to *Callitriche obtusangula* we may expect to find it still more widely diffused in the maritime counties.

SOME LAND ISOPODS FROM COUNTY GALWAY.

BY CHAS. CHILTON, D.SC., F.L.S.

I HAVE lately been going over the terrestrial Isopoda in Professor D'Arcy W. Thompson's collections in University College, Dundee. Among them are several collected at various times from two localities in Co. Galway, *i.e.*, at Galway itself and at Roundstone. As some of the species do not appear to have been previously recorded from this part of Ireland, it may, perhaps, be worth while giving the list of species here:—

Ligia oceanica, Linn.—from Galway and Roundstone.

Trichoniscus pusillus, Brandt.—Galway.

Oniscus asellus, Linn.—Galway and Roundstone.

Philoscia muscorum, Scopoli—Galway and Roundstone.

Porcellio scaber, Latr.—Galway and Roundstone.

Porcellio dilatatus, Brandt.—Many specimens from Galway and Roundstone. This species appears common in Galway, though hitherto recorded in Ireland only from Dublin (see Scharff, *Irish Naturalist*, VIII., p. 60).

Porcellio lævis, Latr.—Several specimens from Galway. Apparently this species was previously recorded only from Dublin, in Ireland, though like the preceding species it is very widely distributed over other parts of the globe.

Porcellio pictus, Brandt.—One specimen from Galway.

Metoponorthus pruinosus, Brandt.—Two imperfect specimens from Galway.

It is perhaps worthy of note that the collection contained no specimens of *Armadillidium vulgare*, Latr., since Scharff (*Irish Naturalist*, v., p. 225) has drawn attention to its apparent absence at Clonbrock, Co. Galway, and has contrasted this with its abundance at Dublin. It is, however, not safe to attach very much importance to negative evidence of this kind.

University College, Dundee.

REVIEWS.

The Penycuik Experiments. By J. C. EWART, M.D., F.R.S.
Edinburgh: A. and C. Black, 1898. 10s. 6d.

The title of Prof. Ewart's book conveys little to the ordinary reader of the *Irish Naturalist*. To some the name even of the small Scotch town—Penycuik—the place which the author has chosen for his experiments, may be unknown. But many zoologists and breeders of stock have been watching with keen interest the results of Prof. Ewart's experiments for some years past. Since he first succeeded in mating a zebra with a horse, with the result that a most interesting hybrid was born, he has secured several others, and has paid particular attention to various problems connected with this subject.

Though these experiments have no direct connection with Irish natural history, they are of such general interest and importance, that the readers of the *Irish Naturalist* will welcome a short announcement of the aims of this work. Since several Irish horses, moreover, were used in Prof. Ewart's experiments, an indirect claim actually exists in noticing this little book in our columns.

In the pages of the *Veterinarian* and the *Zoologist* the more important results of the Penycuik experiments have already been fully discussed. However, the form in which the results of Prof. Ewart's interesting experiments are now published, enables the reader to more thoroughly grasp their importance and the methods by which it is desirable that they should be continued by others.

No less than nine zebra hybrids have been bred by Prof. Ewart by crossing mares of various sizes and breeds with his famous zebra stallion "Matopo." He also reared three hybrids which had zebra mothers, whilst the sire was in one case a donkey and in two ponies.

Now, the breeding of these hybrids sheds a new light on many questions of general biological interest, such as the origin of stripes, reversion, inbreeding, and prepotency.

We know very little as yet about reversion. To give a familiar example of what is meant by the term, we cannot do better than quote the author's own words—"It is commonly believed that a child sometimes, instead of taking after its father, closely resembles its father's mother, or is the image of its own mother." Some of the hybrids reared by the author, for instance, suggest their zebra sire, others their respective dams; but, curiously enough, even the most zebra-like in form are utterly unlike their sire in the markings. "It is not a matter of taking after a grand-parent," remarks the author, "but after an ancestor in all probability thousands of generations removed, an ancestor probably far more like the Somali than any of the Burchell zebras."

Hitherto stock-breeders have worked on rather haphazard lines, and there can be no doubt that they will greatly benefit by the application of thoroughly scientific methods to their experiments.

From the older experiments conducted by Darwin and others, we know already that the crossing of extreme forms appears to lead to reversion towards a remote ancestor, and also that some breeds are more prepotent than others. Reversion, again, thinks the author, "seems to lead to a form of rejuvenescence due presumably to the ancestral units overcoming and controlling the more recently evolved and less stable units, which, if allowed to have their way, would give rise to offspring bearing all the marks of decadence that characterised the immediate ancestors."

What, then, do we understand by prepotency? The author's explanation clearly indicates to us what is meant by the term: "Any animal, male or female, which strongly impresses its own peculiarities of form, colour, disposition, &c., on its offspring is prepotent, while animals that are the offspring of more or less intimately related parents are inbred—when the parents have been closely related for several generations they are said to be grossly inbred." "The wild parent is said to be especially prepotent because it belongs to an older and longer established type than our domestic breeds."

As for inbreeding, it is a subject we know little about. It appears that artificial prepotency may be gradually produced by it by fixing the characters of the particular variety of stock selected. On the other hand, intercrossing may arrest the deleterious effects of inbreeding.

Discussing the supposed decadence of the English race-horse, the author states that, in his opinion, the best way to maintain its speed, staying power, and constitution would be to have recourse occasionally to Australia or New Zealand for sires and dams equal, if possible, in fleetness and size to our own thoroughbreds, but differing from them in having a recent dash of Arab blood in their veins.

Perhaps the most interesting parts of Prof. Ewart's experiments are those connected with the subject of "telegony." This term, it may be mentioned, is applied to the supposed permanent influence by the first male on the offspring of a female with which it had been mated. So far, however, the author's experiments give no support to the telegony hypothesis.

After a perusal of Prof. Ewart's beautifully illustrated work, we clearly perceive the intricacies underlying the principles of breeding. The author has by no means solved the many problems connected with the subject, but he has shown us that the methods of scientific inquiry can be of much practical use to the breeder. He has also indicated to us the manner in which future experiments should be conducted, and altogether has given to us a work of great interest from a biological point of view.

R. F. S.

The Naturalists' Directory, 1899. London: L. Upcott Gill; pp. 167. Price 1s.

The present issue of this little book is a great improvement on last year's edition. The names of eminent naturalists formerly unaccountably omitted are now inserted, and the list given may claim to be fairly representative of students of the various branches of natural science in the British Islands. We would advise the editor next to turn his attention to the list of magazines. To name only two of the more startling omissions—are the *Zeitschrift für wissenschaftliche Zoologie* and the *Archives de Zoologie Expérimentale et Générale* not worthy to be mentioned in a list which finds a place for the *Sunchildren's Budget*? And we must again raise our humble but decided protest against the insertion of advertisements on pages alternating with the text.

Early Chapters in Science. By MRS. W. AWDRY. Edited by Professor W. F. Barrett; pp. 348, with numerous illustrations. London: John Murray, 1899. Price, 6s.

This brightly-written little book is intended, to quote its editor, "to provide young people with an introduction to the two great divisions of Science—biological and experimental—to the world of life and the world of experiment." The first half of the book deals with the form, classification, and physiology of animals, while plants are discussed in two chapters. Eleven chapters are then devoted to physics, and a concluding chapter to chemistry. It might perhaps have been more satisfactory if the physical sciences, which underlie the science of life, had been dealt with first; and considering that plants can be more readily studied than animals in a practical way by young children, botany seems rather restricted as compared with zoology. At the same time there can be no doubt that animals are to most children the most attractive objects in nature; and we can most warmly commend the bright, natural way in which the outlines of classification are sketched from creatures which can be observed in a garden. The authoress has produced a valuable little book, and it is evident that Professor Barrett has spared no pains to ensure accuracy of statement, having obtained the help of several naturalists in the revision of the different chapters. The original illustrations by Miss Stevenson and Miss Mothersole add both to the attractiveness and usefulness of the volume.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Hooded Crow from Dr. E. Blake Knox, three Peacocks from Lady Mowbray and Stourton, and two Doves from Mrs. Mahon. Two Aondads have been born in the Gardens, while seven Monkeys, a Marabout Stork and a number of small birds have been bought. The rare Hainan Gibber, after a life in the Gardens of two years, has died. Its skin has been secured for the Science and Art Museum

9,680 persons visited the Gardens in March.

The Report of the Society for 1898 has recently been issued; it gives an encouraging account of the year's work. Though there has been a falling off both in the number of visitors to the Gardens and of new members admitted, as compared with 1897, the financial position of the Society has improved, the account showing a credit balance of £352. The great work of the year has been the erection of the Haughton Memorial house, which will greatly add to the attractiveness of the Gardens. It comprises quarters for Marsupials, Monkeys (which will obtain open-air accommodation in the summer), and Birds, while the upper storey will be available for lectures and social gatherings. It is satisfactory to notice that the Council has called the attention of local authorities in the western counties to the persecution to which Choughs are subjected during the breeding-season. Of the litter of twelve Cape Hunting-puppies born on November 8th, it has been found possible to rear two by transferring them to a foster-mother. The Report is illustrated by some excellent photographs.

DUBLIN MICROSCOPICAL CLUB.

MARCH 16.—The Club met at Leinster House, Mr. W. HAUGHTON in the Chair.

Mr. M'ARDLE exhibited *Riccia sorocarpa*, Bish., which he has succeeded in cultivating at Glasnevin, from specimens which were collected last year by Rev. H. W. Lett and himself on a wall-top, by the roadside leading from Dingle to Ventry, Co. Kerry, the only locality known in Ireland, where it was discovered in July, 1873, by Dr. D. Moore and Professor Lindberg, and has not been collected since that period (26 years) by any persons in Ireland. It is very scarce in the locality. When dry the margin of the fronds become inflexed, it is then very difficult to detect, as the plant is minute, having the fronds palmately divided, the divisions fleshy and of a brilliant green colour on both surfaces. Mr. M'Arde promises at a future date to exhibit the fruit of this curious hepatic, which when young is immersed in the substance of the frond.

Mr. H. J. SEYMOUR exhibited specimens of mica from the Godfjeld mica mine, near Krageroe, Norway. They contain numerous very beautiful dendritic inclusions of iron oxide in various stages of hydration, and also many minute rutile crystals.

Rev. H. W. LETT sent for exhibition specimens of *Hypopterygium flavescens*. This moss was first noticed by exhibitor in January, 1887, on a pot in Mr. G. Pim's cold fernhouse, at Monkstown, Co. Dublin. It attracted attention in January, 1899, being observed growing in abundance over the walls and stones in the same place. And since that date Mr. Pim has found a stalk with a mature capsule.

Mr. Wm. Mitten, of Hurstpierpoint, to whom specimens were sent, writes:—

“ I have compared it with what I have, and think it most nearly agrees with *Hypopterygium flavescens* from Brazil: it does not come near to *H. tamariscium*, the oldest known South American (Jamaica) species which, perhaps, might be expected to occur in Ireland. The genus is richest, so far as I know, in species in the southern hemisphere, but one is found in Thibet, and one in Japan. I have a specimen of *H. viridulum* which fruited in the Cambridge Botanical Gardens, and there can be no doubt some plants are brought over with tree ferns which when dead are draped with mosses in greenhouses. I had myself for some years *Racomium tomentosum*, so common in tropical America, as a weed on the earth in pot plants which were not disturbed.”

It is curious to find this tropical moss making its home in a house which is never heated. But apart from this, the moss has points worth noticing. The leaves of *Hypopterygium* are arranged in three rows, closely resembling the arrangement of the leaves in many hepatics. Two of these rows are, as in many European mosses, disposed in a pinnate manner, one along each side of the stem, while the third row is at the back of the stem, and the leaves of this third row are much smaller and different in shape, and are pressed close to the stem. They occupy the exact position that the underleaves do in *Lejeunea*, *Frullania*, and many other hepatics.

The leaves of the two pinnately disposed rows remind us of the leaves of a *Mnium*, with their oval pointed outline and finely-toothed margin of longitudinal cells. The cells of the leaves are small, and may be described as “ hexagonal-diamond shape.” The nerve is nearer the upper margin of the leaf, and hence the lower half of each leaf is the larger.

BELFAST NATURAL HISTORY AND PHILOSOPHICAL SOCIETY.

APRIL, 11.—A meeting was held in the Museum, when a lecture was delivered by John N. Finnegan, B.A., B.Sc., on the subject, “ Luminous Discharges in Rarefied Gases.” The lecture was illustrated by experiments and photo slides.

BELFAST NATURALISTS' FIELD CLUB.

MARCH 21.—H. L. Orr and R. Welch exhibited a series of minute land-shells—genus *Vertigo*—from various localities, including a number of *Vertigo antiverugo* recently collected at Shaw's Bridge, Belfast, where there is a very large colony in the marsh. Mr. M'Kinney exhibited coral found in clay near Glenarm. Mr. VINYCOMB taking the chair,

Mr. GRAY submitted his report as delegate from the B.N.F.C. to the meeting of the British Association at Bristol. He described the object, constitution, and method of procedure of the Association, and stated that the committee of corresponding societies was framed for the purpose of securing the co-operation of all such local scientific societies publishing transactions and papers calculated to further the advancement of science. The Belfast Naturalists' Field Club was one of the first local societies registered as a corresponding society by the British Association. At the Bristol meeting the subject of coast erosion was recommended for consideration. The question of geological photography was also considered, and a high compliment was paid to the B.N.F.C. for the very excellent photographs already contributed by Mr. Welch, Mr. Phillips and other members of the Field Club. The desirability of having all reports and, if possible, all transactions published of uniform size was recommended to facilitate the orderly binding for reference. The Ethnographical Survey Committee recommended the subject for the investigation of the corresponding societies. The work already done in Ireland was acknowledged, but one branch of the subject had not received in Ireland the attention it merited—namely, the archaeological survey of this country. It was pointed out that with the number of capable organizations now operating in Ireland there should be no difficulty in compiling a very complete catalogue of all the ancient monuments of Ireland. The Conference Committee resolved at Bristol to write to the Royal Society of Antiquaries of Ireland, pointing out the necessity for undertaking this work. Mr. Gray referred to the fact that two meetings of the British Association had been held in Bristol since the last meeting in Belfast, in 1874. Since then the Association met several times in England, Scotland, Wales, and Canada, as well as in Dublin. It was, therefore, time to ask the Association to come to Belfast again. Mr Gray described the various places of interest in and around Bristol, as well as the places visited on the excursion, including Standon Drew, Raglan Castle, Tintern Abbey, Salisbury, Old Sarum, and Stonehenge. His descriptive sketches were very fully illustrated by original lantern slides, with special reference to Anglo-Norman invasion of Ireland under Strongbow. After the lecture the Chairman and other members joined in a short discussion, and the meeting closed by the election of some members.

BOTANICAL SECTION.—March 25.—The study of the British Grasses, which was carried on at the monthly meetings during the winter, was concluded by Rev. C. H. Waddell who described the fescues, brome and

rye grasses. Arrangements were made for mounting a number of plants kindly presented to the herbarium by Mr. R. L. Praeger, Miss Knowles, and Rev. C. H. Waddell, for which Miss S. M. Thompson kindly presented printed labels.

DUBLIN NATURALISTS' FIELD CLUB.

MARCH 14.—The President (R. LLOYD PRAEGER, B.A., B.F.), in the chair. Forty members and friends were present. Mr. J. N. HALBERT read a paper on the "Irish land and water bugs," illustrating his remarks by a fine set of lantern slides prepared from specimens in the Science and Art Museum. The Hemiptera or "Bugs" comprise such insects as the aphides or green flies so injurious to greenhouse plants, the barklice of our fruit trees, including the cochineal insect of commerce, the common froghoppers, and the true plant and water bugs. They all have the mouth parts formed for sucking, the majority derive their nourishment from plants, but some are carnivorous. Amongst the aquatic kinds we find some walking or skating on the surface of the water, these have their limbs highly specialised for this purpose, whilst others enveloped in a covering of air bubbles live in the depths beneath, paying occasional visits however to the surface to renew the stock of air. In the so-called Water Scorpion of our ponds the first pair of legs is modified into formidable pincer-like organs for the capturing of its prey. Most of the aquatic species can fly well, so that they can migrate should the small streams and ponds frequented by them dry up. The Bed-bug is known to be an introduced insect in Britain; it did not become a pest in England until after the Fire of London, when it is supposed to have been imported in great numbers with the lumber used in the rebuilding of the city. Mr. H. K. G. Cuthbert (Hon. Treas.), and Mr. F. W. Burbidge, M.A., spoke on the paper. Dr. N. H. Alcock (Hon. Sec.), showed a set of his beautiful lantern slides of various bats, taken mostly from life, and illustrating their habits. Miss F. Conan showed a specimen of the lace-bark tree from Barbadoes.

APRIL 11.—The President, R. LLOYD PRAEGER, B.A., B.F., in the chair. Prof. GRENVILLE COLE, F.G.S., gave a paper on the "Structure of Ireland." An interesting account of the mode and time of the origin of the various mountain ranges of Ireland was given; explanation of the cause of the great central plain was offered; the relation of Ireland to the lost western continent and to Europe; the cause of the difference of the east and west coast, the lava flows of the north-east and its extinct volcanoes were all considered and fully illustrated by a fine series of lantern slides. The President and Mr. Henry J. Seymour, B.A., spoke on the paper. Misses F. and A. M. Joly were elected members.

NOTES.

BOTANY.

Note on the arrangement of a Flora.

A word with regard to the *Appendix* to the *Cybele*. I wish to say that, on the question of putting excluded plants in an appendix, I cannot agree with the reviewer in December number, but entirely approve of the practice adopted in the preparation of the *Cybele*. That practice has the high sanction of Sir J. D. Hooker, in his *Student's Flora*. The classificatory instinct rebels against the commingling of dissimilar subjects, and the inconvenience spoken of, if any, is infinitesimal. I find none. When one wishes to know of plants outside the native flora, we look at once to the appendix. At all events, life need not be run at such a rate that we must sacrifice the seemly in order to gain half a second of time.

S. A. STEWART.

Belfast.

There are certainly two sides to this question, but Mr. Stewart's arguments appear to me to be not convincing. A discussion on the subject would be hardly in place here, but let me briefly refer to three of Mr. Stewart's points. He quotes Hooker as sanctioning the relegation of excluded plants to an appendix in his *Student's Flora*. But he does not mention that in almost every other standard work on general or local British botany, from Sowerby, Watson, and Babington, down to innumerable county Floras, such plants are inserted in their proper places in the body of the work. As regards classificatory instinct, one would think it would rebel rather against the splitting up of a flora into halves than against its treatment according to the recognised system of classification. Lastly, Mr. Stewart says; "when one wishes to know of plants outside the native flora, we look at once to the appendix." But who is to say what is the "native flora"? It is notorious that no two botanists can agree on the question. The line separating native plants from naturalized species, and these again from colonists or denizens, is a devious and arbitrary one. Nor is it even constant to any one author's standard, for the flora is ever changing; the casuals of to-day may be the most assertive and well-established species of to-morrow, and the unquestioned claims of others may crumble before the searching scrutiny of the latter-day botanist. A comparison of the old and new editions of *Cybele* well exemplifies this, showing how many plants have gone up in the world and others come down. If "excluded" plants are separated from their allies and placed in an appendix, none but the author of the work can be sure in which place to find many of them, and even his standard may change, as the world goes on and knowledge increases.

R. LLOYD PRAEGER.

Dublin.

ZOOLOGY.

MAMMALS.

The natural history of Bats.

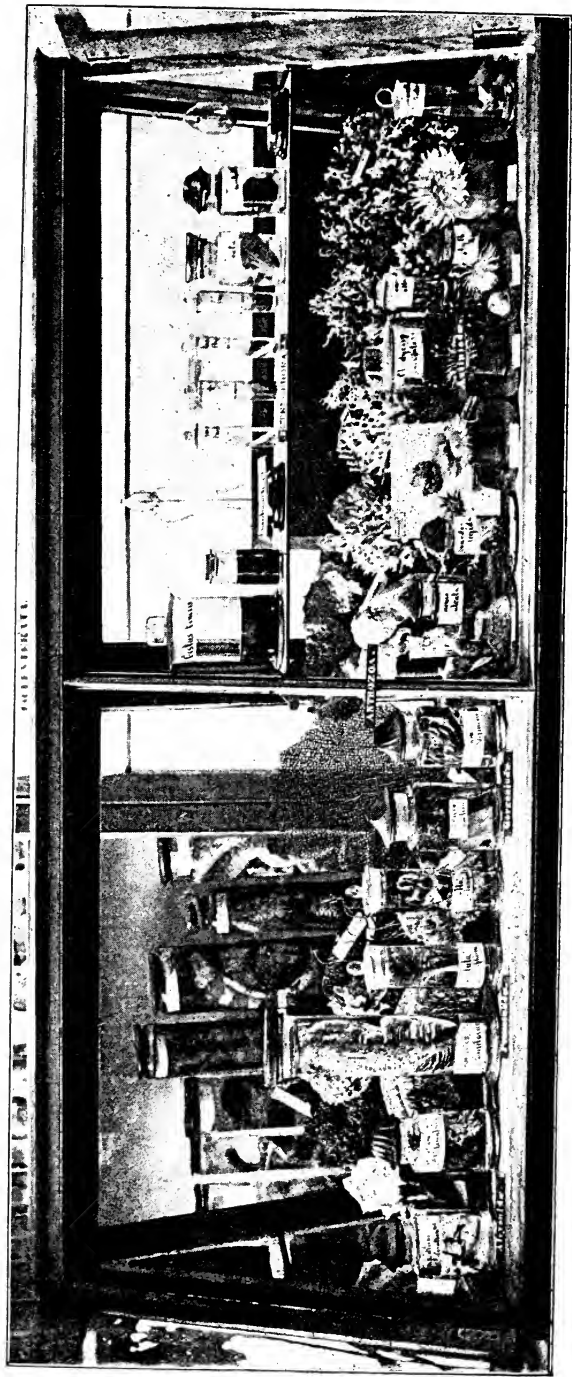
Mr. Alcock in his admirable papers on the Natural History of Irish Bats, has quoted me in one or two places, and it is only fair to him to point out the results of some later observations. On page 31 of this volume he mentions that we give the time of appearance of Daubenton's Bat as 70 minutes after sunset, and adds that this was the time when the first bat was noticed on the water. It has never been my luck to watch this bat leaving its diurnal resting-place, but from my later observations, I find that the average time when I first observed it on the water was 56 minutes after sunset, approaching much nearer to Mr. Alcock's average of 54 minutes. The average is taken from notes made in May, June, and July. Again, I find that I have noticed this species three days later than in earlier years. On August 20th, 1896, several were flying on a still reach of the River Bollin, although there were none on the pond where I usually observe them.

I have never observed Noctules on the wing before the end of March, although I received two which had been taken from the roof of a house on the 19th of that month, whose stomachs contained undigested food. On page 33 Mr. Alcock states that I saw Noctules in Devonshire on September 22nd. This I think is a printer's error, as it was at Alport, in Derbyshire, that I saw them. The latest date that I have seen this bat was on October 10th, 1896, when I observed a single one on the wing at 5.20, six minutes *before* sunset. The following day we had the first fall of snow.

In his paper on the Whiskered Bat, Mr. Alcock says that only one specimen was found using a tree as a resting-place. My experience has been similar: I only once came across one in such a situation. It was hiding behind some loose bark on a dead tree in Delamere Forest. The Whiskered Bat seems to be fond of feeding in the day time; on June 3rd, 1898, a bright sunny day, I observed two flying over the River Dane, near Winicle, in Cheshire. The first I saw kept for some time in the shadow of the bridge, but afterwards flew up and down the stream in strong sunlight. The other was flying under some trees, every now and then going up stream for about fifty or a hundred yards. Although the light was strong, both bats eluded my attempts to capture them for a considerable time. I struck the first one down with a cloak, but it got up from the ground and escaped unhurt. The second I killed with an umbrella, and then made certain that it was a Whiskered Bat. Oldham killed another the same day in the Coyt Valley, near Whaley Bridge, a locality where he has seen them in the daytime before.

Bowdon, Cheshire.

T. A. COWARD.



CASE OF CORALITERATA IN NATURAL HISTORY MUSEUM,
QUEEN'S COLLEGE, GALWAY.

THE NATURAL HISTORY MUSEUM, QUEEN'S COLLEGE, GALWAY.

BY PROFESSOR RICHARD J. ANDERSON, M.D.

[Plate 6.]

THE natural history collection is contained in five rooms. Three of these serve for zoological specimens and apparatus, and two for fossils and minerals. The Museum is reached by a vestibule on the ground floor, which is joined by a staircase to the department above. The lower jaw of a Whale-bone Whale is placed in the vestibule, and reaches nearly from floor to ceiling. The length is nearly 18 feet, which means that the original owner of the jaw was 70 feet long, or a little less. The anchor placed between the sides of the jaw was found many years ago on a rock in Galway Bay, called St. Margaret's Rock, and belonged possibly to the White Falcon, a warship of the Spanish Armada, wrecked on the Galway coast. A bit of cable still remained attached to the anchor when the latter was discovered. This is regarded by some as an undoubted proof of its antiquity.

The small Herbarium, near the anchor and whale's jaw, contains specimens of ferns, and is meant to illustrate the Carboniferous flora. The model of a salmon, 69 lbs. weight, is shown on the first staircase landing. Flax, in all stages of manufacture, appears in a case beside the huge salmon model. The birds shot by Professor Valentine Ball, when in India, are mostly in cases that line the walls of the staircase and landings.

Two large sheet pictures represent prehistoric ideal scenes. One is a Mesozoic scene, and has figures of some of the chief reptiles of the period. The other is a representation of a Kainozoic scene, with the Tusked Tiger, Mastodon, and Water Elephant. Large deer forms are in the background and tropical birds, whilst on the branches of a tree sit two apes, of very human aspect, that view with seeming concern the proximity of a Mastodon below.

The Geographical Museum contains ten vertical cases that stand out from the walls between the windows and seven horizontal cases. The vertical cases in their upper parts serve for the display of fossils arranged in a chronological series,

and below contain specimens of granitic, volcanic, and metamorphic rocks. The horizontal cases have minerals and ores, classified according to the base constituents. Thus one half case contains the ores of iron, the opposite side has ores of copper. The lime salts have a half case to themselves, and so have the feldspars and zeolites.

Illustrative specimens of ice-worn and scored rocks and perforated limestones, from the neighbourhood of Galway, are placed, for inspection, on wall-brackets. A large lump of rock from a "Bone Bed," agglomerated shells and other interesting fossil remains are placed in convenient spaces. A giant Crinoid, a large skeleton of a Plesiosaur, one of a small Ichthyosaur and the model of the head of a Mosasaur are on the walls. The restorations of many years ago of Labyrinthodon and other prehistoric types are still illustrated by small alabaster models.

Dr. King placed a useful case at one end of the larger room. This case has a series of fossils arranged chronologically on boards that can be easily lifted out, examined, and replaced.

A long horizontal case, reaching from end to end of the Museum, contains Galway minerals and fossils alone. Here are to be seen fine specimens of calcite and ores of lead, copper, and zinc. There are, of course, jasper and Connemara marble in variety, and black polished marble from Menlo. Various rocks of economic value, though of no special mineralogical importance, are found in Galway, especially the red Galway granite. This granite bids fair to be a formidable rival of the Aberdeen rock. Such rocks are quite suggestive of new industries that may sometime creep into the West of Ireland.

The Galway fossils are Silurian and Carboniferous, and are easy to collect. Weathering of the inland fossiliferous limestone often causes the fossils to stand out in bold relief; if organic matter be present the action seems to be more perfect. But the process by which the sea accomplishes the solution of certain lime salts amongst the septa of certain corals is of especial interest. A *Lithostrotion* brought to the sea in former times has been so bleached and washed out that it resembles in colour a modern coral, as if a visit to

the place of its youthful surroundings had brought back its colour and true features. Several good photographs of interesting bits of scenery are placed on the walls. The Mineralogical Department is illustrated by crystal models of the usual kind, glass and wood. A compromise is attempted in giving effect to the views of the practical mineralogist, like Professor Panebianco of Padua, who says that some mathematical discussions concerning crystals tend to become either childish or pedantic, and the views of the mathematician who emphasizes the importance of the study of form, figure, and molecular attraction. The type forms of Dana accord with the practical instincts of the man who is constantly handling minerals. Apparatus have been designed and placed in this Museum, to illustrate the forces that are at work in modelling crystals. Four cords above and four below mark the edges of an octohedron in a simple way. The shape of the octohedron is altered by the adjustment of weights and the movements of sliding pulleys. The right octohedron of the cubic system can be changed into that of the dimetric and so on. The mind is thus led to dwell upon the effects of the aggregation of forces. All the forces that make a body spherical, would, if collected at the extremities of three diameters standing at right angles, in such a way as to be quite equal, thus be at work tending to develop an octohedron in a cohering mass. The forces producing an ellipsoid might, if reduced similarly to six, produce other right octohedra. The Museum diagrams suggest a method by which form, colour, and composition may be learned, at once, by the student. Take a figure of carbonate of iron. The acid constituent may be marked on one side, and the base on another face. Anyone can colour the crystal, and, if a note be added with reference to hardness and specific gravity, what more does one want except a practical acquaintance with the mineral itself, which can only be obtained by inspection, testing, and handling? So one might put silica on one side, and manganese on another side of rhodonite, figured, and paint it flesh colour. By drawing such crystals an interesting fact becomes impressed on the mind, viz., that impurities in minerals are often associated with complications in the faces,

slight traces of a foreign substance having long been known to change the shape of a crystal. The effects of a little less or a little more water in modifying the shapes of salts are noted in several works. The Museum has a supply of spectroscopes, a goniometer, a globe, and maps with the mountains in relief, which are of great use in demonstrations.

An optical lantern with slides illustrative of skeletons, figures, and prehistoric ideal scenes is also amongst the equipments, besides microscopes suitable for the examination of mineral sections. A micropolariscope for use with the ordinary microscope and one for the lantern microscope have also been found to be valuable aids. A small chemical cabinet is a useful adjunct to a mineralogical collection, as well as a few physical apparatus for the determination of specific gravity. These, with blowpipe and crucibles, are in use frequently.

The zoological collection is contained chiefly in twenty-four vertical cases, some of which stand out from the walls, and in ten horizontal cases. There are, however, numerous large skeletons, as in other museums, and stuffed animals that cannot be conveniently placed in cases. A Cuvier's Duck Whale is amongst the latter, also a Dugong and Manatee, an Elephant, and Horse, a Camel and an Ox. The four last skeletons were prepared and mounted in the Museum. There is to be seen here the skeleton of a Donkey. Those who doubt the existence of a dead donkey may, after a visit, decide that the skeleton need not be included in the current belief referred to by young Mr. Weller. The *extinct* kind of Zebra and the nearly extinct Giraffe are represented in this collection. Birds, native and foreign, occupy two vertical cases. A tame Gull that lived in the Museum some years ago displayed a sympathetic interest in two of his race that are permanent specimens. He found them out in his daily perambulation up the Museum and sat down between them. The skeleton of an Emu brought from Australia by Mr. Campbell of Belfast, and presented to the Belfast Corporation, has here found a resting place. A Rhea keeps her company.

The Reptile case has one skeleton and two spirit preparations of *Hatteria*. There is a Cryptobranch; and, amongst the fishes are a *Protopterus* skeleton, and a spirit preparation of *Ceratodus*.

There are, besides, from Galway Bay, a Sunfish and Spiny Shark. The Sunfish uses its dorsal and anal fins in progression (as some other fishes do).

The Museum shows some good-sized invertebrates from the neighbouring bay, amongst these a *Maja squinado*, a *Palinurus* and a Starfish are the most conspicuous. The Starfishes, indeed, deserve a prominent place in any museum, and they have got it here. The Echinoderm case contains the modern groups with drawings and dissections. The Sea-Urchin is shown in vertical and horizontal section, so that the internal anatomy is understood at a glance. Tunicates, Bryozoa, Cuttlefish, and Worms are placed in the same vertical case, whilst the horizontal cases are set apart for the general collection of Mollusca.

Small vertical cases have been erected on some of the horizontal ones. These contain varieties of the Manus skeleton (No. 1); Skeleton of pes (No. 2); glass models of Protozoa (No. 3); Insects and their development (No. 4); Insects, mimicry (No. 5); Crustacea, anatomy (No. 6).

One collection of insects shows many of those dangerous to crops, others are of systematic value. Typical collections of moths and butterflies, and examples of mimicry may be mentioned.

Metropolitan museum authorities have sought to give a natural character to their collections, which one seeks for in vain amongst the average stuffed animals with their sleepless eyes and too cowering or too rigid pose. The example so well set has been followed here.

One case represents a tug-of-war between an owl and a Stoat, the rope is represented by a rat. Another shows the Platypus at home with the avenues to his burrow by water and land; a third shows a Peregrine and a slain Rabbit; a fourth—a number of water birds with scenery; a fifth—the Hornbill at home; a sixth—a Fox interested in a Woodcock; a seventh—an owl giving portions of a dead bird to its young; an eighth—a Stoat with water birds, water, a Dace, and a water-beetle; a ninth—a spider with a humming bird in his clutches.

Passing over the models of fungi, dangerous and harmless, one may note the models of the stomach of an ox, the brain and

the dentition of a horse. The advantages of a study of the latter will appear when it is remembered that horse-breeding is much favoured in Ireland, and the difficulties of telling the age (say between four years and five years) are very great indeed. Blaschka's models of various invertebrate types, Fritch's elegant dissections, and some special casts of viscera serve to illustrate forms that are not always available in a fresh condition. The collection of dried plants and fruits is of the ordinary kind.

The apparatus for illustration include a series of panoramic diagrams on rollers, that enable the student to see the figures in a progressive series, and save much trouble to assistants in arranging drawings for demonstration. An apparatus for determining the rotation of limbs consists of a frame with a graduated circle, by which the amount of rotation and its character can be understood. A vertical shaft that carries framed diagrams is a useful apparatus; the latter is in use elsewhere, especially in picture galleries. A microscope with a revolving platform is one of the most satisfactory instruments. Specimens can be examined in succession by turning a handle. The instrument is enclosed in a box so that it cannot be injured in any way by a visitor or an observer. One case is of very great interest—the case of disarticulated skulls. These are of great value in the study of the size and distribution of the bone bars and plates in the skulls of different groups; such skulls can be advantageously compared with those that are intact or with special sections.

Stopping for a moment to mention the groups of birds' nests and eggs, a combination may be mentioned that partakes partly of the nature of a laboratory, a biological cabinet, and a museum, viz., the preservation of a few living invertebrates in suitable bottles or cages.

Proximity to the sea makes it possible to secure quite a number of specimens. These can be renewed from time to time. Young people at Salthill, Galway, obtain a heterogeneous collection on the shore, and the movements and activities are watched for hours with much interest. Many other varieties obtainable on the land are not sought after with so much avidity.

I note on a window, as I write, a good many invertebrate types, living and well—sea-anemones and starfish, nereids and periwinkles, crabs and tunicates, crickets and spiders. In one tank are frogs and Freshwater Mussels, in another Tadpoles. *Chara* is in one vessel, *Spirogyra* in another, and *Lemna* in a third, whilst in some bog-water contained in a jar are examples, naturally, of more simple organisms.

The Museum is supplied with microscopes of the Beck, Swift, and Zeiss build; a one-fifteenth water immersion lens goes with the Beck. This is an excellent objective. An oil immersion (achromatic) belongs to a Zeiss combination. There are many objectives of different powers. A lantern microscope (Newton's best) has to be mentioned. The various microscopic slides can be projected on the screen by means of powers of moderate dimensions; Beck's fifteenth has been used for the projection of bacteria with great success. Three good section-cutters are amongst the apparatus, viz., those of Thoma, Rutherford, and Cathcart. The Museum contains boxes of Jauch's *Flora Artefacta* and some of Brendel's flower models.

Queen's College, Galway.

ANIMAL PHOTOGRAPHY.

Some members of the Avicultural Society are organising a Postal Club for the encouragement of bird and other animal photography. They invite the co-operation of photographer naturalists. Communications should be addressed to the undersigned Hon. Sec., *pro tem.*

Springfield, Brigg.

CHAS. LOUIS HETT.

NOTES ON THE RAZORBILL.

BY EDWARD M'CARRON.

With a Prefatory Note by R. M. BARRINGTON, LL.B., F.L.S.

It might be thought that the changes of plumage of such a common bird as the Razorbill were, by this time of day, thoroughly worked out.

I do not quite agree with this. They puzzled Colonel Montagu; and the enclosed Notes from the pen of Mr. M'Carron, one of our Irish Light-keepers (I do not agree with him that there are two species)—coupled with specimens in my collection—show that there is something yet to be done.

I have a specimen from the Saltees about four days old, with chin and throat sooty black; one about ten days old, with chin and throat greyish-white; one was sent me on August 1st, about eight inches long, with throat black; one, apparently full grown, in January, with throat white; and one in June, also full grown with throat white.

This last specimen is very puzzling, and if not abnormal would go to prove that the adult breeding plumage is not reached until the second year. If that be so, where are all the birds of the previous year in the breeding season—do they, like the young Kittiwakes, keep far out at sea?

R. M. B.

It was in the winter of 1884 when I was on the Tearaght—one of the Blasquet Islands—as Principal Light-keeper, that I first observed the “young Razorbills.” It was generally in stormy weather that they came close to our island. They were then quite busy and active in procuring food. Many a day I sat for hours in the shelter of some rock, and as close to the sea as the surging surf would permit, looking at them through my telescope. I could seldom get a glimpse at one of them, for they dived immediately. In fine weather they rested quietly on the water, but kept at a distance from the island. My object was to identify these birds, which were like the Razorbill, with the exception of the neck and bill. None

came on the rocks or island, and about the 1st of March, 1884, they left altogether. Next winter they were back again, and came close in stormy weather, diving with the same activity; but in fine weather, keeping at a distance as before. On the 13th January, 1885, our attending boat came, and the crew were not in much hurry—the day being fine. I took advantage of this opportunity, and sent off an Assistant Keeper to shoot one if possible. He succeeded, and I sent it off to Mr. Barrington, who informed me, by return of post, that it was a “young Razorbill.” In the June following, I observed about five or six on the island among the hundreds of other Razorbills. What brought them on the island except to breed, like all other birds which came? I shot one, and it was in every respect like the one I sent Mr. Barrington in January. I shot one of the Common Razorbills, weighed both—one against the other. The “young” bird was much heavier than the old one, and it was decidedly much larger.

Now I will show some facts which will go a long way I think to prove my contention, viz., that this “Young Razorbill” is a distinct species from the Common Razorbill. Yarrell says, vol. iv., p. 60 (quoting from Mr. Barrington), that “the young Razorbill a week old has the chin and throat *white*.” Mr. Barrington says in the Report on the Migration of Birds in Ireland for 1885, p. 5, that a young Razorbill about six weeks old which I sent him on the 1st August, 1884, had the chin and throat *black*. Could such a change—from white to black—take place in the same species of bird in so short a time? I think not. I think it is quite plain that these two young Razorbills were two different species. Another young bird killed on January 13th (already referred to), Mr. Barrington says had the chin and throat *white*. Here would be three distinct changes in a bird still young; but it had yet another change to undergo—it had to turn black again, when it was then no longer young. Here are four distinct changes in what is said to be the “Young Razorbill.” In my opinion the young bird of the week old, having the chin and throat white, and the older bird shot on the 13th January, with chin and throat white, was one and the same distinct species of the Razorbill; and the young bird of the six weeks old having the

chin and neck black, is the young of the Common Razorbill, which has the chin and throat black.

In 1889 and 1890 I saw several "young Razorbills" exactly like the one I shot on the Tearaght, swimming and diving around the Copeland islands—the same "young Razorbill" which I found heavier and larger than the old common bird—their young being with them. Only a single pair would be met with. Here we have the "young Razorbill" accompanied by its young. I passed quite close to them in our attending boat, and saw them several times in the Sound between the Copeland islands and the mainland, at Donaghadee—always in single pairs—the "young Razorbill" with its young by its side, and diving along with it. I saw the same kind of bird with its young by its side on several occasions at the entrance to Kingstown Harbour in 1894. Are these not proofs that the "Young Razorbills" which had their own young with them, were old birds, distinct from the common species?

Will it be said that these "Young Razorbills" accidentally met with their younger kindred, which had been abandoned by their own parents—the Common Razorbill—and became their guardians?

I observed during the several years I was on the Tearaght the great care and apparent anxiety of the Razorbill in the rearing of its young. The hatching is done by the male bird as well as the female. When one goes away the other takes its place immediately. The Guillemots do the same; perhaps the principal object is to protect the eggs against the Herring Gulls, which are continually hovering about, looking for any exposed egg that they may carry it off. The Razorbills lay their eggs mostly in splits or crevices in the rocks, where they make a good fight and often cause blood to flow, before they allow themselves to be captured.

The following incident will illustrate this:—While I was on the Tearaght, my wife with her little boy, about five years old, went one evening for a walk along the pathway which skirts the side of the island. She also had a little dog with her. The boy with the dog wandered away some distance above the road, while she had a rest by the way. After a little while, she heard an awful screech from the boy; he put his hand

into a hole where a Razorbill was hatching its egg, and was caught by it. The little dog attacked it at once, but was caught by the Razorbill, and began to roar even worse than the boy. The bird still kept the grip, the dog crying furiously until the boy's mother came up excited and breathless. She at once attacked the Razorbill which let go the dog, and in the twinkling of an eye, got a good firm grip of her hand. They all walked away bitten and beaten by the Razorbill, which remained in possession and unconquered. This shows how fiercely they will fight for the protection of their young.

The young Razorbills, like the young Puffins, leave their nesting places in the night time, when they proceed to the sea; but I have seen a few of the young Razorbills set out on this perilous journey in the day time. The young ones are jostled all the way down to the sea by the old ones. If the young one rests too long, the old one shoves it on, and on it goes, rolling and tumbling, and falling sometimes down steep cliffs: but at last the sea is gained. Then an interesting performance takes place. The old bird wants to get the young one off to sea. The young one, apparently, does not understand this, and merely swims about. The old bird seems excited, swims round it and right off before it a few yards, then returns and dives a few times round about it. At last it commences to peck and tug and worry the young bird; but it is so stupid that it cannot understand. Hours are spent in this way, and little progress is made; at last the old bird dives down and comes up under the young one, which is nicely poised on its back. In this way the mother swims off to sea with its offspring, rising and falling with the heaving of the billows, until they are lost to view in the distance. This is no mere hearsay—it is my own actual observation; but my wife was the first on the island to observe it. Some of the young ones give no trouble when they tumble into the water—they swim off to sea at once, along with the old ones. Others are carried off by wind and tide, and young and old wander along for months. They do not gather in flocks as the Puffins do, but go along in single pairs. The shrill piercing cry of the young Razorbill can be heard all round the coast of Ireland. It can be heard by people working in the

fields, or going along the country road—a considerable distance from the sea—either day or night. The mother bird can also be heard.

All those birds—the hundreds on the water at the Tearaght in January; the one I sent Mr. Barrington, the one I have still in my own possession, the five or six on the island in June, those I observed at the Copeland Islands and at Kingstown Harbour—had the beak exactly alike, and not fully developed. Where do they breed? Well, I remarked already that five or six were on the Tearaght at the breeding season, and if the matter was looked after it might be found that they have some particular part of the coast, or some particular islands, where they breed; and the fact that I saw their young with them at Donaghadee and Kingstown, would show that they breed somewhere on the coast.

These are my impressions of the “young Razorbill,” and I have at last carried out the resolve which has been a long time in my mind to commit them to paper.

Dublin.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Peregrine Falcon and a Kestrel from Surgeon H. Broomfield, and a West African Chevrotain from Mr. D. H. Donovan. A pair of Coypus, a pair of Ocelots, nine monkeys, two dozen tortoises and five dozen small birds have been bought.

19,311 persons visited the Gardens during April.

DUBLIN MICROSCOPICAL CLUB.

APRIL 27.—The Club met at Leinster House. Prof. T. JOHNSON in the chair. It was proposed by Mr. F. W. MOORE, seconded by Mr. W. N. ALLEN, and resolved:—

“That the members of the Dublin Microscopical Club desire to express their great regret at the death of their President, Dr. William Frazer, one of the original members of the Club.”

The meeting then adjourned without further business.

DUBLIN NATURALISTS' FIELD CLUB.

APRIL 29.—The first excursion of the season took place. About thirty members and their friends repaired to the quarry at St. Doulagh's, under the guidance of Dr. A. H. Foord, F.G.S. The party was favoured with brilliant weather, and after a pleasant walk through St. Doulagh's Park reached their destination at about 3 o'clock. First of all Dr. Foord addressed some remarks to the members of the Club on the geological phenomena exemplified in the quarry. He pointed out that the rocks belonged to a lower division of the Carboniferous system, viz., the Lower Carboniferous Limestone, which, like other pure limestones, is chiefly of organic origin, and contains the hard parts of shells, corals, crinoids, and other marine invertebrates in considerable abundance. The thickness of the rock (about 1,200 feet in the Province of Leinster) indicates a deepening sea, which admitted of the accumulation of the debris of vast quantities of the organisms mentioned, and the sediment thus built up gradually solidified, partly by pressure, partly by chemical agency. Subsequently, earth movements taking place, these subaqueous deposits were raised into dry land and their consolidation was finally effected, with the result that massive limestone rock was formed, such as that exposed in the quarry. Dr. Foord then described briefly some of the characteristic fossils which the quarry-men had obtained, stating that the St. Doulagh's fossils were fairly representative of the invertebrate fauna of the Carboniferous limestone. The following are the names of these fossils:—CRINOIDEA—stems of crinoids, very abundant in the upper part of the beds; POLYZOA—*Fenestella plebeia*, M'Coy, very abundant; BRACHIOPODA—*Productus semireticulatus*, Mart., abundant; *Spirifera striata*, Sby.; *S. pinguis*, Sby.; *Rhynchonella fugnus*, Sby.; LAMELLIBRANCHIATA—*Aviculopecten granosus*, Sby.; *Cardiomorpha oblonga*, Sby.; GASTROPODA—*Euomphalus pentangulatus*, Sby.; *Naticopsis Phillipsii*, M'Coy; CEPHALOPODA—*Orthoceras*, body-chamber of an undetermined species; *Celonautilus pinguis*, Sby.; *Solenocheilus dorsalis*, Phil.; CRUSTACEA (Trilobitæ), *Phillipsia gemmulifera*, Phil.

Some of the members, provided with hammers, succeeded in finding and knocking out some specimens of *Fenestella* and *Productus*, the most characteristic fossils of the beds; several specimens of *Spirifera* were also obtained.

On leaving the quarry a few of the party visited the interesting little church of St. Doulagh's. All then repaired to Mrs. Hone's house, St. Doulagh's Park, where the members were most hospitably received. In Mrs. Hone's collection of fossils Dr. Foord noticed a very fine specimen of *Spirifera striata*, Sby., the largest he had ever seen. The party left for Dublin by the 6.22 train, having spent a very agreeable afternoon.

BELFAST NATURALISTS' FIELD CLUB.

APRIL, 25.—The thirty-sixth Annual General Meeting of the Club was held. Rev. C. H. WADDELL, B.D. (President), in the chair. The Secretary read the annual report, which stated that the work of the Club had been carried on successfully during the year by excursions and evening meetings. A feature of interest was the appointment of a field lecturer, whose explanations and short lectures given during the excursions were much appreciated by the members. A new feature in connection with the winter meetings was the institution of a science gossip half-hour before each meeting. These half-hours were well attended, and gave beginners in natural history or archæology an opportunity of getting information on subjects in which they were interested.

Three collections submitted in competition for prizes were of considerable merit, one by Mr. Adams containing a plant new to Ireland, as well as several additions to the flora of the N.E. Ireland. This collection received special mention. Mr. H. L. Orr's collection of land and fresh-water shells also contained some new species as well as a good representation of more usual forms, all neatly mounted and carefully named, and secured the prize offered. Miss Finlay secured the prize for flowering plants. The Hon. Treasurer submitted accounts for the year, which showed the Club was in a good financial condition.

Mr. WM. GRAY spoke on the report and accounts, which were passed, and will be printed and circulated among members as usual. A cordial vote of thanks was passed to Mr. Phillips for the effective services he had rendered the Club as Hon. Secretary. His "talks" to the Geological section were of practical value in the laboratory, and his demonstrations in the field were most instructive and useful.

The election of officers for the coming year was proceeded with, as follows:—Rev. C. H. Waddell, B.D., President; F. J. Bigger, Vice-President; W. H. Phillips, Treasurer; William Swanston, Librarian. A vacancy having occurred by retirement of a secretary, Mr. Wm. Gray, M.R.I.A., was unanimously elected to the post, along with W. D. Donnan, M.D. The new Committee comprises George Donaldson, W. J. Fennell, John Hamilton, F. W. Lockwood, J. St. J. Phillips, S. A. Stewart, F.B.S.E.; Miss S. M. Thompson, John Vinycomb, Robert Welch, and Joseph Wright, F.G.S.

Suggestions were received and discussed as to places of interest for summer excursions

Mr. W. H. PHILLIPS gave an address on British ferns, in which he showed how the study of ferns is most interesting and fascinating, being half botany and half horticulture. The Counties of Antrim and Down are full of glens, mountains, and roadsides well stocked with varieties. A description of the different genera and species was then given showing the salient points of structure and the difference of each; and many examples were shown and explained after the lecture.

GEOLOGICAL SECTION.—MAY 6.—An excursion to Barney's Point and Magheramorne took place to visit the Lias, Greensand and Chalk, and Estuarine clays. A local member, Mr. Dixon Donaldson, pointed out glacial striæ on some rocks recently exposed when extending quarrying operations. Afterwards Mr. Donaldson showed an interesting collection of fossils gathered in the locality. The members had tea in the Kilcoan Schoolhouse and afterwards returned to Belfast, having spent a most profitable and enjoyable evening.

MAY 11.—The last of a series of "Introductory talks on Geology" was held in the Club rooms. J. ST. J. PHILLIPS briefly described a few of the characteristic fossils from the Mesozoic and Cainozoic formations, exhibiting specimens—some of which the members had collected on the Saturday excursion. In closing his talks he referred to the great variety a geologist found in the study—some would be interested in the economic applications of rocks as building stones or as soils, others would delight to trace the evolution of the landscape and picture past physical geographies; others would endeavour to gain a knowledge of the history of life on the earth from the fossil contents of the rocks whilst some would study the results of volcanic or plutonic activities in the igneous rocks. At the close of the "Talk," W. J. Fennell, M.R.I.A., expressed the thanks of the members for the trouble taken in preparing for the series, and said that the large attendance that had followed the course must be taken by Mr. Phillips as indicating the interest members had taken in his work. In reply Mr. Phillips said that it was most gratifying to see the regularity with which the same members had come night after night. As to the members he was somewhat sorry to find thereom was not large enough to accommodate all comfortably. He hoped that his talks would result in the enrolment of new names in the Geological Section.

CORK NATURALISTS' FIELD CLUB.

MAY 1.—The Annual Meeting was held. Mr. J. L. COPEMAN, President, occupied the chair.

The Hon. Secretary read the report, as follows:—Your committee have to report that the membership has been maintained during the past season. Five members, on leaving Cork, resigned, against which we have five new members. The following ten excursions were held during the summer:—May 4th, to Injiscarra and the Lee; Professor Hartog conducted and pointed out the interesting geological features of the neighbourhood. On Whit Monday, May 30th, to Meeshal, near Coachford, there was only a small party as the day was very showery. On June 11th to the Lough Nurseries, where after a pleasant and interesting afternoon, the members were kindly invited to tea by Mr. Hartland. June 29th to Youghal, by the kind invitation of Mr. T. Farrington, where the members spent a very pleasant day. On July 6th to Ballinhassig Glen, and quarries, conducted by Mr. E. B. Hughes,

Some interesting specimens were found in the slate quarries. On July 7th to 13th to Kenmare and surrounding district, a week's excursion, in connection with the Irish Field Club Union. This was a most enjoyable outing, the weather was perfect, and several new finds were recorded. Some of the members, including those from Cork, extended the excursion the following week, visiting Derrynane, Waterville, Valencia Island, and Caragh Lake. On July 30th to the grounds of the Queen's College, where the party were met by Mr. Griffin and shown the objects of interest. On August 20th to Riverstown, and through the grounds of Mr. W. T. Steward, which was largely attended. On September 3rd to Oldcourt, Rochestown, where between twenty and thirty members were conducted by Mr. J. L. Copeman. On September 14th to Fota, by the kind permission of the Hon. A. H. Smith-Barry, M.P. On October the 11th a conversazione was held in the School of Science and Art, jointly with the Cork Historical and Archæological Society, which was largely attended. The exhibits of the Field Club included specimens sent in by Miss Delap from Valentia of *Laodice*, *Verella*, *Cydidippe*, *Tubularia larynx*, *Corymorpha nutans*, *Tomopteris*, and the *Teredo* (Ship-worm). These she kindly presented to the Field Club. Miss H. Martin also exhibited the specimens caught by her at Valentia, and has kindly written a short description of her work which is appended. Mrs. E. B. Hughes showed botanical specimens found in the County of Cork. Mr. J. L. Copeman and Mr. W. H. Johnson showed specimens of Lepidoptera taken in County Cork. There were also exhibited ten cases of Lepidoptera, being the first part of a complete set of Irish specimens specially prepared by Mr. G. H. Carpenter for the Cork Field Club. He also sent specimens of fresh-water shells. Mr. Johnson reports having again taken *Colias edusa*, a male specimen, being taken on the 14th of November, and in good condition, close to Cork. On February 9th a joint lecture with the Literary and Scientific Society was delivered by Mr. R. L. Praeger, in the Assembly Rooms, on "Naturalists in Kerry," illustrated with views taken on the excursion by Mr. R. Welch, of Belfast. The Committee call attention to the valuable botanical work being done by Mr. R. A. Phillips, for the County of Cork, and trust many other of the members will take as special subjects, and work them out systematically, so as to produce works of reference for the district. Cork Harbour and its abutary streams, and the varied coast line, so easy of access, afford opportunities of study seldom equalled.

The report was adopted unanimously, and the accounts for the past year were passed.

Mr. T. Farrington was unanimously elected President.

The Vice-Presidents were elected as follows:--Professor M. Hartog, Miss H. Martin, W. H. Shaw, J.P.; J. H. Bennett, J. Lund, J. L. Copeman, Mr. W. H. Johnson was re-elected Secretary, and Mr. H. A. Phillips was re-elected Curator.

The following Committee were elected:—Mrs. Russell, Mrs. Hughes, Mr. Blair, Mr. Franklin, and Mr. Noonan. A cordial vote of thanks was given to Mr. Copeman for his work in connection with the Club. The election of new members was then proceeded with, and after a short discussion as to the excursions for the coming season, the meeting terminated.

OBITUARY.

WILLIAM FRAZER, F.R.C.S.I.

The death on Sunday, April 16th, of Dr. William Frazer removes a well-known figure from scientific and antiquarian work in Dublin, Although his claims to celebrity rest chiefly on his archæological work, he took a keen interest in science in all its forms—mineralogy being, perhaps, his favourite branch. He was one of the original members of the Dublin Microscopical Club, which was formally established on December 20th, 1860—although the nucleus had been in existence four years earlier—and at the time of his death filled the office of President. During the long period of his membership he was a regular attendant at the Club though he did not often exhibit; and the older members will recollect with pleasure the meetings that took place at his house in Harcourt-street, and the cheery greeting of its warm-hearted owner.

Dr. Frazer was of a Scotch family, but was born in Dublin on August 28th, 1824, and had just reached the ripe age of 75. He obtained his medical qualification in 1848, and was elected a Fellow of the Royal College of Surgeons in 1872. He had been Lecturer on *Materia Medica* at the Carmichael Medical School, and on Forensic Medicine in the Park-street School. He joined the Royal Irish Academy in 1866, was elected into the Council in 1881; at the time of his death he held the important post of Librarian to the Academy. Like so many other of his nationality, he was a staunch Presbyterian, and took much interest in church matters generally—as well as more particularly in the office of the Ormond-quay Congregation, of which he was a prominent member. He was twice married, and his second wife and some grown-up sons and daughters survive him.

GREENWOOD PIM.

 NOTES.

 BOTANY.

 FERNS.

Records of Connemara Ferns.

About twelve years ago the late Mr. Henry Seebohm gave me Vol. I. of *The Naturalist*, published 1851. Happening to open it a few days since I found his "List of Ferns found in Connemara" on p. 220.

This list has two or three very interesting records, which appear in both editions of the *Cybele Hibernica*, but strange to say the list itself is nowhere referred to in either.

RICHARD M. BARRINGTON.

Fassaroe, Bray.

The records referred to in the above note are no doubt those given for *Pilularia* and *Lycopodium inundatum* at pp. 463 and 459 of the second edition of *Cybele Hibernica*. Mr. Barrington's discovery is of considerable interest as fixing the date of the original records.

NATHL. COLGAN.

REGINALD W. SCULLY.

Dublin.

 PHANEROGAMS.

Irish Plants.

The recently issued 14th Annual Report of the Watson Botanical Exchange Club contains a number of references to Irish plants, collected by Rev. H. W. Lett and Rev. C. H. Waddell.

***Poa nemoralis*, L., in Co. Down.**

Although recorded as a Co. Down plant many years ago this grass seems to have been overlooked of late years. It is probably not uncommon, and should be looked for in dry shady places, shrubberies, and especially in beech woods. I find it plentiful in such localities at Saintfield. A slender form which I gathered at Beechpark, near Jurgan, but in Co. Down, seems to be a distinct variety, which I hope to collect in larger quantity, and have named. I notice that Rev. H. W. Lett has had a grass named *P. nemoralis*, in the Report of the Watson Exchange Club lately issued, from Ivy Lodge, Newry, in the southern part of the county.

C. H. WADDELL.

Saintfield.

Neotinea Intacta in Co. Galway.

A new locality may be added for *Neotinea intacta* in Co. Galway, as I found it on May 16th growing with *Dryas octopetala* (the latter sparingly), *Gentiana verna*, *Sesleria caerulea*, etc., on "Corbashly's Farm" near Castle, Lambert, four miles inland, due east from Oranmore. It was not growing among crags or rocks as in Burren, but on bare grassy clearings between the heather, in scattered groups of from eight to fifteen plants each. No doubt plenty more of it will be found in that district. I also found a plant of *Vicia Orobus* not yet in flower.

M. E. JOYCE.

Craughwell.

ZOOLOGY.

MOLLUSCS.

Land and Freshwater Mollusca of Clonbrock, Co. Galway.

In a quantity of vegetable debris from about the roots of rushes in marshy ground, kindly sent to me by the Hon. R. E. Dillon, I find, among other species, the following additions to the Clonbrock list given by Dr. Scharff in the *Irish Naturalist*, 1896, p. 223 :—*Hyalinia nitida*, a few; *Agriolimax lævis*, four or five rather large specimens; *Helix pulchella*, a dozen or so; *Vertigo antivertigo*, a dozen; *Carychium minimum*, over 600; and of *Planorbis spirorbis* and *Ancylus laustris*, one dead specimen each. Of the rarer species already listed by Dr. Scharff, *Hyalinia radiatula* and *H. pura* occurred sparingly with *Helix pygmaea*, while of *Vertigo pygmaea* there were over 70 specimens.

R. WELCH.

Belfast.

Land Shells from Co. Limerick.

Whilst collecting Land Mollusca last November at Galbally, Co. Limerick, I obtained the shells mentioned below in a beechwood adjoining the old churchyard, and in the Glen of Currane or Carrigan. (about 2 miles north of Mitchelstown). Those from the latter are the results of a small basketful of moss. They have been kindly named for me by Mr. Welch.

The following ten species were common to both places:—*Hyalinia radiatula*, *H. crystallina*, *H. fulva*; *Helix rotundata*, *H. hispida*, *H. rufescens*, *H. virgata*; *Cochlicopa lubrica*; *Pupa cylindracea*; and *Carychium minimum*. Also in beechwood alone—*Vitrina pellucida*, *Hyalinia nitidula*, *Helix rupestris*, *H. aspersa*; *Balea perversa*, and *Clausilia bidentata*. In the glen alone—*Hyalinia alliaria*, *H. pura*; *Helix lamellata*, *Vertigo edentula*, *V. ubstriata*, *Acme lineata*—22 species in all.

ANNIE L. MASSY.

Malahide.

BIRDS.

Green Woodpecker in Ireland.—A Correction.

In Swann's "Handbook of British Birds," 1896, it is stated that this species had only twice been obtained in Ireland previously to October, 1889, "when an extensive immigration occurred."

Again, Aflalo's "Sketch of the Natural History of the British Islands," 1898, speaks of a "recent immigration into Ireland, where previous to the appearance of the last edition of Mr. Saunders' admirable manual but two examples have been recorded."

The above immigration never occurred, and neither edition of Mr. Saunders' manual is responsible for such a statement as regards the Green Woodpecker, though in the last quarter of 1889 six Great Spotted Woodpeckers were shot in Ulster, two in Leinster, and one in Munster a tenth was shot in Kerry in January, 1890. The species referred to should therefore be *Dendrocopus major*. I make this correction in a friendly spirit, as I hope any similar mistakes of mine hereafter may be immediately corrected.

R. J. USSHER

Cappagh, Co. Waterford.

Spring Arrival of Sandwich Terns at Killala.

The wet and excessively stormy weather evidently delayed the arrival of the Sandwich Tern in the bay and estuary, for although I saw a solitary bird flying over the estuary on the 26th of March, and three on the 5th of April, yet they did not appear in any numbers until the 11th inst., when Mr. A. C. Kirkwood saw a fair number fishing in the sheltered channel near Partragh Island.

ROBERT WARREN.

Moyview, Ballina.

Iceland Gull at Londonderry.

On 17th April I noticed an Iceland gull (*Larus leucopterus*) among the usual flock of common gulls which frequent the river Foyle along our quay. Fortunately it flew quite close to where I stood. It was the size of a small specimen of the Herring Gull, with wings extra long, and plumage was *entirely white*, showing that it was just passing into the mature state

D. C. CAMPBELL.

Londonderry.

MAMMALS.

Capture of Live Bats.

I should be glad if any readers of the *Irish Naturalist* could give me some hints as to taking bats alive. I am desirous of photographing our common ones. I have searched likely places for roosts without success. I have been told that bats will settle on anything white, such as a sheet; but once tried it without success.

CHAS. LOUIS HETT.

Brigg.

THE IRISH CHARACEÆ.

BY PROF. T. JOHNSON, D.SC., F.L.S.

(Read before the Dublin Naturalists' Field Club, November 8th, 1898.)

THE Characeæ or Brittle-star plants form a group which has probably had, as regards its systematic position, a more chequered history than any other group. Though now generally regarded as an anomalous group of green algæ the Characeæ were once by many, and are still by a few, regarded as on a level with the Flowering plants. This view is due to the regularity of arrangement of the parts of the plant body, to their high degree of differentiation, and to insufficient knowledge of the exact nature of the reproductive organs. There are many flowering plants with a very poorly developed plant-body, yet by their reproductive organs recognised at once as true flowering plants.

The sub-kingdom Thallophyta (Algæ, Fungi and Lichens) consists of plants which have, as a rule, no marked division of the plant-body or "thallus" into stem, leaf, and roots. The Characeæ stand out from most Thallophyta by the possession of a marked differentiation of the plant-body, which shows a diagrammatic regularity of arrangement into stem, leaf and root. The stem grows by a well-marked apical cell, from which segments are regularly cut off with a definite future history. In the stem one recognises nodes and internodes, stipulate leaves in whorls or circles, and branches, as in an ordinary flowering plant. Though called stem, leaf, etc., the organs have no morphological connection with the stem and leaves of the higher plants. They belong to another generation and cannot be truly compared. The apical bud serves as an excellent object for dissection under the simple microscope; carefully done, the apical cell and the cells cut off from it can be seen. In the stem of the Characeæ there is no suggestion of the veins or conducting strands of the higher plants. The internode consists of one long cell, surrounded in *Chara* by a many-celled cortex which is often more or less encrusted with chalk or carbonate of lime. In *Nitella* there

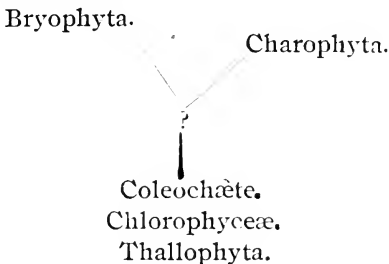
is no cortex and the internodal cell shows well under the compound microscope the streaming or rotation or cyclo-sis of protoplasm of which fuller accounts have been quite recently published. The tips of the leaves serve equally well for examination. The protoplasm of the older internodal cell contains many nuclei and they may be seen dividing directly or by "fragmentation", a mode of nuclear division rarely seen in the higher plants. For a detailed and illustrated account of the characters of the stem, leaf, mode of branching, etc., readers should consult a general text-book of botany. Here it would be quite out of place. The Characeæ are found in fresh and in brackish water—in canals, ponds, dug-out quarries, clay-pits, bog-holes, etc. In some cases, as in *Chara fetida*, their smell is anything but agreeable. The sexual organs of the Characeæ are well-marked and are always derived from the leaves. In some cases the male organs—antheridia—and the female organs—carpogonia or oogonia or "nucules"—are found on the same plant (monœcious), in other cases on different plants (dicœcious). They are to be found on different species from spring to autumn, and occasionally make their appearance in very early spring before the ice, which rarely comes in Ireland, has disappeared. They are found in connection with the whorls of leaves and are generally recognisable, by the naked eye, as bright orange or red specks. The male organ—the antheridium or globule—is round and contains a very large number of male cells or antherozoids which, when set free, swim about in the water by the aid of two long lashes or cilia. These antherozoids differ from those of all other algæ in being spirally coiled, like a cork-screw—the Characeæ agreeing in this respect with the Mosses, and Liverworts, &c.

The female organ—oogonium or carpogonium—is larger and more cylindrical in form. The egg-cell—ovum or oosphere—is enclosed in its cell-wall and is further protected, before fertilisation, by becoming surrounded by five spirally twisted filamentous cells—the involucre or pericarp. The tips of these cells meet at the free end of the oogonium and become cut off by horizontal walls to form the corona of five cells in the *Charææ* or of ten cells in the *Nitellææ*. At the time of fertilisation the corona cells separate; through the canal so

formed an antherozoid passes and on through the mucilaginous wall of the oogonium to the receptive spot in the egg-cell.

The antherozoid fuses with the nucleus of the egg-cell and so fertilisation is completed. Food matter now accumulates in the egg-cell; the oospore and the involucre become darker in colour and thick-walled to protect the oospore from injury during its period of rest—at the bottom of the pond, etc.—from the autumn till the following spring when germination takes place. The nucle¹ bursts open and two little threads grow out; one into the mud as a root, the other is green, and on it a new plant arises in a way which need not be described here. In addition to this sexual reproduction vegetative propagation is not uncommon. Cells of the root-filaments may become filled with starch, round off, and as bulbils give rise to new plants. *Starch-stars* arise by some of the surface cells of a node growing out and becoming filled with starch. This is well seen in *Tolytellopsis* in which the nucle rarely ripens. Other ways of simple reproduction are also known. *Chara canescens (crinita)* is remarkable in that the egg-cell gives rise to a new plant parthenogetically, *i.e.*, without fertilisation. *C. crinita* was discovered in Ireland in 1894 by Dr. R. W. Scully.

Migula regards the Characeæ as a group of plants independent of the two subkingdoms of the Thallophyta, and the Bryophyta (including Mosses and Liverworts) and proposes a new subkingdom—the *Charophyta*—for their reception. Their relationships are thus indicated:—



¹ By nucle one understands the resting oospore with the more or less complete involucre and corona if present still.

The group contains 150 species, some of which like *Chara fetida* are cosmopolitan. Twenty-eight species are found in Great Britain. Twenty are recorded for Ireland in the new edition of the "Cybele Hibernica." A detailed account of their distribution in Ireland appears in the *Irish Naturalist* for 1895, by the brothers Groves, who have made a special study of the British Characeæ. The publication of their fasciculi of dried specimens has made the study of the group much easier, as has the recent completion of Migula's fully illustrated Monograph "Die Characeen" in Rabenhorst's "Kryptogamen-Flora," an abridged form of which has more recently appeared.

The collecting of Characeæ is helped by the use of a small hook dredge. Owing to their entangled and brittle character, special care is needed both in collecting and mounting specimens.

The following key is practically an adaption of the one in Migula's work and that by the Groves brothers in the *Journal of Botany*, 1880, to which periodical many illustrated papers on different Characeæ have been contributed by these botanists.

Tolypellopsis is a very interesting connecting link between the *Characæ* and the *Nitelleæ*, and is regarded by Migula as the oldest living representative of the Characeæ. Its oospores, oosperms, or nucules show a close likeness to those of a fossil type. They are rarely fully ripened, reproduction being essentially vegetative. The genus has a very isolated geographical distribution, indicative of a waning character. *Tolypellopsis stelligera*, Mig. is recorded from England but is an Irish desideratum. Of the six genera only three—*Nitella*, *Tolypella*, and *Chara*—are Irish.

KEY TO THE CHARACEÆ.

A. Crown or corona of 2-celled filaments, *i.e.*, crown is 10-celled.

I. NITELLEÆ.

- a. Leaf or 'branchlet' with only one leaflet or 'ray'-producing node.
 Leaflets projecting beyond leaf-tip, often themselves again branched; Antheridia apical, on the leaf or leaflet of the penultimate order. 1. *Nitella*.
- b. Leaf undivided or having shorter lateral leaflets; Antheridia terminal on 1-celled lateral leaflet, 2. *Tolypella*.

B. Crown or corona of 1-celled filaments, *i.e.*, crown is 5-celled.

- II. CHARÆÆ.
- a.* Without whorl of stipules. 3. *Tolytellopsis.*
- b.* With whorl of stipules.
- aa.* Oogonia standing *below* the antheridia;
uncortexed; monœcious. 4. *Lamprothamnus.*
- bb.* Oogonia *mixed* with the antheridia;
incompletely cortexed or uncortexed; monœcious. 5. *Lycnothamnus*.*
- cc.* Dioecious or monœcious; in latter case oogonia *above* antheridium; cortexed or uncortexed. 6. *Chara.*

REVIEW OF SPECIES OF NITELLA, Agardh.

I. Leaves only once divided, end segments 1-celled, Corona deciduous: *Monarthrodactyle (Flexiles).*

† [A. Sexual organs with gelatinous envelope: *Glycocarpha.*

- a.* Female leaves unforked, oospore or nucule smooth. 1. *N. syncarpa.*
- b.* Female leaves forked, oospore or nucule with bands. 2. *N. capitata.*]

B. Sexual organs without gelatinous envelope:

- a.* dioecious. *Gymnocarpha.*
- b.* monœcious. 3. *N. opaca.*
4. *N. flexilis.*

II. Leaves repeatedly divided, end-segments 2 or 3-celled, Corona persistent: *Diarthrodactyle.*

A. Whorls without or, only occasionally with, accessory leaves: *Homœophylle.*

a. Sexual organs without gelatinous envelope:

- a.* End segments short, with the lateral leaflets also short, producing an insignificant corona: *Coronata.*
Fertile leaves crowded together into very small masses, end segments of leaves scarcely recognisable with the naked eye. 5. *N. translucens.*
- β.* End segments longer, forking of the leaves distinct, the last cells of the end segments attached as a short corona to the preceding cells, which are several times longer. *Mucronata.*

1. Sexual organs at several rays.

* Oospore or nucule with sharp bands. [7. *N. mucronata.*]

* Oospore or nucule with slight bands.

* Not British.

† [] = not Irish but step inserted as a guide for comparison.

** Oogonia at all places of division of the leaves, whorls open, *i.e.*, not crowded, end-segments often 3-celled. 8. *N. gracilis*.

** Oogonia mostly lacking at the first places of division, whorls "balled," "massed" or crowded; end segments always two-celled.

9. *N. tenuissima*.

2. Sexual organs only at the primary ray.

[10. *N. confervacea*.]

b. Sexual organs with gelatinous envelope:

11. *N. batrachosperma*
or *N. Nordstedtiana*.

B. Whorls with numerous, mostly 16, accessory leaves called *stipular* leaves: *Heterophylle*. [12. *N. hyalina*.]

[III. Leaves divided several times, end-segments 3 to 5-celled
Polyarthrodactyle. 13. *N. ornithopoda*.]

REVIEW OF SPECIES OF TOLYPELLA, Leonh.

I. MONÆCIOUS.

A. End-cells of leaves pointed or acute.

a. Sterile leaves simple. 14. *T. prolifera*, Leonh.

b. Sterile leaves divided. 15. *T. intricata*, Leonh.

B. End-cells of leaves blunt or obtuse.

a. With one to several sterile leaf whorls.

aa. Oospore not above 370 μ long ($\frac{1}{70}$ inch), membrane minutely punctate. 16. *T. glomerata*, Leonh.

bb. Oospore not less than 380 μ long ($\frac{1}{68}$ inch), membrane smooth. 17. *T. nidifica*, Leonh.¹

[*b.* Without sterile leaf whorls. [18. *T. Normanniana*.]

[19. *T. hispanica*.]

¹ The following note bearing on the late Dr. D. Moore's Irish specimens, preserved in the Science and Art Museum, should justify the inclusion of the species in the Irish flora:—

T. nidifica, A. Braun: "Fragmente einer Monographie der Characeen." (*Abhandl. der königl. Akad. Wissensch. Berlin*, 1882, p. 94.)

Forma intermedia, Frankreich, Hyères (Var.) (Antheridien auffallend gross, o, 44 —, 47 mm. dick). Accedens ad glomeratam. — Irland. Dr. Moore in herb. Hooker. (Form, die ächte mit *T. intricata* und *prolifera* oder zunächst *N. glomerata* zu verbinden scheint). Habitus *N. nidifica* baltica, folia verticillorum fertiliium eodem modo incurva et obtusa. Color nigrescens. Semina minora magis contorta 10-gyrata, unreif, o, 46 —, 48 mm. lang, ohne Kronchen o, 43 —, 44 mm. lang, Kern hell gelbgrün o, 30 — 0.35 mm. lang.

II. DICÆCIOUS.

Tolypellopsis (v. Leonh.) Migula.

(This genus includes *Lycnothamnus stelliger*, Braun, not yet recorded for Ireland).

Cortex of stem and leaves and stipular whorl absent. In place of stipules 3 small cells of the basal node of the leaf are strongly developed on the outer side of the leaf at its base.

Leaves with only one or two nodes, leaflets one or two at the nodes, often quite absent.

Antheridia and oogonia represent leaflets; antheridia are solitary, stalked, quite at the bulging side of the leaf. Oogonia solitary or in pairs with quite short, often a common stalk cell, on the bulging part of the leaf.

The neck portion of the involucre cells is elongated and beaklike; the corona is small, rounded off with small cells, not erect, and becoming thinner towards the apex.

Tolypellopsis is distinguished

- a. from all other *Characeæ* by the absence of a stipular whorl, the form of the involucre-cells and of the corona, as well as in habit by the small number of leaflets.
- b. from *Lycnothamnus* by the position of the antheridia,
- c. from *Lamprothamnus* by the development of the oogonia.
- d. from *Chara*, by this and by the completely different structure of the stem node.

[*Lamprothamnus alopecuroides*, Braun, is very rare, not recorded for Ireland; it was discovered in the Isle of Wight, in 1862, by the late A. G. More, and is recognisable by the characters of the genus already given.]

REVIEW OF SPECIES OF CHARA.

I. Whorl of stipules 1-seriate, plants monœcious:

Haplostephane, A. Br.

Completely uncortexed, oospore or nucule without a chalky envelope or involucre. End-joint of leaves a little longer than the leaflets of the last node and producing with these mostly a 3-pointed crown or tuft.

[23. *C. coronata* Ziz. or *C. Braunii*, Gmel.]

II. Whorl of stipules biseriata (in *C. ceratophylla* sometimes triseriate).

Plants monœcious or dicœcious: *Diplostephane*, A. Br.

A. Cortex incomplete, only of elongated, irregular cells:

Imperfectæ, A. Br. [25. *C. imperfecta*.]

B. Stem cortex complete, of elongated internodal cells and isodiametric nodal cells: *Perfectæ*, A. Br.

1. Number of rows of cortical cells same as of leaves of corresponding node:

Isostichæ A. Br.

* Dicœcious.

26. *C. crinita* Wallr.

or *C. canescens*, Loisel.

* Monœcious.

27. *C. denudata*, A. Br.

or *C. dissoluta*, A. Br.

2. Number of rows of cortical tubes twice as many as of leaves of corresponding node : *Diplostichæ*, A. Br.

* Chief or middle or primary rows stronger developed, spines on edges of cortex : *Tylacanthæ*

- (a.) Dioecious, 28. *C. ceratophylla*, Wallr.,
or *C. tomentosa*, Linn.

(b.) Monœcious.

a. Oospore or nucule with chalky involucre, plant also always more or less incrustated.

* Oospore black.

** Spines of cortex absent or only slightly developed, then always solitary.

Oospore (nucule) with spinules (thornlets); 680 μ . (1/37) inch) long at most; leaflets scarcely developed; on the back of the leaf.

*** Leaves of normal length, at any rate never conspicuously short, with several cortexed or at least fertile leaf nodes. 30. *C. contraria*, Kütz.

** Spines of cortex strongly developed, solitary and also always some tufted, sometimes the latter only present;

Oospore with or without spinules; leaflets fairly uniformly and strongly developed round the leaf.

*** Oospore more than 700 μ . (1/36 inch) long, with 10-12 strong bands 32. *C. polyacantha*, Braun.

* Oospore brown (very rarely almost black), more than 700 μ . long (1/36 inch), leaflets on the back of leaf very short. Spines mostly strongly developed, sometimes tufted, more rarely scattered, but then still long and strong.

33. [*C. papillosa*, Kütz., or
C. intermedia, A. Br.]

β . Oospore without chalky envelope, plant not incrustated, Oospore more than 700 μ (1/33 inch) long, black with strong spinules.

[34. *C. baltica*.]

† Primary or middle rows more or less raised above the secondary or intervening rows, more rarely both almost equally developed.

Thorns (or papillæ or the isodiametric cells, in forms which develop neither thorns nor papillæ) in the grooves or furrows, often quite absent from the secondary rows: *Aulacanthæ*, A. Br.

Stem and leaves completely cortexed except one or a few of the no longer fertile leaf-segments.

Antheridia and oogonia together.

* The nodal cells of the cortical tubes develop either no papillæ or spines or these remain small and relatively thick, always solitary.

Leaflets far weaker developed on the back of the leaf and appearing only as papillæ.

- ** Leaflets on the back of the leaf almost wholly undeveloped, scarcely longer than broad.

38. *C. fatida*, A. Br., or *C. vulgaris*, Linn.

- * The nodal cells of the cortical tubes develop more or less long spines which are in part solitary, in part tufted, but sometimes tufted only. Leaflets developed on the under side of the leaf are half as long as those on the upper side.

- ** Leaflets on the back of leaf half as long as or shorter than those on the dilated (inner) part, mostly incrusted.

- *** Secondary and primary tubes almost equally well developed, leaflets on the dilated part longer than the fruit (oospore).

41. *C. hispida*, Linn.

3. The number of the series of cortical tubes is three times that of the leaves of the corresponding node :

Triplosticha, A. Br.

† Diœcious.

- a. Spines present, mostly distinctly evident.

In addition to shorter leaflets on the inner side five longer ones on the side and on the dilated side.

- a. Covering leaflets and subsidiary leaflets as long as the two lateral ones, developing unicellular bulbils in mucilage.

43. *C. aspera*, Willd.

- b. Spines absent, only two subsidiary and one covering leaflet, rarely two short lateral leaflets developed.

- a. Cell-wall of cortical tubes very thin, stem and leaves becoming when dry as thin as paper, producing strawberry-like bulbils in mucilage.

[45. *C. fragifera*, Durien.]

- β. Stem and leaves, but especially the cortical tubes thick walled, remaining in drying almost round, stiff, shining, without bulbils.

44. *C. connivens*, Braun.

‡ Monœcious.

Leaflets on the back of the leaf undeveloped or wart-like only, oospore black.

- a. Without spines or warts, primary and secondary rows of cortical tubes equally well developed.

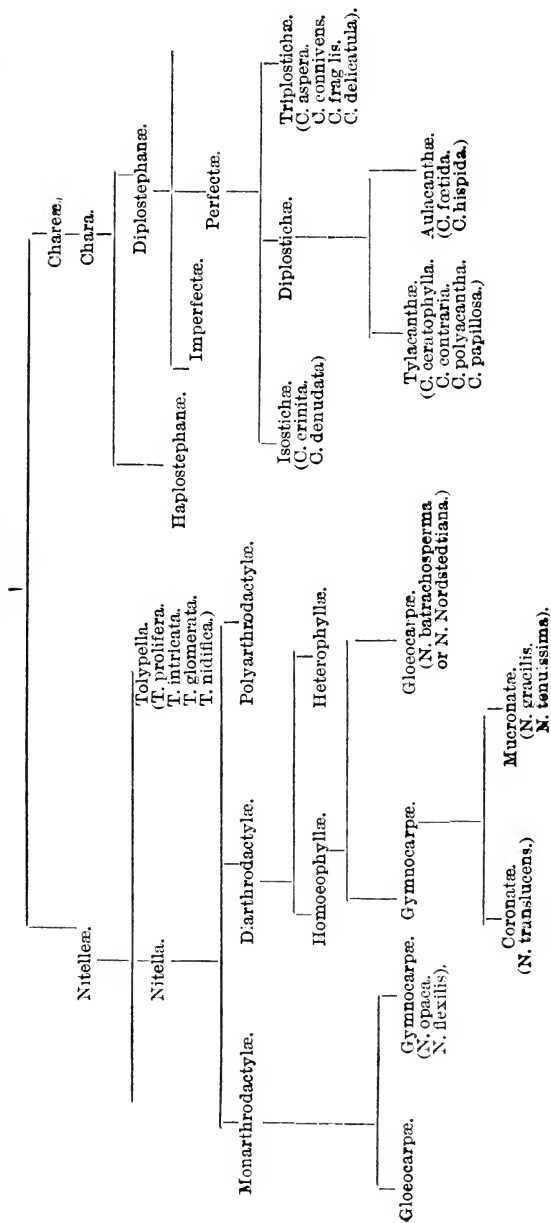
48. *C. fragilis*, Desv.

- β. The primary or middle rows project above the secondary or intervening rows and bear distinct warts or spines.

49. *C. delicatula*, Braun.

TABULAR REPRESENTATION OF THE IRISH CHARACEÆ.

CHARACEÆ.



SOME ALGÆ FROM THE ANTRIM COAST.

BY HENRY HANNA, M.A., B.SC.

[Collected for the R.I.A. Flora and Fauna Committee.]

THE following notes contain some of the more interesting results on the seaweeds collected on the coast of Co. Antrim. Excursions to various points on the coast were made, where suitable conditions were likely to exist for shore-collecting or dredging, such as the Gobbins, Larne Harbour, Murlough Bay, Colliery Bay, Torr Head, Portrush, and the Giant's Causeway, in addition to part of Belfast Lough. It was not found possible to visit Cushendall, Cushendun, or Glenarm, including Carnlough, places I should have liked very much to explore, but this would have exceeded the limits of the time at my disposal.

On July 4th, 1898, and on a subsequent occasion, the Gobbins were visited for to carry out shore-hunting: here I found a fine specimen of *Ectocarpus brachiatus*, Harv., (= *Stictyosiphon Griffithsiana*, Holm. et Batt.), growing on a very young specimen of *Fucus serratus*, on an exposed part of the coast. Dr. Bornet, to whom I am greatly indebted for kindly examining it, referred it to *Ectocarpus brachiatus*, Harv., similar to that sent out in Mrs. Wyatt's *Alg. Danm.*, No. 187. The usual habitat for this plant is *Rhodymenia palmata*.

Dredging was carried on in and outside Larne Harbour on three different occasions towards the end of July, and on the 25th September. Numerous *Nitophylla* were dredged, the principal being *N. lacratum*, Hillier; also a small scrap of *Bonnemaisonia asparagoides*, and some forms of *Lithothamnium*. The latter were forwarded to Dr. M. Foslie, who kindly undertook their examination, one of which he makes the type of a new variety of *Lithophyllum calcareum*—f. *cunana*, Fosl. in a recent number of the *Selskabs Skrifter* (no. 6, 1898).

The first week in August was spent at Murlough Bay, and neighbouring localities were examined, such as Colliery Bay and Torr Head. Mr. E. M. Holmes accompanied me on this occasion, and his assistance was invaluable.

The following plants collected are new to Ireland :—

Phyllophora Traillii, Holm. et Batt.—Torr Head.

Elachistea (Streblonema) Areschougii, Crn.—Murlough, on *Himanthalia lorea*.

Rivularia biasoletiana, Menegh.—On rocks near high water mark exposed to spray; Torr Head.

Blastophysa Rhizopus, Rke.—Torr Head.

Phæostroma pustulosum, Kuck.—Murlough, on *Laminaria saccharina*.

Wildmannia miniata, Fosl.—This plant, collected at Murlough Bay, floating up at high tide, is of interest owing to the lateness of the season when observed. It flourishes best during early spring, and, according to Dr. Foslie, should perhaps be considered as only a form of *Diploderma amplissimum*, collected many years ago on this coast at Cushendall by the late Dr. Moore. Kjellman figures and describes this latter plant in "The Algæ of the Arctic Sea." pl. 18. 1883.

Porphyra leucosticta, Thur.—Larne; Murlough Bay.

Polysiphonia divaricata, Kütz.—Washed up, probably from very deep water, at Murlough Bay, on the second day after arrival. This plant, included in Holmes and Batters' "Revised List of British Marine Algæ" as occurring in district 4, where it was probably collected by Dr. Magnus, of the North Sea exploring party, does not appear to have been found since. This plant, which Mr. E. M. Holmes kindly identified as Kützing's *P. divaricata*, is doubtfully a true species, as I am not aware of fruit having ever been found. It may be only a rare variety of some better known plant.

Ceramium Derbesii, Sol. Kützing, Tab. Phyc., t. 14, vol. xiii.—Murlough Bay, on rocks at low water; it is new to the British Flora.

I would here gratefully acknowledge the help and kindness extended and shown to me by Mr. E. M. Holmes, Dr. Edward Bornet, Prof. Sauvageau, Dr. Foslie, and Prof. Johnson.

Royal College of Science, Dublin.

SOME FRESHWATER MITES FROM CO. DUBLIN.

BY D. FREEMAN, M.A., M.B.

FOR many reasons the determination of species of the *Hydrachnidæ* has hitherto attracted the attention of but few persons in Great Britain or Ireland, the chief one being, I suppose, that no work has yet been published with figures and descriptions of the British species. Papers, however, are now in progress in "Science Gossip" which will supply this want, so that any one interested in these little "spidery" creatures can easily work at the group, with very little cost for a text-book.

In the years 1884 and 1885 I collected Hydrachnids in the neighbourhood of Dublin: the captures which were identified were determined from the works of C. L. Koch, A. Dugès, P. Kramer, and C. Neuman. The literature of this family of mites was then largely in a scattered, even fragmentary state, Neuman's monograph being then, I believe, the principal modern authority dealing with the whole group. Since 1885 I did little or no work until the appearance of Dr. R. Piersig's great monograph (publication not yet completed), when I revised old work, using his nomenclature where possible. The following species occurred:—

Atax crassipes, Müller (Bruzelius).—Common and generally distributed.

Hydrochoreutes filipes, Neuman.

Hydrochoreutes cruciger, Neuman.—The last two species are given with Neuman's nomenclature. Piersig suggests by query that Neuman's species are synonymous with *H. unguulatus* (Koch) Piersig, but my captures were identified from Neuman, and are not now in a condition to be compared with Piersig's figures and descriptions. *H. filipes* and *H. cruciger* are not common; two examples of the former and one of the latter were taken in the Royal Canal (May).

Curvipes conglobatus, G. L. Koch.

Curvipes longipalpis Krendowskij.?

Curvipes nodatus Müller.?

Curvipes fuscatus, Hermann.

Hygrobates longipalpis, Hermann.—Common everywhere. *H. impressus*, Neuman, = ♂ *H. longipalpis*, according to Piersig, occurred occasionally in the Royal Canal.

- Limnesia histrionica**, Hermann.—The common mite placed under this name requires investigation. Male (?) examples seem to be disproportionately numerous.
- Limnesia maculata** (Müller), Bruzelius.—Common.
- Brachypoda versicolor**, O. F. Müller.—This very small mite is much the commonest of the *Hydrachnide* about Dublin.
- Mideopsis orbicularis**, O. F. Müller.—Royal Canal. Rare. A single example was taken on two occasions in May.
- Midea elliptica**, O. F. Müller.—Royal Canal, occasionally.
- Arrenurus globator**, O. F. Müller.—Generally distributed, and fairly common.
- Arrenurus securiformis**, Piersig.—Many examples ♂ occurred in a ditch near the new Clontarf railway station (May and June).
- Arrenurus caudatus**, De Geer.—Examples ♂ and ♀, brilliantly coloured as in Neuman's figures (orange-red anteriorly and posteriorly, and indigo-blue in the middle of the body) were taken plentifully from a ditch by the railway at Broom Bridge, Royal Canal.
- Diplodontus despiciens**, Müller.—The dusky yellowish-brown mite figured and described by Neuman under the synonym *D. filipes* Dugès, is rare here. I found it only in the Tolka River (Botanic Gardens), August, and a few years ago at Carton, Maynooth (June). A bright red-bodied form with red epimera, legs, and palpi is common; the body is not depressed and somewhat flaccid as in Neuman's mite, and it is a livelier and stronger swimmer. Is there a specific distinction?
- Hydryphantus ruber**, De Geer.—A few examples in a marsh pool, Howth Hill, in May. This Hydrachnid is one of the first to appear in the season; it has been detected by Mr. Halbert this year in the middle of March.
- Thyas venusta** C. L. Koch. ?—One example found in a pool in Santry Demesne.
- Hydrachna globosa** (De Geer), Dugès.—Plentiful in the ponds at Mount Temple, Clontarf, in May.
- Hydrachna** Sp.—A mite of this genus having the plates of the *area genitalis* widely distant from each other, occurred a few times in the Royal Canal (March). Mr. Halbert secured many examples this year (March) at Gollierstown, by the Grand Canal. I have not seen it figured or described; Piersig's descriptions of the genus have not yet appeared. Neuman points out the separation of the genital plates in his description of immature examples of *H. geographica*, which however, is much the largest of the *Hydrachnide*, attaining eight or nine millimètres in length of body, while this species barely reaches two.
- Eylals extendens** (Müller), Latreille.—Common, April to July.
- Limnochares holosericea**, De Geer.—Rather common, March to June.

I fished for mites a few times this year, adding the following species :—

Cochleophorus vernalis (Müller) C. L. Koch.—One example, female (April). Ditch near Broom Bridge, Royal Canal.

Limnesia Koenikel Piersig.—One example, Royal Canal (April), of hyaline ground colour, with faint blue epimera, palpi and legs. Perhaps this variety is synonymous with *L. albella* Koch, described also by Neuman. Mr. Halbert had previously detected *L. Koenikei*.

Lebertia tau-insignita Lebert.—Pond by Grand Canal at Golliers-town (Easter).

Neuman (1880) described 20 genera and 69 species for Sweden ; G. Haller (1882), 12 genera and 32 species for Switzerland ; Krendowskij (1884), 10 genera and 35 species for South Russia ; Th. Barrois and R. Moniez (1887), 21 genera and 72 species for the north of France. But Piersig (1897), while he suppresses some species described by these investigators, doubles for Germany the number recorded for North France in the portion of his work that has already been published. It is clear that much now remains to be done for a Dublin list.

The fresh-water mites, excepting a very few species parasitic on *Unio* and *Anodonta*, are found among aquatic plants, and may be taken with a finely-meshed water-net. They are most plentiful in May and June, when often a single dip into a bunch of *Callitriche* yields a quite embarrassing number of specimens: many species can be taken in fair quantity in March and April. My method of fishing is to use a net of "grenadine," or of straining linen. Having passed it through the water-weeds, I turn it inside out and wash it in a portable white rubber camp-basin. All the mites taken will, in this way, be secured, and the very smallest of them can be seen swimming about. They are fished out of the basin with a soft, rather large, camel-hair pencil, and dipped into a phial containing water and some water-weed. When the creatures touch the water they disengage themselves instantly, and so are finally secured. The weed supplies a resting place for the captures, and more or less refuge from attack, for some kinds—such as species of *Limnesia* and *Hygrobatas*—are more than commonly rapacious, and are apt to destroy less active and softer skinned kinds, especially if numerous individuals are contained in a vessel which does not afford "elbow-room" enough.

Callitriche verna is particularly haunted by water mites, also the large water sedges. *Elodea canadensis* yields many species. I have found *Potamogeton* quite unproductive.

For the purpose of noting the colouring of water mites, they should be examined alive. For preservation they must be scalded, in order to retain the limbs in an extended position. Unfortunately, this treatment utterly spoils the colour of many kinds. *Atax crassipes* and *Cochleophorus vernalis* will turn quite black in an hour or so.

I keep the mites in tubes containing spirit and water—about one-fifth spirit. Many kinds have retained colour fairly for fifteen years. Most species of red colour, however, bleach rapidly.

Hydrachnids can be kept alive a long time in an aquarium containing suitable aquatic plants, and Entomostraca (e.g. *Daphnia*, *Cypris*) for food. According to Piersig they also feed on gnat-larvæ and Infusoria.

Dublin.

NOTES.

BOTANY.

Rev. E. S. Marshall on "*Cybele Hibernica*."

To the *Journal of Botany* for June, Rev. E. S. Marshall, M.A., F.L.S., contributes some "Remarks on *Cybele Hibernica*, ed. II." Apart from Mr. Marshall's high position as a British field botanist, his claim to speak on the Irish flora rests on several thorough and successful explorations carried out in recent years in little known parts of our island, and his remarks are therefore deserving of careful attention, and we trust that the paper will be read and noted by Irish botanists. Mr. Marshall is distinctly of opinion that a too rigid severity has been applied to the claims of certain species to rank as natives in Ireland—such as *Ranunculus parviflorus*, *Teesdalia nudicaulis*, *Helianthemum Chamæcistus*, *Geranium pusillum*, *Medicago sylvestris*, *Trifolium glomeratum*, *Epilobium Lamyi*, *Ananthe pimpinelloides*, *Sisyrinchium californicum*, *Leucojum æstivum*, *Brachypodium pinnatum*. We fancy that many of our readers will agree that the severe treatment applied to some of these in "*Cybele*" was hardly warranted by the facts.

Geranium rotundifolium, L. in Co. Wexford.

On August 10th, last year, I noticed a few plants of *Geranium rotundifolium* growing near New Ross, but had not time to investigate its distribution in the district until May 25th, this year, when I was again in the neighbourhood, and found that it occurs abundantly on some rocks about half a mile south of the town, and sparingly at intervals along the rocky sides of the road leading from that into the town. As the only other known Irish stations for this species are in counties Cork and Clare it makes an interesting addition to the flora of District IV. *Geranium columbinum*, already recorded from other localities in Co. Wexford, also grows on these rocks.

R. A. PHILLIPS.

Cork.

Teesdalia nudicaulis in Co. Down.

A year ago I had the pleasure of detecting *Teesdalia nudicaulis* in Co. Antrim. This year I have met with it, in some abundance, in the adjoining County of Down, in a shady place near the filtering ponds of the pleasantly situated bleaching grounds at Lambeg, bordering on the River Lagan. The conditions of the place where it grows, and where it would seem to have been long established, point to its having come thither by the canal with sand from Lough Neagh, possibly from the Co. Tyrone shore, where it is known to occur. In the last named station, where the species was first discovered in Ireland, the editors of *Cybele Hibernica* consider it a doubtful native, but have, nevertheless, admitted it, provisionally, to a place in the Irish flora. *Teesdalia* has a wide comital distribution in England and Wales, extending into Scotland, and if, as seems likely, it should have come to Ireland to stay, our flora will be enriched by the addition of one of the most distinct and interesting species of *Cruciferae*.

J. H. DAVIES.

Lisburn.

ZOOLOGY.

Phenological Notes from Co. Tipperary.

As the May number of the *Irish Naturalist* does not make any announcement of the arrival of summer migrants to Ireland I send particulars of which those have come under my notice. Wheatear (seen by a friend), 25th March; Sand Martin (seen by a friend), 31st March; Sand Martin (seen by myself), 5th April; House Martin, 5th April; Chiff-chaff, 1st April; Willow Wren, 6th April; Meadow-pipit, 7th April; Sandpiper, 8th April; Swallow, 19th April; Sedge Warbler and Cuckoo, 23rd April; Corn-crake, 25th April; Swift, 27th April; Reed Warbler, 4th May.

A large number of Reed Buntings made their appearance on the Nenagh River and shores of Lough Derg about the 20th of April, and flocks of May Birds or Whimbrel passed over Lough Derg from the Co. Galway on 7th May.

The rough north-east wind and rough broken weather between the 7th and 20th of April interfered very much with the early arrival of our migrant birds. Is there any record of the Fieldfare breeding in Co. Tipperary? I believe there are some pairs breeding here at present in some Scotch firs.

For the past week (May 1st-6th) the Mayfly or Green Drake has been showing up on Lough Derg, so that the regular rise may happen any moment. I find that the Orange Tip butterfly hatches out in this locality, as a rule, the week before the full rise of the Mayfly, and the Orange Tip has been fairly numerous the past week. The Brimstone Butterfly comes out with the Mayfly, and I have already seen several on the wing. The Small White, Green-veined White Wood Argus and Speckled Wall Butterflies are also plentiful the past week, with many Small Tortoise-shells here and there, probably hibernated specimens, though a few looked very fresh and bright. I have also seen a few Peacock Butterflies, but they must be last year's brood.

Why do not some of the Field Clubs pay a visit to North Tipperary which is an interesting district, and but little known to Irish naturalists?

MICHAEL GLEESON.

Nenagh.

WORMS.

Irish Worms Wanted.

I am almost every day getting new species of small worms from gardeners, florists, and others in England. I wish Irish workers could be prevailed on to send me similar material. White worms now abound in manure, leaf-mould, bulbs, &c., and I have no doubt there are many new species yet to be discovered if only workers would send material.

HILDERIC FRIEND.

Ocker Hill, Tipton:

CRUSTACEA.

Irish Crustacea.

In the current volume of the *Annals and Mag. Nat. Hist.* (7), iii., 1899, Canon A. M. Norman publishes (pp. 70-78) a valuable annotated list of the British Land Isopoda. Several additional species have been found in England since Dr. Scharff's paper on the British and Irish Woodlice was published in our pages (vol. iii., pp. 4-7; 25-9.) Another paper in the same volume of the *Annals* (pp. 317-40) by the same author, on British Isopoda Chelifera, contains the records of several species taken in Irish waters in recent years, and the complete survey of their British and general distribution is of great value, as also the very complete bibliography.

Mr. W. T. Calman has contributed to the same volume (pp. 27-39) a paper on the British Pandalidae, in which he gives additional details on the structure of *Pandalus propinquus* and *P. leptorhynchus*, G. O. Sars, which were recorded by him from the S.W. coast of Ireland in the *Trans. R.I.A.*, vol. xxxi., 1896. These species have now been found in Scottish waters. The latter is in future to be known as *P. Bonnierii*, Caullery.

INSECTS

Macroglossa stellatarum in Co. Dublin.

During the past few days I have observed an unusual abundance of the Humming-bird Hawkmoth in this part of Co. Dublin. On June 1st and 2nd I noticed a large number of them about a bed of Columbine in my garden, and next day found them in great numbers along every roadside in the neighbourhood, and especially along the sea side of the West Pier battery wall at Kingstown, where scores of them were flitting back and forward, their loud crackling hum attracting instant notice. The insect is usually common enough in this district, but I have never previously seen it in such numbers.

H. G. CUTHBERT.

Blackrock.

Vespa rufa in Co. Clare.

While staying in Limerick during the Whitsuntide holidays I spent a day at Scariff, in Co. Clare, and noticed there a great abundance of the females of this wasp. All the specimens captured were engaged in hawking flies, showing that nest-building had commenced, although I was unable to locate the position of any nests. I saw no specimens of *V. austriaca*, a wasp I have always taken on the wing much later in the season.

H. G. CUTHBERT.

Blackrock.

Vespa austriaca in Derry and Donegal.

While hunting for Longicorn beetles yesterday in Walworth Wood, Co. Derry, I observed *Vespa austriaca*, Panz. (*arborea*, Smith), females in abundance. It was in company with *V. rufa*, which is very abundant in Derry and Donegal this season, from which it may readily be distinguished when on the wing by the much deeper tone of its hum, the contrast being quite as strong as the difference between *Bombus hortorum* and *B. terrestris*. I had no suitable net for taking them, but succeeded in capturing four examples in less than half an hour, besides missing others. The black dots on the clypeus vary in each example; in two cases the three dots are united, all have a yellow line on the front of the first joint of antennæ, and in one specimen there is only the faintest trace of the yellow dot under the wings.

On 16th August last I took a male *V. austriaca* at White Castle, Co. Donegal. Mr. Edward Saunders kindly examined and verified this for me. I believe this to be the second male *V. austriaca* taken in the British Isles, the previous example being taken in 1896 by Rev. O. Pickard-Cambridge, in Dorsetshire, and recorded in the *Irish Naturalist*, vol. vii., p. 18.

My specimen was taken in company with male *Vespa norvegica* and *V. sylvestris*. *Vespa norvegica*, *V. sylvestris*, and *V. rufa* are all plentiful in this district this year. *V. vulgaris* not so common, and I have not yet met with a single example of *V. germanica*.

CLAUDE W. BUCKLE.

Londonderry.

The Habits of *Vespa austriaca*.

Mr. Buckle's note on the occurrence of this interesting wasp in the North of Ireland suggests that the attention of our readers should be called to Mr. Chas. Robson's recent observations on the habits of this species (*Science Gossip*, vol. v., 1898, pp. 69-73). He was able to examine a nest of *Vespa rufa*, which contained both males and females of *V. austriaca* just ready to emerge from their cells, and showing the characteristic marking of the species. The generally-believed idea that *V. austriaca* is a "cuckoo parasite" or inquiline (see Mr. Cuthbert's paper, *Irish Naturalist*, vol. vi., 1897, pp. 285-7) has now received full confirmation.

MOLLUSCA.

Marine Shells from the Kenmare River.

During a visit to Kenmare last Easter, Mrs. Tatlow and Miss Massy did a little hurried shell-collecting at Parknasilla, and on the strand at the mouth of the Blackwater. The time was very limited, otherwise a fair list might have been worked up. As it is, the list may be worth publishing, as Mr. A. R. Nichols informs me there are few records from the long sea-inlet called Kenmare River. Thanks are due to Dr. G. W. Chaster for some of the determinations. The following is a list of the species collected. Those marked * were found at both Parknasilla and Blackwater; those marked † at Blackwater only; the remainder at Parknasilla only:—**Anomia cphippium* and var. *aculeata*, *A. patelliformis*, *Ostrea edulis*, *Pecten Pusio*, *P. varius*, *P. maximus*, **Mytilus edulis*, *Modiolaria marmorata*, *Montacuta bidentata*, *Lasea rubra*, *Cardium exiguum*, **C. edule*, **C. norvegicum*, **Venus exoleta*, *V. fasciata*, *V. verrucosa*, *V. ovata*, *V. gallina*, *Tapes aureus*, **T. pullastra*, **T. decussatus*, *Tellina crassa*, **Gastrana fragilis*, *Psammobia vespertina*, **Mactra solida*, **Lutraria elliptica*, **Scrobicularia piperata*, **Solen ensis*, **Mya arenaria*, *Saxicava rugosa*, †*Pholas candida*, **Patella vulgata*, *Tectura virginea*, *Fissurella græca*, *Trochus helicinus*, **T. magus*, *T. cinerarius*, *T. umbilicatus*, *T. tumidus*, *T. zizyphinus*, *Lacuna divaricata*, *L. pallidula*, **Littorina litorea*, *L. rudis*, **L. obtusata*, *Rissoa punctura*, *R. parva*, *R. albella* var., *R. membranacea*, *R. violacea*, *R. striata* and var. *artica*, *R. cingillus*, *Hydrobia ulve* and var. *Barleci*, *Skenea planorbis*, *Odostomia plicata*, *O. albella*, *O. pusilla*, *Cerithium reticulatum*, *Purpura lapillus*, *Buccinum undatum*, **Murex crinaceus*, *Nassa reticulata*, *N. incrassata*, *Pleurotoma costata*, *Cypræa europæa*, *Melampus bidentatus*.

R. LLOYD PRAEGER.

FISHES.

**Extraordinary abundance of Herrings in the Rivers
Suir and Barrow.**

In November last we had a visitation from a body of herrings of such unusual magnitude as to deserve record in the pages of the *Irish Naturalist*. Not only were the fish in very great numbers, but they found their way up the rivers to a considerable distance from the sea. At low tides on November 11th and 12th they were cast up alive on the beach at Pilltown (Co. Wexford, on the Barrow, above its junction with the Suir), in such quantities that the beach was white with their bodies, and the farmers sent their carts down to the river to remove loads of them. Unfortunately I was not able to go and see the beach again, but I was informed that the fish continued in a similar abundance for about a week, and that there were places where in her course between Waterford and New Ross the local river steamer forced them out of the water on her paddles. Enormous takes were made by the fishermen living nearer the sea. I am informed that a similar appearance of herrings in the Barrow has not occurred for fifty years, but I read in Arthur Young's "Tour of Ireland in 1776-1779" (Cassell's National Library, 1887, p. 131), that in 1774 they were in such quantities in Waterford Harbour "that the tides left the ditches full of them."

G. E. BARRETT-HAMILTON.

Kilmanock, Co. Wexford.

MAMMALS.

Capture of Live Bats.

In reply to Mr. Hett's note in last month's *Irish Naturalist* (p. 144) he will find it possible to attempt the capture of these animals in one of two ways—

- (1.) Catching them on the wing;
- (2.) Finding them in their holes.

The first method is scarcely suitable for his purpose, though sometimes it is possible to catch bats quite uninjured by means of a net stretched by some device on a fishing-rod.

The second method is usually preferable, but tedious. Different bats will be found in different localities. For instance, Long-eared Bats frequent church steeples and roofs of buildings, Hairy-armed Bats live in hollow trees, &c., &c. Caves, holes, and cracks in rocks are always worth searching—care being taken to search the smaller holes especially thoroughly, as bats pack themselves into an amazingly small compass. French window-shutters that have not been touched for some time are generally good places.

If Mr. Hett will write to me personally I shall be very pleased to render him any assistance in my power.

N. H. ALCOCK.

Trinity College, Dublin.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a monkey from Mrs. J. T. Campbell. Eleven monkeys, two lemurs, an Ocelot, two Golden Agnotis, two Vulturine Guinea-fowl, ten White-fronted Geese, and a number of small birds have been bought. It is highly satisfactory to notice that the action taken by the Council last year with reference to the protection of the Chough has led to the issue of instructions to the Royal Irish Constabulary to enforce vigorously the Wild Birds' Protection Act.

Over 19,000 persons visited the Gardens in May.

BELFAST NATURALISTS' FIELD CLUB.

MAY 20.—The members held their first Field Meeting for the year at Armagh, whither a goodly party proceeded by the morning train. The party at once proceeded to the celebrated Navan Fort, or Emania, the pre-Christian residence of the Kings of Ulster, whose occupation extended down to the fourth century of the Christian era. A formal meeting was constituted, and Mr. John Vinycomb, M.R.I.A., was elected chairman. The arrangements for the day were announced, some new members were elected, and a discussion took place as to the desirability of inviting the British Association to Belfast at an early date. The Chairman delivered a short address referring to the historic events suggested by the surroundings. The meeting was then addressed by Mr. Robert Pillow, a local antiquarian, well versed in archæological, topographical, and folk-lore subjects. He rendered the party most efficient service during the entire day by his prompt answers to every question put him by the inquisitive members of the party. Leaving Emania, an adjournment was made to the adjoining quarries, which were successfully explored for the characteristic fossils of the locality.

Returning to the City of Armagh, a visit was paid to St. Patrick's Well and the Callan Water—a stream often referred to in the annals of Ireland. The party next visited the Abbey, in the Palace grounds, and then walked on to the Museum of the Armagh Natural History Society, where, under the guidance of the Society's Secretary, they found an excellent collection of natural history and antiquarian objects. The Chairman pointed out the important and valuable collection of seals, and made some suggestions as to their arrangement. Walking on to the observatory, the party were very cordially received by the chief astronomer, Dr. Dreyer, who conducted the members over the premises. Next a visit was paid the Roman Catholic Cathedral, where a courteous officer, by the kind direction of Rev. John Quinn, P.P., gave the history of the building, and pointed out its prominent features and contents. It was intended to visit the Armagh Library, but the time for closing had arrived, so the members of the B.N.F.C. had to close their interesting tour of inspection with a visit to the old cathedral.

After tea, the Chairman again constituted a formal meeting, at which the events of the day were discussed. The conductor having tendered the Club's thanks, through Mr. Fanning, the Secretary, to the Armagh Natural History Society, made some suggestions as to the Museum and some subjects of geological inquiry, including the desirability of having a typical collection of local fossil fish remains, and proposed the following resolution, which was passed unanimously:—"That this meeting, having noticed the neglected condition of what now remains of the ancient sculptured stone crosses of Armagh, it is desirable that steps should be taken to have the crosses re-erected and restored, and that the B.N.F.C. should initiate the movement at an early date." Mr. Fanning suitably responded to the expressions of thanks to the local authorities, and promised, on behalf of the Natural History Society, to give the suggestions of the Club their very best attention.

JUNE 10.—On the 10th instant the members of the Club held their second Field Meeting of the session at the hill fort at Lurigethan, County Antrim, a point out of the beaten track, but one of great interest. Availing themselves of the facilities afforded by the Northern Counties Railway, the party was conveyed as far as Retreat Castle, on the south side of the valley of Ballyemon. Leaving the railway carriage the party proceeded on foot up the slope and along the great ridge that separates the valleys of Ballyemon and Glenariff. A walk of about a mile brought the party to the ancient earthworks that constitute the important hill fort at the extreme end of the ridge, which rises abruptly from the coast-line, and appears from below a truncated cone 1,154 feet high. To the geologist this point of view is of special interest, not only from the varied features of physical geography that it presents, but from the marked difference between the geological structure of the district to the north and the area under view to the south, for whereas the district to the south, with the construction of Lurigethan itself, is built up with the same geological formations of the Secondary period that constitute the main structure of Antrim, and are displayed in the escarpment of Cave Hill and the eastern coast-line, the rocks in the northern area are mainly primary rocks, mica schist, and crystalline limestone, much older than any other rocks in Antrim or Down, and more nearly related to the rocks of the opposite side in Scotland, a relation that opens up a chapter of inquiry of the greatest interest. To the antiquarian the fort of Lurig must be of special interest, not alone for itself, as the stronghold of the chieftains of the glens, when, as Scots, they joined the Picts in resisting the Roman advance in North Britain, but also because of the number of events and variety of ancient monuments called to remembrance by the prospect enjoyed from this spot. The Club's meeting at Lurig was presided over by Mr. John Vinycomb, M.R.I.A. Business matters were discussed, new members elected, and one of the Honorary Secretaries, who acted as conductor, pointed out the special national and historic features of the locality, and reported the results of recent observations in natural history by members of the Club

DUBLIN NATURALISTS' FIELD CLUB.

MAY 27.—Excursion to Ireland's Eye.—This excursion, under the direction of Mr. H. K. G. Cuthbert, Hon. Treasurer, was attended by twenty-eight members and their friends. Leaving Amiens-street by the 1.55 p.m. train, the party embarked in boats at the West Pier, Howth, and reached the island in about half an hour. One boat was retained during the afternoon for dredging. The bulk of the members devoted their time to an examination of the botanical features of the island, most noteworthy of which was the great abundance of the Blue-bell and Vernal Squill. Tea was served at six, and the party returned to town by the evening trains.

 INJURIOUS INSECTS.
Twenty-second Report of Observations of Injurious Insects.

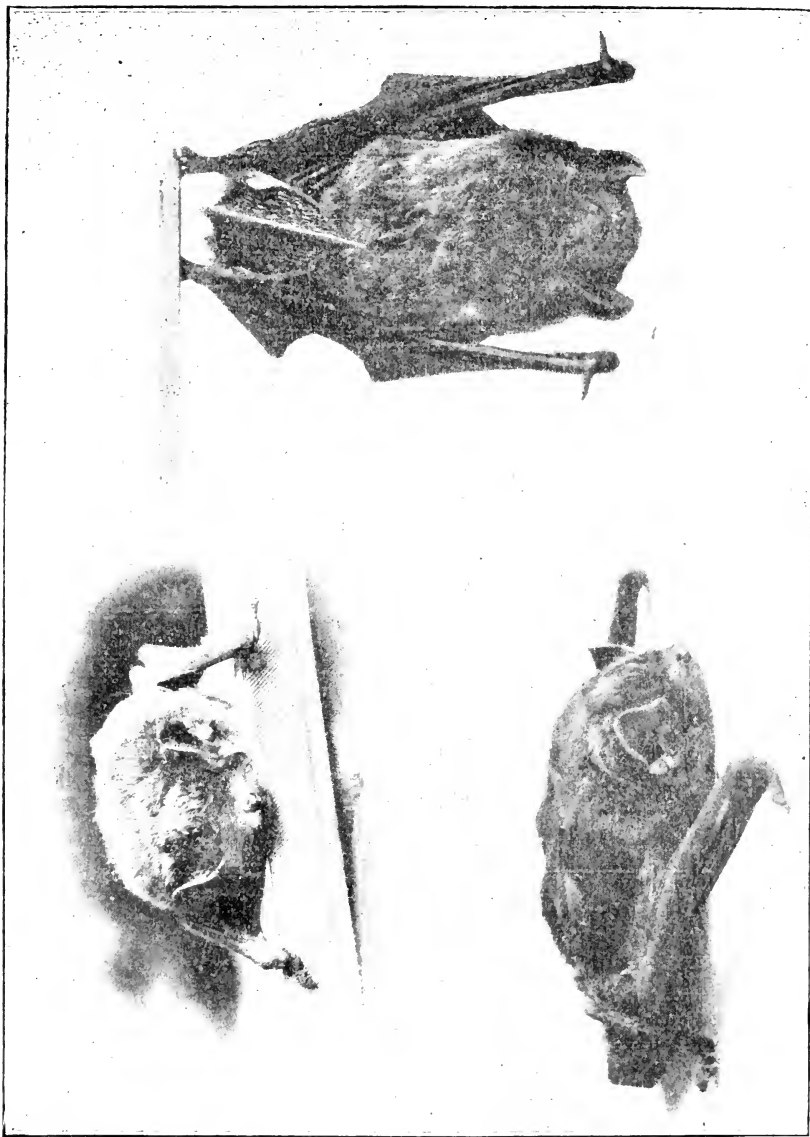
By ELEANOR A. ORMEROD, F.R.Met.Soc., &c. London: Simpkin, Marshall, Hamilton, Kent and Co., 1899. Price 1s. 6d.

This Report is a worthy successor to those which have preceded it, and is excellently illustrated, many of the figures being new. Insects likely to be of special interest to Irish cultivators are the ground-beetle *Pterostichus madidus*, which is mentioned as destructive to mangold roots and allied species which attack strawberries, as also the "rustic" moth *Hydrecia micacea*, Esp. whose caterpillar bores potato stems—a new observation. This last-named insect pupates in the ground and is therefore more difficult to destroy than an allied species *Gortyna flavago*, which was noticed some years ago by Miss Ormerod as also injuring potatoes in this manner, but which pupates within the stem.

Several enquiries from Ireland as to the "Murrain worm" have led to the publication of a description and figure of the "Elephant" Hawkmoth (*Charocampa elpenor*) and its caterpillar. Miss Ormerod's correspondents detail the well-known legend that this caterpillar causes sickness in cattle. She makes the suggestion that as the larva frequents ditches and feeds on plants which grow by the water, "it appears very likely that sickness may be caused by the poisonous water-plants and the caterpillar, being seen accompanying, be erroneously considered to be the cause of the mischief."

It is more likely however that the caterpillar's evil reputation in this country is due principally to its alarming appearance. From the descriptions given of the insect by peasants it is evident that much stress is laid on the reptilian look of the eye-spots when the "terrifying" attitude is adopted. One of Miss Ormerod's correspondents writes, "from the farmer's description it is evidently a lizard or something akin to it." And Mr. Battersby, of Cromlyn, Co. Westmeath, has informed us that an ordinary blown specimen of the caterpillar is not recognised by the country people as the dreaded "Murrain-worm."

G. H. C.



THE HAIRY-ARMED BAT. *Vesperugo leisleri*, Kuhl.
Photographed from life. Natural size.

THE NATURAL HISTORY OF IRISH BATS.

BY N. H. ALCOCK, M.D.

THE HAIRY-ARMED BAT.

Vesperugo (Pipistrellus) Leisleri, Kuhl.

[Plates 7 and 8].

THIS handsome species is one of the most easily recognised and studied of our Irish Bats, and as it occurs very abundantly near Dublin it has been possible to ascertain some interesting details of its life-history with more precision than was practicable in other districts, where this bat is merely an uncommon visitor.

Three principal characteristics serve to distinguish this species from those with which it might be confounded.

1. The size.
2. The fur.
3. The teeth.

The measurements given by Dobson (iv., p. 216), are:—

Length Head and Body.	Tail.	Head.	Ear.	Tragus.	Forearm.	Thumb.	3rd finger	5th finger	Tibia.	Foot.
2·3 inches.	1·65	0·7	0·6	0·2	1·5	0·25	2·7	1·8	0·65	0·3

Many individuals are slightly larger than this, the length being sometimes as much as 2·6", forearm 1·68", 3rd finger 3·0", 5th finger 1·97".

The fur is of a fine chestnut colour above, the terminal one-fourth of the hairs being bright yellowish, the basal three-fourths dark brown; below, the terminal one-fourth is light brown, the basal part dark brown. The fur is said to be darker in young individuals than in old. In several specimens I examined, the males were darker than the females, in others not; this may possibly be an example of age difference, but further investigation is necessary to decide the question.

The incisor teeth furnish another distinguishing characteristic. The outer upper incisor is equal to the incisor in cross section at the base, while the lower incisors are said to stand in the direction of the jaws, and not to be "crowded."

A very elaborate controversy has arisen on the bats captured by Mr. Barrington in 1868, at Tandragee, and referred by him to this species. Mr. J. E. Harting ("Remarks on British Bats," *Zoologist* (3) xi., p. 168), writes:—

"There is reason to believe that some specimens of a large bat taken at Tandragee, Co. Armagh, and reported to be *Vesperugo Leisleri*, were in reality *Vesperugo noctula*. To be more explicit—in the *Zoologist* for July, 1874, Mr. R. M. Barrington gave a very interesting account (pp. 4,071–4,074) of the discovery in June, 1868, of a colony of large bats in the desmesne of the Duke of Manchester, at Tandragee, Co. Armagh, and of the subsequent capture of several (presumably of the same species) at the same place in May, 1874. Mr. Barrington identified them as *Vesperugo Leisleri*, observing (p. 4,072), 'they were all of the Hairy-armed species.' I have presented two specimens to the British Museum." These two specimens, at our own particular request, were examined by Dr. Dobson in 1876, when preparing his Monograph of the Asiatic Chiroptera, and he pronounced them to be immature examples of *Vesperugo noctula* it seems to us that this circumstance establishes the fact of the occurrence of the Noctule in Ireland."

In 1878, however, Dr. Dobson (iv.) catalogued these same specimens as *Vesperugo Leisleri*.

In 1889 the subject was re-opened, and Mr. Barrington sent four specimens of this bat to Dr. Dobson. After some vicissitudes they arrived safely, and Dr. Dobson writes:—

"15 : 7 : 89.

"DEAR SIR,

"Your postcard and the bats reached me to-day, re-directed from London. I have carefully examined the bats, and am rather puzzled about them. While agreeing with *V. Leisleri* in the bicoloured fur, in the lower incisors being in the direction of the jaws, and not transverse as in *Vesperugo noctula*, and in their small size; they differ in the large size of the outer upper incisors at the base, herein agreeing with *V. noctula*. I am not satisfied that the three ♀'s are full-grown. The young one (with persistent milk teeth) has its forearm as long as any of the other three and they have the incisors quite sharp and unworn, so it is very likely that they are only a month or two older than this young individual. Therefore, before definitely pronouncing an opinion, it would be well to have before me specimens with worn teeth, indicating full growth, and I would be glad if you would endeavour to procure such. If the characters I have referred to be also found in the perfectly adult animal then the Irish specimens represent either a new species, or a curious case of hybridization.

"Very faithfully yours,

"G. E. DOBSON.

"P.S.—Your letter arrived as I had written so far. I was obliged to kill the bats in order to make the necessary examination, and have put them in spirit."

Mr. Barrington then sent another specimen, which appears to have gone to the British Museum, to await Dr. Dobson's inspection, who wrote again to Mr. Barrington *before* he had examined the bat as follows :—

“October 18, 1898.

DEAR SIR,

“I write on the back of Mr. Harting's reply to my letter, which gives you the information you ask for [*i.e.*, the fate of this last specimen]. I have lost the locality of the four bats you sent me some time ago, and which, if not examples of immature individuals, appear to me to represent a form intermediate between *V. noctula* and *V. Leisleri*. I am therefore very anxious to obtain additional specimens, for it would be most interesting to find a new species of mammal in Ireland. The specimen you sent cannot be determined until dead, as it would be necessary to examine its teeth.

“Believe me,

“Yours very truly,

“G. E. DOBSON.”

Dr. Dobson's untimely death, so much regretted by the world of science, prevented further investigation at the time; but apparently the examination of adult specimens has not confirmed these speculations, as Mr. De Winton, of the British Museum, to whom I wrote for information, tells me that he sees no difference between English and Irish individuals of this species.

It is not my intention in these papers to take any part either in this controversy or in the still more thorny question of nomenclature, so I will merely add that there seems to be very insufficient evidence at the present time for admitting the Noctule as an Irish species.

The habits of the Hairy-armed Bat are interesting in many ways. The earliest date on which it was seen in the spring of 1899 was April 21st—many flying on April 24th—both observations being made at Bray, Co. Wicklow, by Dr. E. B. Knox. None were seen earlier, though on April 16th I looked for them with particular care.

The last day in the autumn of 1898 was September 16th; no observations were taken for the next few days, but on September 26th, though both the Pipistrelle and Daubenton's Bat were seen, the Hairy-armed Bat had retired.

This species usually appears in the evening about 15 m. after sunset, being about 10 m. earlier in the spring and 10 m. later in the autumn.

At first it commonly flies at a considerable height, in open country taking long sweeps and wide zigzags, often being seen but once in an evening. Near woods and in favourable localities it will often remain for some little time near one spot, flying at an altitude of 30-40 feet, with a faster and less irregular flight than the Pipistrelle, the tail being extended in a straight line with the body. Later on it flies nearer the ground, very commonly shrieking loudly, and I have observed two bats at this time chasing one another exactly as two butterflies do, both flying very fast and screaming.

As far as I can ascertain—the point is difficult to determine—the Hairy-armed Bat flies for about an hour, and then retires, not to reappear till the next evening.

I have not been fortunate enough to come across any of the resting-places of these animals, so that the times given above are only approximate, being taken from observations made in the open. Still, making every allowance for error, the facts are sufficiently remarkable. A mammal, that rests for six months in the year, that only feeds for one hour a day during the other six, spending this hour in rapid and sustained flight—as great a contrast as can be imagined to its previous condition—certainly presents a very curious picture of animal economy.

This species would appear to be wholly insectivorous. Mr. G. H. Carpenter's researches on the fragments found in the stomach after death show that Diptera form the great bulk of the food, and he has been able to identify a midge, probably a Mycetophilid, an Acalypterate Muscid, and the yellow-haired fly, *Scatophaga stercoraria*, already referred to, besides legs and wings of caddis-flies. Scales of moths were plentifully found in one case. This bat furnishes therefore an interesting contrast to the Noctule, the latter feeding on species of beetles.

The Hairy-armed Bat has been found in colonies inhabiting hollow trees and roofs of houses, as in the case of Mr. R. M. Barrington's specimens, but most of the captures have been of solitary individuals either in the open or in rooms into which they have flown.

The habits of this species in captivity do not seem to have been observed since 1858, when Mr. Darragh's specimen lived for ten days in confinement. Mr. G. P. Farran, on February 13th, very kindly presented me with a female which he had obtained at Rathfarnham, Co. Dublin, and which lived with me for some time. For nearly a month it remained in a typical state of hibernation, but on March 11th it woke up and ate raw meat dipped in milk, not appearing in the least degree wild or shy. A few days of cold weather sent it back to sleep, then it reappeared, very lively, and with a great appetite.

It always slept during the day, waking up about 8.30 p.m., when it was taken out of its cage and placed on the dining-room table. Here it ate raw meat in truly enormous quantities, and exercised itself scurrying round the table, never attempting to fly, though occasionally falling off on to the floor! It learned to come to a pair of scissors, the clicking together of the blades serving as a "dinner bell," and would always walk towards one's hands, which it climbed over and finally crouched down in, apparently enjoying the warmth. Its career was closed by an unexpected tragedy, as on the evening of April 6th, while careering round the floor, it was accidentally crushed, to the great grief of all its acquaintance.

The photographs on Plate 7 were all taken from this specimen during life, while the animal was hibernating. The position of the tail, the post-calcanean lobule, the toes—always widely separated during life—and the beautiful curves of the ears are worthy of note. When the bat wakes, it raises itself from the ground, and the widely open eyes give an alert expression to the countenance which changes its character considerably.

The cry of this species is moderately high in pitch, corresponding to about 17,000 vibrations per second, as measured by Galton's whistle; a fair imitation can be made by striking a sixpenny piece against a halfpenny.

The distribution of this bat is remarkable. It occurs probably throughout the whole of the Palæarctic region, being reported from France, Germany, Middle Russia, and the Ural, extending west as far as the Azores, and east to the Himalayas. In the British Isles, with which we are more immediately concerned, its distribution is curiously local, in England being

found in some numbers along the valley of the River Avon in Warwickshire, Worcestershire, and Gloucestershire (Tomes, xvii.), rarely in Yorkshire (Clarke and Roebuck, xxvi., Charbonnier, xxv.), and once in Cheshire (Coward, xxvii.). It has been recorded from Norfolk (Paine, xxx.), but the identification of the species has been questioned (see Harting, xxviii.).

In Ireland, as can be seen by the map which accompanies this paper, the Hairy-armed Bat is common in the north-east, and is not recorded elsewhere. The references are from Jameson's paper (x.), and a note by C. B. Moffat (xxix.). Whether it is really absent from the districts where it has not been observed is a question I am unable to answer.¹

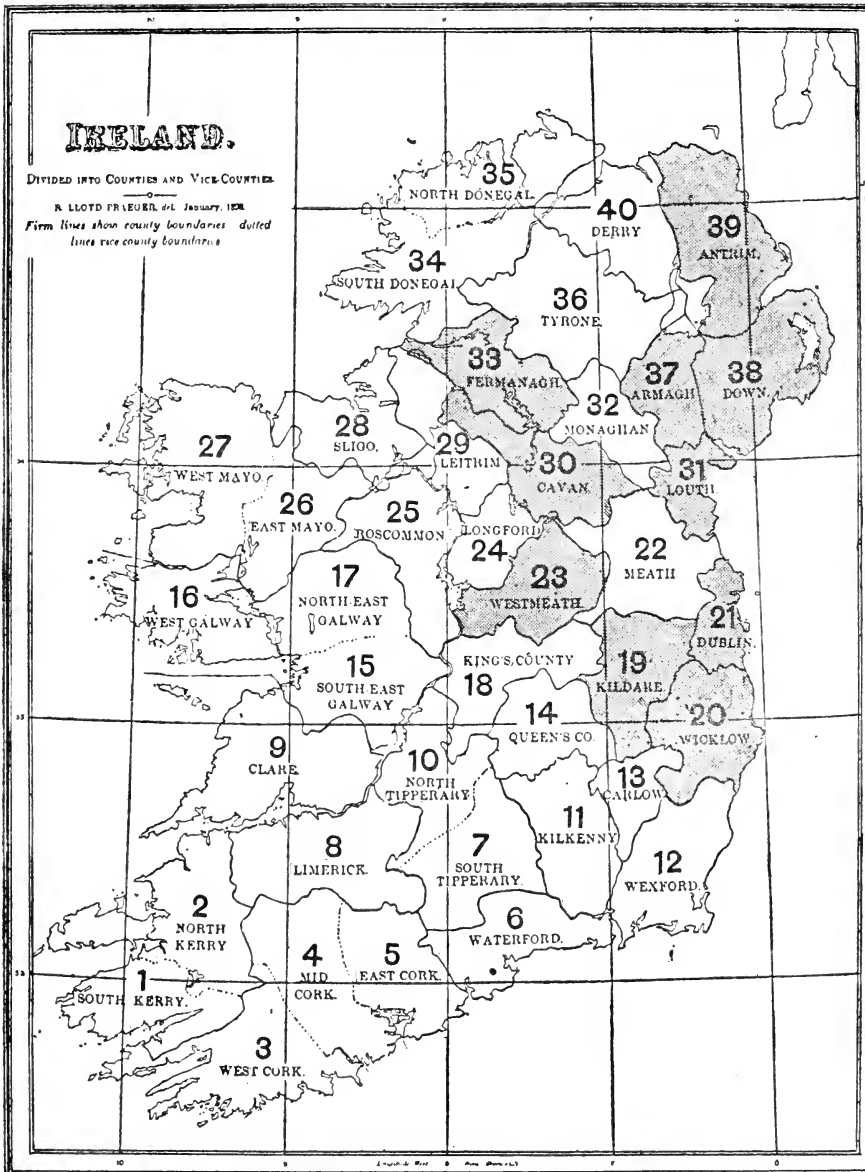
In conclusion, I have much pleasure in expressing my obligations to Mr. R. M. Barrington, who most kindly placed his valuable MSS. at my disposal, to the officials of the Science and Art Museum, Dublin, to Mr. De Winton, of the British Museum, to Dr. E. B. Knox, and to Mr. Byrne, of the Brewery, Bray, for their very kind assistance in many ways, and to whom I feel deeply indebted.

AUTHORS QUOTED.

See also pp. 35-6 and p. 57, *supra*.

- XXV.—CHARBONNIER, H.—(Hairy-armed Bat in Yorkshire). *Zool.* (3) xvi., 1892, p. 329. [The identification has been questioned, but Mr. Charbonnier has sent me two of the specimens captured on this occasion: they are undoubtedly *V. Leisleri*.]
- XXVI.—CLARKE and ROEBUCK. *Vert. fauna of Yorkshire*, 1881. (Hairy-armed Bat in Yorkshire).
- XXVII.—COWARD, T. A. (Hairy-armed Bat in Cheshire.) *Zool.* (4) iii., 1899, p. 266.
- XXVIII.—HARTING, J. E. *Remarks on British Bats.* *Zool.* (3) xi., 1887, p. 161, et seq.
- XXIX.—MOFFAT, C. B. (Hairy-armed Bat in Westmeath). *I. Nat.*, vi., 1897, p. 135.
- XXX.—PAINE. *Ann. Nat. Hist.*, ii. (1839), p. 181 (Hairy-armed Bat in Norfolk).
- Braekna Lodge, Merrion,
Co. Dublin.

¹ While this paper is in the press, I have seen a male *Vesperugo Leisleri* shot at Culmore, near Londonderry, by Mr. C. W. Buckle on July 20th, 1899. The specimen is in the Science and Art Museum, Dublin.



DISTRIBUTION OF THE HAIRY-ARMED BAT IN IRELAND.

Co. Derry (40) should be shaded also. (See foot-note p. 174)

A VISIT TO ROUNDSTONE IN APRIL.

BY M. FOSLIE.

SINCE the publication of Harvey's *Phycologia Britannica*, about fifty years ago, Roundstone, on the west coast of Ireland, has been well known for marine botany. Several of the rarer and more interesting of British seaweeds are found in this locality, and some have only been found here up to the present time. Among the latter are *Lithothamnion agariciforme* and *L. fasciculatum*, Harv.

Working with calcareous algæ for some years, it has been of great interest to me to understand clearly the *Lithothamnion* described by Harvey. For instance, *L. fasciculatum* is one of the Corallines very differently interpreted by different writers. In fact, two authors, writing about this alga, have understood different species. So also as regards *L. agariciforme*, as well as *L. calcareum*, the latter quoted by Harvey from different parts of the Irish and British coasts. This misunderstanding is due to the fact that Harvey's type specimens of this group of algæ are lost, and the descriptions and figures of sterile specimens are all that can be relied on in arriving at what was understood.

The above Roundstone species have, according to Harvey, been collected by M'Calla. Apparently a small part of M'Calla's collection, now in the Science and Art Museum Herbarium, Dublin, labelled *L. agariciforme*, is not to be considered as authentic, since the labels, according to Prof. T. Johnson, have been re-written some time before they were acquired by the Museum. They do not quite correspond with Harvey's figure nor his description. On the other hand, some of them may perhaps belong to the same species, but unfortunately, so far as hitherto examined, they are sterile and not suitable for accurate determination of the species.

Therefore, I took the opportunity of visiting Roundstone early in the year, as many of the calcareous algæ do not appear to possess fruit in summer. Professor T. Johnson greatly facilitated my object by placing at my disposal his advice and suggestions gained from a previous visit, as well as apparatus, dredges, &c., and has given me the opportunity of

examining the collection of this group of algæ in the Science and Art Museum, Dublin. He also was kind enough to make it possible that Mr. H. Hanna was enabled to accompany me to facilitate the object of my visit. Mr. Hanna has collected algæ at different parts of the coast, and within the past year has sent me for examination some *Lithothamnium* from Larne, Co. Antrim, one of which I have made the type of a new variety, *L. calcareum*, f. *eunana*, now, however, probably to be considered a variety of *L. fasciculatum*.

After a pleasant drive from Ballynahinch station, we arrived in Roundstone in the afternoon, in beautiful weather. We soon saw that it would take more time than we had at our disposal to work over the different bays by dredge in search of the so-called "coral banks" where the *Lithothamnium* especially grow, and it was therefore necessary to engage a man well acquainted with the localities.

The next morning, having engaged the services of a fisherman who claimed to have personal acquaintance of all the banks on the west coast, including the adjoining bays, we proceeded to Bertraghboy Bay in a sailing boat; but having made two hauls, we soon found he was not acquainted with the particular coral banks we were most interested in. Here we encountered a sudden squall, and were forced to return to Roundstone Bay, where we proceeded to dredge.

The following day we engaged another man, who had some previous experience in such work. Although he considered himself to be thoroughly acquainted with just those banks we most desired to dredge on, after showing him figures of what we were in search of and newly collected samples, we soon learned that his acquaintance was still more superficial. We then proceeded, with the aid of charts, to locate the banks on which the *Lithothamnium* were to be found, knowing from Harvey's work that the previously mentioned species were very local and occurred in quiet bays.

The accompanying sketch (fig. 1.) shows the principal localities where we dredged, indicated by numbers.

In Station 1 we found, in a depth of about 3 fathoms, immense quantities of a small form, partly allied to *L. squarulosum*, partly to *L. calcareum*. We found a number of specimens entire, some of which were in fruit. The bulk of

the specimens on the bank consisted of fragments partly dead, partly producing new branches, showing that this part of the bay is much exposed.

Farther up (station 2) we met with larger specimens of the same forms, and here the specimens were less broken into fragments, the depth being about 3 fathoms.

At station 3, in a depth of about 1-2 fathoms, we brought up a few specimens of the same forms previously dredged, but a great number of another and larger species, which apparently seemed to be what hitherto has been considered a form of *L. calcareum*, but appears to be more nearly related to *L. fasciculatum*.

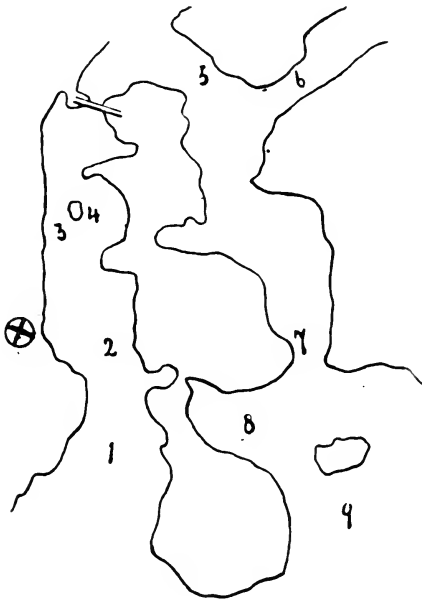


Fig. 1. A PLAN OF ROUNDSTONE BAY.

At station 4 the *Lithothamnium* were very local, but here we met with much larger forms, and partly agreeing with the last mentioned from station 3, partly fully agreeing with typical *L. fasciculatum*, Harv. Besides we found a few specimens as at station 1 and 2. Also here we met with a form no doubt that figured by Harvey as a variety of

L. fasciculatum, but partly closely coinciding in habit with *L. dentatum*, Kütz., and on the other side connected with the form in M'Calla's collection labelled *L. agariciforme*. Close to the banks of *Lithothamnium* we dredged large quantities of *Cladophora* lying loosely fixed among the *Zostera*. This most probably is or at least is nearly allied to *Cladophora corynarthra*, Kütz. There seems to be but little doubt that station 4, and probably also 3, are the principal localities where M'Calla collected calcareous algæ. On the other side we were not able to find the spot where a delicate form, apparently nearly connected with *L. lichenoides*, has been collected and rather considered to be the true *L. agariciforme*, Harv., as Harvey's description agrees better with this form than that labelled *L. agariciforme* in M'Calla's collection. However, we could not work over these localities as well as we wished, because they were protected, since some beds for oyster culture had been cleaned, and oysters put out about a year ago. Unfortunately, the agent or owner was away from home, and his herds appeared to be rather too anxious about our seaweed collecting, whether discharge of duty or for other reasons seemed to be a question.

At station 5 we made only one haul, and found a rather muddy bottom, with thinly scattered specimens of *Cladophora*, as at station 4. Depth about 4 fathoms. At station 6, also, one haul was taken in a depth of about 5 fathoms, with a rather hard bottom; there was brought up *Laminaria digitata* and a few specimens of a sterile *Lithothamnium*, which most probably is *L. coralloides*, Crn., not formerly found in the British Isles in the sense here taken. In the one haul taken at station 7 the bottom was found to be rather muddy, with some *Lithothamnium* most nearly related to those in the previous station.

At station 8, a bank nearly crossing the bay, we found in about 1 fathom water quantities of a rather coarse form of *Corallina officinalis*, very much encrusted with *Melobesia corallinæ*, the former mixed with *Zostera*, or often fastened to scattered specimens of *L. coralloides*, some of which were provided with conceptacles.

Station 9 (3-6 fathoms) was a rather poor bottom for algæ, of broken shells, with a large intermixture of mud and

scattered specimens of *Squamariaceæ* and crustlike *Lithothamnium*, together with a perforating alga, *Conchocelis rosca*. Probably another species nearly related to the latter was observed infesting the central parts of a *Lithothamnium* at station 1. Of animals in the above hauls, there was observed a fine specimen of a *Dentalium*, the shell of which was made up of fine sand-grains firmly cemented together.

After the work of dredging, we divided our attention between encrusting *Lithothamnium* and the other seaweeds to be found between tides. South and south-west of Roundstone Bay, in somewhat exposed rock-pools, we found *L. incrustans* (*L. polymorphum*, Harv.) to be very abundant. This seems to be a species capable of rapid growth, and is of interest as showing the great variation brought about in the struggle for existence between seaweeds and animals. In the most exposed places at "The Beaches," we met with well-developed specimens in fruit of *Phymatolithon polymorphum*, a rather northern calcareous alga. Closely associated we found an interesting form of *L. lichenoides* nearly related to that form figured by Harvey in *Phycologia Britannica*, showing that also this species varies according to the nature of the locality. We also met with several *Melobesia*, and *L. Cronani*, not formerly found in Ireland. This species was found here, as at other places, growing on the stems of *Laminaria hyperborea*, together with *Melobesia laminariæ*, but more scarce than farther north. Of other algæ we met with numerous specimens of *Chætomorpha acraea* mixed with *Cladophora hirta* and *Chætomorpha tortuosa*. In deep rock-pools at about half-tide we observed luxuriant plants of *Desmarestia ligulata* and *Ralfsia* sp., as well as other interesting species, among these many parasites and epiphytes partly infesting *Cystoseira*, partly other algæ, but not yet worked at, as they require microscopic examination. One of us also met with in these rock-pools a few specimens of the starfish known as *Asterina gibbosa*, while on the other hand the well-known boring sea-urchin, *Strongylocentrotus lividus*, which is common along the west coast, was observed in abundance. Many of the urchins were nearly concealed under a crust of *L. incrustans*.

The calcareous algæ did not appear to be made use of here, as in other parts of Ireland, for manuring purposes. But on the shore, close to "The Beaches," there were many heaps of

other dried seaweeds. We were astonished to learn on further inquiry that these were to be used for kelp. It was hard to believe that they were for use in that way, because a very large number of specimens were heaped one on another on stone walls in such a manner that the largest proportion must have remained damp for a very long time before they became dry, and during the changing weather much of the valuable residual product must have been lost. Close to these heaps were many very fine drying-grounds for this purpose, and, instead of burning as soon as the specimens were in a fit condition, they were kept for months, and thereby, after much unnecessary exposure, the kelp produced must have become very much reduced in market value. Most of the seaweed used was the stems of *Laminaria digitata* and proportionally small specimens of the more valuable *L. hyperborca*. Besides there were heaps of *Fucus*, mixed with other smaller seaweeds, which were said to be put to the same purpose. This seems to be almost unnecessary labour. No doubt, much more profit might be reaped by the kelp-burners by following more exact methods of drying and burning, as well as more restricted selection of the weeds. We understood the process of burning to be wasteful, and but little adapted to its purpose. Prof. Johnson has issued instructions for kelp-burning, and distributed them through the Congested Districts Board for Ireland, but the kelp-burners here appear to be too conservative to follow new methods.

We did not attempt a detailed study of the algal flora of Roundstone, as our stay was only of a few days' duration, and was principally taken up in studying the calcareous algæ. These algæ appear to occur very generally around the coast, but as yet are far from being well known, since most of the specimens collected up to recently have been devoid of fruit, and therefore difficult to clearly determine. We learned of the existence of many banks in the neighbourhood, which should prove to be of great interest to examine, but for want of time we had to put off their examination until some future period. Much work yet remains to be done before it is possible to get a clear idea of the distribution and mode of life as obtained in this important group of algæ.

Trondhjem, Norway.

BOTANICAL NOTES FROM EAST GALWAY.

BY MARGARET F. JOYCE.

THERE are a few interesting botanical notes for the month of June from County Galway, where *Epipactis atro-rubens*, *Geranium columbinum*, *Ophrys muscifera*, and *Habenaria albida* were all found.

The one first mentioned, grows on top of Knockmae, a hill six miles west of Tuam, among loose slabs of limestone, almost barren of vegetable life.

Geranium columbinum grows at the edge of a field of rocks, between Kilcornan and Rahasane. Here also were a few plants of *Arabis hirsuta*, growing out of the fissures of the rocks, and about half a mile westward three plants of *Habenaria intacta*.

Ophrys muscifera, also *Habenaria albida* grow at Finerty-Moyode, three miles south of Athenry; the latter sparingly on one hill, the former plentifully in the rocky pasture wherever it is clear of Hazel scrub. From this locality *Gentiana verna*, *Habenaria intacta*, *Viola stagnina*, *Sesleria cerulea*, *Hieracium iricum* have been already recorded.

As Mr. Lloyd Praeger kindly identified the *Epipactis* and Mr. Colgan the *Geranium* I feel no hesitation in sending a notice of both plants to the *Irish Naturalist*.

St. Cleran's, Craughwell.

WEST CORK PLANTS.

BY R. W. SCULLY, F.I.S.

IN the course of a walk taken from Kinsale to Crosshaven early in June of this year the following interesting plants were observed:—

Ranunculus parviflorus, Linn.—In cultivated land near Robert's Head. Apparently not observed in West Cork since the date of Drummond's record 80 years ago.

Trigonella ornithopodioides, DC.—Found growing abundantly over a limited area at Currabinny. This is a new record for District I. and gives a wide south-western extension of range to a rare Irish species hitherto believed to be confined to East Ireland.

Trifolium fillforme, Linn.—At Currabinny with the preceding.

Apparently an addition to the flora of Co. Cork.

Orobanche major, Linn.—On furze in Currabinny wood, Cork Harbour.

Orobanche minor, Sutt.—Abundant on *Trifolium pratense* in a field near Flat Head. Further on *Linum augustifolium* and *Leontodon hispidus* were observed, the latter rare in West Cork though previously noticed by me near Carrigaline.

Euphorbia amygdaloides, Linn.—Abundant over a considerable space about the western extremity of Oysterhaven. This gives a welcome extension to the restricted range of one of our rarest Irish plants.

Dublin.

ALLIUM SCHŒNOPRASUM, L. IN IRELAND.

BY REV. F. S. MARSHALL, M.A., F.L.S.

In July, 1895 (and again in 1896) I discovered a flowerless garlic, thinly scattered over about two miles of the limestone tract lying immediately south of Lough Mask, E. Mayo (extending to within 100 yards of Co. Galway, though I could not trace it across the border, where it probably occurs), which had quite the habit of Chives; the blooming of one plant now at length justifies my opinion. The nature of the locality forbids all reasonable doubt as to its wildness, and I think that a careful search will result in its being found elsewhere. The inflorescence of *A. sibiricum* from the Lizard, long grown in my garden, hardly differs except in the much shorter styles (perhaps a variable character), but their habit is quite distinct; the stouter, very glaucous, recurved leaves of *sibiricum* contrasting greatly with the green, straight foliage of *Schœnoprasum*. Yet, in spite of their constancy, they are scarcely more than varieties of one species, as Babington and Hooker have ranked them. The wild Mayo plant, owing to the shallowness of the soil, was only from two to four inches high in those dry summers.

Godalming.

THE SONG OF BIRDS.

Cries and Call-Notes of Wild Birds. With Musical Illustrations.

By C. A. WITCHELL, Author of "Evolution of Bird-Song," &c.
London: L. Upcott Gill, 1899. 1s.

It is a gratifying sign of the times that there is a demand for a shilling manual on the notes of birds. To a naturalist it is not less essential to learn something of the language of our feathered favourites than to study their plumage, nests, eggs, migration, and food; but on all the above topics the student has access to vast store-houses of knowledge in the shape of books, pictures, museums, and private collections. Sounds, however, cannot be collected, like eggs, nor recorded with exactness, like dates of arrival, or contents of crops and pellets; and for this reason every beginner has to learn more for himself on the language of birds than on most other ornithological matters. The few attempted guide-books that have been written are experimental rather than recognized primers; such, for instance, is Mr. Ilett's "Dictionary of Bird-Notes," of which it remains to be seen whether the bulk of the syllabic renderings will be recognized when the notes they are intended to represent are heard.

Mr. Witchell is well entitled to speak with authority on a subject which he has already treated so excellently in his former work. At the same time, we might have hoped for a better book than the one before us from the author of the "Evolution of Bird-Song." We must decidedly object to his perverse arrangement of birds into "Town," "Woodland," "Upland," and "Waterside"—a classification which makes reference, even in so small a book, exasperatingly difficult, and has the strange effect of placing the Carrion Crow in the first chapter, and the Hooded Crow (a doubtfully distinct species) in the last. Then the whole group of sea-haunting birds is omitted, except a few—as the Redshank and Dunlin—which nest inland, and the Rock Pipit, which seems to have slipped in inadvertently. The Sparrow-hawk, Woodcock, and Water Rail are striking instances of inland birds of whose notes Mr. Witchell has nothing to say—we may fairly ask, why? The Water Rail is a peculiarly noisy species, and, from its skulking habits, one of the most likely to baffle the inquisitiveness of a puzzled audience; and the Woodcock's voice has often (though quite unlike) been mistaken for the Nightjar's. These, moreover, are cries of marked character, which, if not to be successfully syllabled, can at least be recognizably described; while we are strongly inclined to doubt altogether the distinctive value of many such renderings of bird-sounds as Mr. Witchell's "chick" (Thrush), "chick" or "ching" (Dipper), "chlip" (Tree-pipit and Corn-bunting), "jigg" (House-martin), "sip" (Cirl-bunting), "sit" (Crossbill and Haw-finch), "twit" (Chaffinch), "whit" (Dabchick), "gick" or "quet" (Greater Spotted Woodpecker), "tick" or "kink" (Lesser Spotted Woodpecker), "clit" (Swallow), "quilt" (Redwing), "tink" (Reed-bunting), "pink" (Chaffinch); bearing in mind that in all these

cases the consonants are imaginary, while the vowel sound is identical. The same calls must too often, to different ears, seem like totally different words. How many of us, for instance, would say with Mr. Witchell that "shushushushu" is the common cry of the Magpie? To the Long-eared Owl our author ascribes only one note, a hissing or rushing "sheea." Now, this is a bird with a very copious vocabulary. In early spring, its nuptial note, a deep lugubrious "oop," is uttered at regular intervals of about three seconds for hours together, and can be clearly heard at a distance of half-a-mile. By the end of April its young are abroad mewing like kittens--whence, perhaps, the bird's local Irish name, "Cat-Owl." The parent owl, at this season, scolds intruders on the family's haunts with a strong "wek. wek, wek." The wood which they frequent is sometimes resonant with a noise like the clapping of hands, caused by several of the owls snapping their bills; and the birds playfully chase one another through the trees with cries like "a-whay a-whay a-wha-a-ay." We have heard (and seen) them uttering several other notes, besides all the above; but never anything like Mr. Witchell's "sheea," which, in print, looks suspiciously like the well-known "snore" of the Barn Owl. On this last-named bird, too, Mr. Witchell has nothing to say beyond that it cries "kek kek kek" like a moorhen. If "Cries and Call-Notes" reaches a second edition it ought to be greatly amplified.

C. B. M.

 N O T E S .

 ZOOLOGY.

 M O L L U S C S .

Land Mollusca of Narin.

The following list of land and freshwater shells from Narin, Co. Donegal, and the surrounding district, was the result of a collection made there last summer:—*Vitrina pellucida*, *Hyalinia cellaria*, *H. alliaria*, *H. nitidula*, *H. pura*, *H. radiatula*, *H. crystallina*, *H. julva*, *H. excavata*, *H. nitida*, *Helix pygmaea*, *H. rotundata*, *H. pulchella*, and var. *costata*, *H. lamellata*, *H. hispida*, *H. rufescens*, *H. fusca*, *H. ericetorum*, *H. acuta*, *H. nemoralis*, *Cochlicopa lubrica*, *Pupa cylindracea*, *P. muscorum*, *P. anglica*, *Vertigo adentula*, *V. pygmaea*, *V. substriata*, *V. antivertigo*, *Balca perversa*, *Clausilia bidentata*, *Succinia putris*, *S. elegans*, *Carychium minimum*, *Limnaea peregra*, *L. palustris*, *L. truncatula*, *Planorbis spirorbis*, *P. albus*, *P. crista*, *P. jontanus*, *Aucylus fluviatilis*, *Acme lineata*, *Vaivata cristata*, *Sphaerium cornutum*. In addition to the above, dead shells were found of *Helix aculeata*, *Vertigo angustior*, and *V. pusilla*, on the sandhills at Kitoorish and Narin, the shell pockets from the latter place yielding 25 species.

G. P. FARRAN.

Templeogue.

 INSECTS.

**Macroglossa stellatarum, and M. bombylifomis,
at Poyntzpass.**

On June 2nd a fine specimen of the Humming-bird Moth flew into my dining-room, and was duly captured. Since then I have seen several, and they have plainly been very much in evidence throughout the country, judging from letters in the daily papers. It would be interesting to find out whether these moths are Irish bred or have crossed the channel.

Of *M. bombylifomis*, Esp., I captured a single specimen on the morning of June 9th. The moth was hovering at the flowers of Stock. I had not my net with me, but as the moth was very intent on extracting the honey from the flowers I succeeded in boxing it. As far as I know this is the first record of its capture in County Armagh.

W. F. JOHNSON.

Poyntzpass.

Macroglossa stellatarum in 1899.

The unusual abundance of the Humming-bird Hawk-Moth noticed by Mr. Cutlbert in Co. Dublin was also a striking feature in this part of Co. Wexford in the early days of June. I saw none until the 1st of June, when one showed itself; but on the 2nd and 3rd I was struck with its unusual frequency, and on the 4th I have an entry in my notebook;—" *Macroglossa stellatarum* in all directions; never saw so many." The numbers seen here did not come up to Mr. Cutlbert's description of the abundance witnessed by him at Kingstown, but I think the simultaneous outburst over so considerable an area is of much interest.

C. B. MOFFAT.

Ballyhyland.

 BIRDS.

Spring Migrants at Poyntzpass.

As might be expected the Migrants were somewhat late this year. The Chiffchaff arrived on March 24th, the Swallow on April 12th, the Willow Wren on April 19th, the Corncrake on April 26th, the Cuckoo on April 27th, and the Swift on May 5th. Though the Swallow was seen as above it did not appear in any numbers till the end of April.

W. F. JOHNSTON.

Poyntzpass.

Bird records in Co. Tipperary.

In Mr. M. Gleeson's list of spring migrants to North Tipperary, I fear he is mistaken in mentioning the Reed Warbler (*Acrocephalus streperus*) as a visitor; if not he will confer a grand acquisition to the Irish collection in Kildare-street Museum by sending a specimen to Dr. Scharff. He is also probably mistaken in believing that some pairs of Field-fares were breeding in Scotch firs at the time he mentions.

ROBERT WARREN.

Moyview, Ballina.

White Wagtails at Bartragh, Co. Mayo.

It may be of interest to note that the White Wagtails (*Motacilla alba*) have again visited the island of Bartragh (Killala Bay) on their northern migration this season. Mr. A. C. Kirkwood, on the 27th of April, met a solitary bird in the stable-yard at Bartragh, and a few days later saw another. This bird disappeared in a day or two, but was succeeded by another pair that were observed on the 4th of May feeding on a manure heap in the stable-yard. From the fact of these birds having been observed during the spring migration on the island of Bartragh in 1851, 1893, 1897, 1898, and in April and May of the present year, it is more than probable that they pass over Bartragh every spring on their way to Iceland, but they are not seen, unless strong northerly winds occur at the time of their passage, causing a few birds to rest and feed on Bartragh before continuing their northerly flight.

ROBERT WARREN.

Ballina.

Rose-coloured Pastor near Inch, Co. Donegal.

On 9th June Mr. John Hunter obtained a specimen of this bird, *Pastor roseus*, L., in fine plumage, between Bridge-end and Inch, about five miles from Londonderry.

D. C. CAMPBELL.

Londonderry.

Quail in Co. Dublin.

On May 27th last a Quail was whistling in the same field, near Templeogue, in which I heard one in the last Quail year, 1896.

G. P. FARRAN.

Cormorants breeding in trees.

I have just visited a lonely lake in the Mayo mountains which at one end contained some islands. One of these is overgrown with yew, birch, and holly of great age. Before reaching this island we heard the cries of a large bird colony, and on rowing round it we found all the trees on the south side and the east end laden with Cormorants' nests, tier above tier, three and four deep, supporting both old and young birds. The former did not take flight until we had a good look at them, and when they did, some tumbled down into the water below before they could get under weigh. One was hanging from the fork of a tree in which its neck was caught. The young, three and four in each nest, were mostly of large size, showing the wing-feathers, but several nests contained eggs or newly-hatched young. The nests were compact and small for so many large birds to stand on. They were built of coarse heather-stems. Several of the trees were dead or dying from the droppings of the birds which covered everything beneath the nests. From the water the array of nests laden with birds looked most striking. I counted eighty, but allowing for others I could not see from the water there may have been a hundred. When the old birds had taken flight on our nearer approach

they filled the air like a flock of Rooks, and then settled together on the lake at some distance. Besides the Cormorants a number of Herons breed on this island, but occupy the interior of it, their huge basket-like nests contrasting with the smaller ones built by the former birds. Both species resort to a neighbouring inlet of the sea to fish.

I have seen Cormorants nesting in trees on Lough Key, near Boyle, but there is nothing like the imposing colony I have described above.

The Cormorant ordinarily breeds on open ledges of the sea-cliffs or on the tops of large isolated rocks, and it is rarely indeed that one meets with a breeding place in trees. However, this species commonly resorts to inland waters, so that it is more likely to remain and breed there. Its congener, the Shag, is exclusively marine in its habits, and far outnumbered the larger Cormorant on the west coast of Ireland.

The birds of the former species I have lately seen have all lost the crests that adorn them in spring, and those of the latter have lost the winter patch on the thigh.

R. J. USSHER.

Cappagh, Lismore.

Bar-tailed Godwits In the Moy Estuary.

An unusually large number of Godwits (*Limosa lapponica*) have remained about the lands of the estuary and bay this summer. When returning from Bartragh in my boat on the 5th instant I observed about a hundred birds on the shore of Baunros. On the 13th of June, on the lands near Moyne Abbey, I saw several flocks, numbering fully 150 birds altogether, and amongst one small group I observed a bird in the red plumage of summer, a very unusual sight in this district, for the birds in breeding plumage do not pass along this coast to their breeding haunts as they do on the east coast of England, apparently all the birds with few exceptions that frequent this coast being immature, too young for breeding.

ROBERT WARREN.

Ballina.

Black Scoter In the Moy Estuary.

While returning from Bartragh on the 5th inst. I observed a black duck diving in the channel off Goose Island, and not being able to identify it with my glass, I let the boat drift up with the tide until within range, when I fired, the bird diving on the instant. However when coming up again, it rose, and I brought down with my second barrel a beautiful adult Black Scoter (*Edemia nigra*) in perfect breeding plumage. The yellow patch on bill was very bright, while the plumage was like black velvet, soft and shining. It was the first time that I ever met this duck in summer, although Scoters are common in the bay in winter, yet they seldom come into the channels of the estuary.

ROBERT WARREN.

Moyview, Ballina.

PROCEEDINGS OF IRISH SOCIETIES.

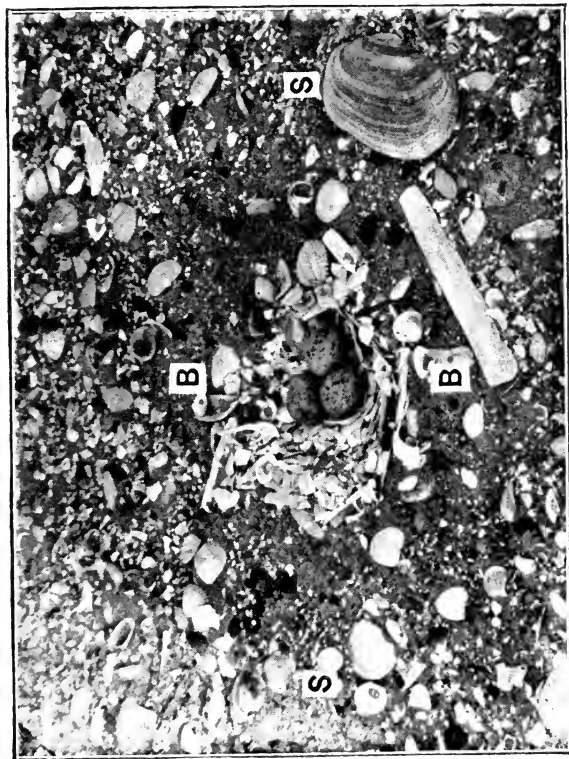
ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Silver Pheasant and a Peahen from Captain A. E. Boxer, a cockatoo from Mr. R. S. Swirles, a Gannet from Mr. P. Cummins, four Redpolls, two Greenfinches, a Chaffinch, and a Bullfinch from Mr. D. E. Kirkpatrick, a Hooded Crow from Colonel Alexander, and a pair of Kestrels from Mr. A. E. Darley. A pair of African Tantalus, a pair of Ravens, two pairs of Mandarin Ducks, and two Gazelles have been bought.

Over 16,000 persons visited the Gardens in June.

BELFAST NATURALISTS' FIELD CLUB.

JUNE 24. --The third field meeting of the season was held at Dundrum Castle, and was attended by a large number of members and friends. The formal meeting was held on the top of the Donjon Keep, and was presided over by the President of the Club. After the election of members and the transaction of some formal business, one of the members gave a description of the main geological features of the district, embracing volcanic, metamorphic, sedimentary, and æolian rocks. After exploring the castle and its surroundings, the party split up into different sections, each taking its own subject for investigation. Some members explored the sand-dunes and collected worked flints, flakes, scrapers, and pottery. Another division visited, sketched, and photographed the cromleac and standing stone at Sliddery ford, also the round tower and ancient church at Maghera. The district in the vicinity of Dundrum has, time after time, been visited by botanical explorers. The Rock Cress (*Arabis hirsuta*) was found in some quantity at the castle. It is 102 years since Templeton, the pioneer of northern botany, first noted this plant on the walls of Dundrum Castle. An interesting plant found in the pond near the castle was Syme's variety of *Morci* of *Apium inundatum*. In the short time available a good number of scarce plants were picked up. Amongst these may be mentioned the Musky Storksbill (*Erodium moschatum*) and the much smaller but not at all common *Erodium maritimum*; also, the White Campion (*Lychnis vespertina*), Viper's Bugloss (*Echium vulgare*), Hound's-tongue (*Cynoglossum officinale*). By the kind permission of the manager the express from Newcastle picked up the party at Dundrum for Belfast.



NEST AND EGGS OF LITTLE TERN (*Sterna minuta*).
 Photographed from nature, at Dollymount Strand, June 11, 1899, by Mr. W. D. Latimer.
 Note the "bare zone" (B) immediately surrounding the nest.
 S = Shingle[s] lying outside the "bare zone."

To face page 189.]

THE CONSTRUCTION OF THE NEST OF
THE LITTLE TERN
(*Sterna minuta*).

BY CHARLES J. PATTEN, B.A., M.D.

(Plate 9.)

WHEN a careful examination of a large number of different birds' nests is made, one cannot fail to be struck with the enormous variety there is to be seen among them. Not only do they differ in shape, and in the constituent materials which form them, but also in the way in which they have been constructed.

All birds (with very few exceptions) *make* or *construct* nests of some kind or another, yet in the strict sense of the word, only certain species can be said to *build* them.

We understand by a *built*¹ nest one which has been constructed by making it up of a number of pieces of material, carefully chosen, and put together after a particular fashion by the bird, according to what the species may be.

Considerable skill is often displayed in these cases by the feathered architects, as may be seen in the beautiful nests of the Long-tailed Titmouse (*Acredula caudata*), Gold-crest (*Regulus cristatus*), Chaffinch (*Fringilla caelebs*), and others too numerous to mention.

On the other hand a built nest may be extremely rude in its formation, as exemplified in those of the *Columbidæ* (Pigeons), and in certain of the *Laridæ* (Gulls). Between the latter and the more perfectly formed nests many gradations exist. But it is needless to dwell any longer on this subject which does not directly concern us at present.

Passing to those species which do not *build* nests, we find that they are in the minority, at all events as far as Ireland is concerned.

They are for the most part occupants of the cliffs or sea beach, and include among them many of the (a.) *Grallatores* or wading birds (especially the *Charadriidæ* or Plover family), (b.) the *Gaviæ* or Terns, and (c.) the *Alcidæ* or "Divers" (Guillemot and Razorbill). The last mentioned group may

¹ We may here include certain birds which sometimes only repair deserted nests of other birds, *e.g.*: Kestrel rebuilding old Magpie's nest.

be said to make no nests at all.¹ The other two groups—(a.) and (b.)—usually lay their eggs in depressions below the general level of the surrounding ground.

The Little Tern affords us a good example. Its eggs are generally deposited in such cavities, and it is the nature of these, and how they are formed that I now wish to consider.

On looking up the literature of the subject it is manifest that the accounts and descriptions given by different writers, dealing with the nests of the Little Tern, are rather general and at the same time somewhat inadequate.

“There are few places,” says Seebohm,² “where this bird breeds in greater abundance than on some of the islands in the lagoon of Missolonghi, in Greece. There it *makes* no nest, but generally scratches a slight hollow in the sand, or in the long line of broken reeds, bits of cork, dead grass, seaweed, or similar rubbish which marks the limits of the wavelets, produced on the lagoon by the storms of winter.”

Saunders³ describes the eggs as being “laid on the bare shingle or soil towards the end of May.”

Yarrell⁴ simply speaks of the nest as a small depression scraped in the ground above high-water mark.⁵

Atkinson⁶ goes further still, and fails to give the Little Tern the credit of even making the depression. This writer says it “lays its two or three eggs in any small cavity which it may be lucky enough to *find* in the selected place.”

From the foregoing quotations it would appear as if this particular species of tern devoted but little time and trouble to the construction of its nest.

Far from this being the case I hope to show, as a result of a closer study of the subject, that the nest of the Little Tern *is a nest*, and a true one, and a much more definite structure than has hitherto been described; and further that it is usually constructed on the same general plan, for a definite adaptative purpose.

¹ It is very probable however that a considerable amount of choice is exercised as to the particular rock on which the eggs are laid.

² “Eggs of British Birds”, p. 103.

³ “British Birds”, Last edition, 1899.

⁴ “British Birds”, vol. iii., p. 558.

⁵ I have found the nests below high-water mark when the colonies have been persistently plundered.

⁶ “British Birds’ Eggs and Nests”, p. 161.

To arrive at any conclusions as to its formation, it is necessary to visit as large a colony of terns as possible. Observations made on one or two nests afford us little help, as they are liable to variation.

A pair of powerful field-glasses or a binocular telescope are also essential, so that the nests and their occupants may be investigated at a distance. Approaching too close frightens the birds; often indeed the slightest provocation induces the whole colony to rise¹ from their breeding haunts and so prevent the observer from seeing the birds at work.

We are fortunate enough in having two colonies not far from Dublin city. One at Kilcool, Co. Wicklow, on the sea beach; and the other at the far end of the Dollymount Strand, or North Bull, Dublin. The nature of the ground differs somewhat in the two localities, and correlated with this fact, the nests are often correspondingly modified. At Kilcool gravel predominates on the beach; at Dollymount sand and shingle (*broken shells*). Let us describe a nest found in the latter locality as our type.

In the unfinished state it is seen to consist of a depression some 5 cm. (2 inches) deep. Viewed from above, the outline is almost circular, with a diameter at its widest part of 6 to 7½ cm. or nearly 2½ to 3 inches. No shells or pebbles are contained in the cavity, which at this stage is entirely lined with sand. Outside, shingles are scattered somewhat abundantly. (Fig. 1, 4).

When seen in vertical section the depression is somewhat conical or V-shaped, the edges sloping at a definite angle, and the deepest part or centre being quite narrow.

In section we might represent the appearance diagrammatically somewhat as in fig. 1 (see next page).

The question now arises—how is this V-shaped depression excavated? By the feet or the beak? Or both? Simply to say that a hole is scratched in the sand affords us no clue as to its formation. The answer is not so easy as one might be inclined to anticipate. As far as direct observation goes I cannot positively assert that I have ever seen the bird using

¹ Though easily startled from their nests, the Little Terns are fierce and courageous, and when they see their eggs or young actually being plundered, they will boldly fly in the face of their assailants.

either its feet or its beak for the purpose in question. I have watched different colonies for some hours, with and without a field glass, and have seen terns sitting in their nests, walking round them, flying to and fro, but never actually in the act of digging the hole. Perhaps this part of the procedure is performed at night?

These facts led me to think that maybe the depression was made by a process of what is commonly called by bird fanciers "breasting." That is to say the bird presses its breast against the sand, &c., and then commences to rotate back and forwards through the arc of a circle, and through a vertical axis passing from the dorsum or back of the bird to its ventral aspect or breast.

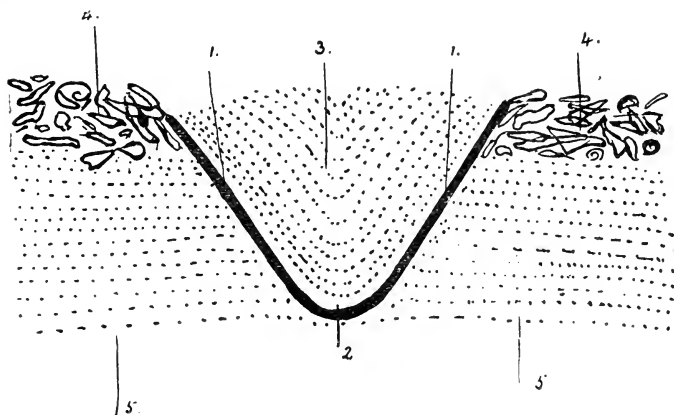


FIGURE 1.—Diagrammatic representation of a vertical section of the nest of *Sterna minuta* in the first or unfinished stage.—C. J. P.

Half natural size.

- 1.—Sloping wall of nest.
- 2.—Lowest and narrowest part of depression.
- 3.—Sand lining nest.
- 4.—Shingles lying outside the nest.
- 5.—Sand under the surface of the shingles.

Sparrows "dusting" themselves in the city streets afford us a crude illustration of this performance. But the shape of the depression minimises the truth of this theory. "Breasting" produces a cup shape and not the conical depression already described.

If we now neglect this method as a preliminary operation, it remains to ask ourselves, are the feet or the beak brought

mostly into requisition? Some observers think the feet are mainly used. But here a difficulty presents itself in this theory.

The finished excavation is on an average 5 cm. (2 inches) in depth, whereas the foot (tarso-metatarsus) of the Little Tern measures only 2 cm. + 1 mm. ($\frac{7}{8}$ inch nearly) in length. It is difficult to understand how the bird could balance itself and at the same time dig a hole, conical in shape, the depth of which is to be more than twice the length of its feet. The beak, head, and neck, would be very much in the way, and the sand could never be thrown up on the surface.

I am strongly inclined to agree with Mr. Williams, and to believe that the process of excavating is performed mainly, if not *in toto*, by the beak.

This structure is admirably adapted for the purpose. Being relatively long (4 cm. or $1\frac{5}{8}$ inches), wedge-shaped, and strongly made, it can be used after the fashion of a pick-axe, until the requisite depth is reached. If at the same time that the beak was at work, the bird walked round a circle the centre of which is at its beak and the distance an imaginary radius from its beak to its feet, the tendency obviously would be for the depression to assume ultimately a conical form. This would be more or less pronounced according to the alterations in the oblique direction of the beak. So much for the description of the unfinished nest.

When completed and containing the full clutch of two or three eggs we note that the deepest and narrowest part of the nest is now filled up with broken shells, which for the purpose of description we may term "*lining shells*." (fig. 2, 1).

Some of these, especially the larger pieces, are pressed against the upper part of the shelving wall, and may even reach to the surface.

Immediately surrounding the nest is a "zone" or "girdle" of comparatively bare sand from which the shingles have been removed save a few of the larger and more entire examples. Outside the "zone" shingles are scattered plentifully.

A rough diagrammatic sketch of the completed nest, as seen in vertical section (containing the three eggs), will serve to illustrate these remarks, and to make them clearly understood. (fig. 2).

I was very much struck with admiration at the appearance of the "bare zone" when I first discovered it in a well-marked specimen. But its great interest depends on the fact that it affords a clue as to how the "lining shells" were actually deposited in the bottom and along the sides of the nest. I think it is almost conclusive that they have been picked away from the mouth of the nest, and dropped or pushed into it, and not carried for any distance by the bird in its beak, as one might first perhaps anticipate.

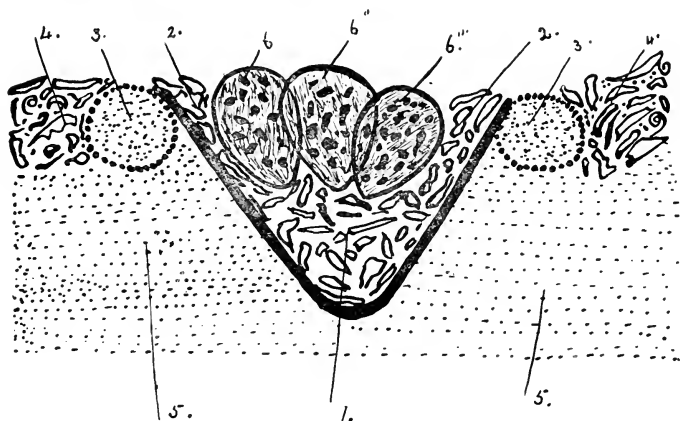


FIGURE 2.—Diagrammatic representation of a vertical section of the nest of *Sterna minuta* in the second or finished stage.—C. J. P.

Half natural size.

- 1.—Lining shells.
- 2.—Lining shells reaching mouth of nest.
- 3.—"Bare zone" or "girdle."
- 4.—Shingles outside the "zone."
- 5.—Under surface sand.
- 6' 6'' 6'''.—Three Eggs in position in nest.

When we think of the very irregular shape, and the slippery nature of broken shells it at once becomes manifest that it would not be conducive to the comfort of the bird to carry these for any distance in its beak. I have never seen terns with anything but food of some kind (fish or shrimps, &c.), in their beaks, at all events when flying.

Another interesting fact about the "bare zone" is that it is liable to great variation with regard to distinctness. In some cases it was very feebly marked, and in others almost absent. The latter condition was often associated with the fact that the

surrounding shingles were not suitable for "lining" purposes, the shells being either too large and entire or badly shaped. Indeed it is quite evident that the Little Tern exercises a certain amount of choice as to the materials with which it will line its nest, small fragments of *Myidæ* and *Cardiidæ* (Razor and Cockle valves) being special favourites.

Before proceeding further, it is convenient at this stage to indicate in a tabulated manner the total number of nests observed during a period of successive years. From these the average number of nests, constructed like the type already described, may be calculated. Such nests may conveniently be termed "typical," whether in the unfinished or finished state. In the first column the letters N.T. will signify the total number of nests observed on such and such a year. In the second column, U.T. stands for the number out of these which conformed to the unfinished type which has been described. F.T.Z., in the third column, shows the number of "Finished Typical" nests with Zone out of the total number, and A.T., in the last column, stands for "Average Typical" number of nests, taking finished and unfinished examples together:—

Tabular view of the total number of nests of the Little Tern (*Sterna minuta*) observed at Dollymount, near Dublin, from the year 1891 to 1899, inclusive, showing also the average number of "typical" nests:—

YEAR.	N.T.	U.T.	F.T.Z.	A.T.
June 18, 1891, . . .	49	27	13	30
June 6, 1892, . . .		No nests	observed.	
May 30, 1893, . . .	8	4	2	6
May 30, 1894, . . .		No nests	observed.	
June 13, 1895, . . .		No nests	observed.	
June 8, 1896 . . .	10	6	2	8
June 16, 1897, . . .	4	1	1	2
June 12, 1898, . . .		No nests	observed.	
May 21, 1899, . . .	16	5	8	13

Summing up, it appears that the fully-formed nest of the Little Tern is a definitely excavated structure, conical in shape, and partially filled up with a choice selection of "lining shells," on which are deposited two or three eggs, and that frequently a "bare zone" or "girdle" of sand immediately surrounds the mouth of the nest.

If we now consider how disproportionately large the eggs are when compared with the size of the bird that lays them, it will be seen that a nest shaped like that which I have attempted to describe will offer special advantages towards the process of nidification. For when the eggs are laid they will tend to assume the position in the nest as depicted in fig. 2 (6' 6" 6"). Here it is seen that the pointed or narrow ends fall towards the bottom of the cone, and the broader ends look upwards towards the parent's breast.¹

In this way the three eggs occupy a smaller space than if they lay on their sides, a condition which allows of their being more completely covered by the parent bird.

The "lining" shells below, by truncating the point of the cone, sufficiently increase the space for the narrow ends of the eggs to rest upon (fig. 2, 1.)

It is also likely that these shells are heated by the underlying sand, and that the increase of temperature reaches the lower parts of the eggs either by conduction or radiation, at the same time that the rest of the surface of the eggs is receiving heat from the body temperature of the mother.

The third illustration (plate 9) is reproduced from a photograph. It is taken from nature and shows the nest undisturbed, with its general surroundings.

The "bare zone" is plainly seen and tolerably pronounced, being only interrupted by a large "razor" and a "collier" shell, which are seen lying somewhat across its path (plate 9, B).

The true conception of the depth of the nest and of the position of the eggs, as seen from above, appears somewhat misleading. This is difficult to avoid, being due to the usual

¹ Sometimes only two of the eggs assume this position, the third one lying altogether on its side. See *Irish Naturalist*, vol. ii., p. 57. Here a nest of the Common Tern (*Sterna fluvialis*) is shown photographed from nature by Mr. Welch, at Mew Island, Belfast Lough. The right hand egg is shown lying on its side.

“contortion” or “telescoping” which so frequently is seen in a photograph illustrating a cavity. At the same time the picture is as good as could be obtained in the field, and my best thanks are due to my friend, Mr. W. D. Latimer, for the care and trouble he has bestowed upon the subject.

There is little to add, except that the conclusions which I have drawn are only based on the results of a limited number of observations, and these have been confined to a narrow district, and are therefore of a rather local nature.

It is therefore not improbable that the Little Tern's nest, in some other localities, may not altogether conform with the type which I have endeavoured to describe. One would expect this all the more where gravel or weeds replace the sand and shingle. However, speaking generally, I think it may be said, that in suitable localities where sand and shingle are obtainable the Little Tern constructs a nest which in its formation displays more care and skill than it has hitherto been credited with by most observers.

Trinity College, Dublin.

OBITUARY.

PROFESSOR SIR FREDERICK M'COY, K.C.M.G., D.Sc., F.R.S.

Irish naturalists will not forget the debt they owe to M'Coy, though he has lived at the other side of the world for the last 40 years. Born at Dublin in 1823, he studied medicine in his native city and at Cambridge; but was drawn off when quite young to the pursuit of natural science. In conjunction with Sir R. Griffith he investigated the fossils of the Irish Palæozoic rocks, his monograph on the Carboniferous fossils being published in 1844, and that on the Silurian in 1846. After a few years of Survey work he was appointed Professor of Geology and Mineralogy in the Queen's University, and he lectured in the Belfast College. In 1852 a large book on British Palæozoic fossils was published by him, under the auspices of the Cambridge University. He was then appointed to the Chair of Natural Science in the University of Melbourne, where he also founded and directed the National Museum of Victoria. He published numerous papers on the zoology and geology of Australia, and in the museum under his care he adopted, at a very early date, some striking and original features in the arrangement of the collections. At this congenial work he continued almost till his death, which took place on May 16th of this year. We are indebted to a notice in the *Geological Magazine* for June for the facts and dates here given.

NOTES ON THE FLORA OF THE COUNTIES OF
ARMAGH, DOWN, ANTRIM, AND DERRY.

BY G. CLARIDGE DRUCE, M.A., F.I.S.

IN the August of last year I spent a few days in the North of Ireland, making my headquarters at Belfast. It was not likely that any important discovery could be made in a part of the country which has been so well and systematically worked as that portion of Ireland has been by so painstaking and enthusiastic a botanist as my veteran friend, Mr. S. A. Stewart, and his coadjutors. But perhaps I may be excused for enumerating a few plants and some notes on a few critical forms which I noticed either when in the company of Mr. Stewart, to whom I am much indebted for kind guidance, or during a few solitary rambles.

Ranunculus acris, Linn, var **Steveni** (Andrj).—Glenarm, &c., Co. Antrim.

Saponaria officinalis, Linn.—Noticed near Toome Bridge, Co. Derry.

Sagina maritima, Don.—Portrush, Co. Antrim.

Erodium cicutarium, L'Herit.—On the Newcastle sandhills, in Co. Down, a very pretty form was noticed, which, according to the description, must be very near if not identical with the var. *dissectum*, Rouy et Foucaud, "Flore de France," iv., p. 108 = *E. cicutarium*, var. *cherophyllum*, D.C. Fl. Fr., v., p. 840, which is distinguished from *E. pimpinellifolium*, Sibth., by "Feuilles toutes à segments profondement pinnatifides, à rachis assez étroit." The former has "Feuilles au moins les inférieures à segments simplement incises pinnatifides, à rachis large." M. Rouy has not yet replied to my query as to whether the Irish form is identical with his var. *dissectum*. The same form occurred on the Wigtown coast.

Millegrana Radiola, Roth. = *Radiola Millegrana*, Sm.—Newcastle sandhills, Co. Down.

Viola tricolor, L.—Near Lough Gilly, in Co. Armagh, a pretty form of this plant was noticed. Herr Freyn suggests that it may be under *V. tricolor*, L.—*V. saxatilis*, Schmidt, var. *Sagoti*, Rouy and Foucaud, "Flore de France," iii., p. 43 = *V. tricolor*, var. *Sagoti* (Jord. Obs. Fragm. ii., p. 34), Gren. and Godr., Flore de France, i., p. 184.

Anthyllis Vulneraria, Linn.—I should refer to the var. *maritima*, Koch, plants seen on the coast between Portrush and the Giant's Causeway.

Ononis spinosa, Linn.—I think I saw this in some pastures near Coleraine, Derry, but unfortunately I did not collect specimens.

- Rubus Rogersii**, Linton.—Near Toome Bridge, Co. Derry, in some plenty; it grew between the station and Lough Neagh.
- R. Selmeri**, Lindeb.—Cave Hill, near Belfast; Glenarm, Co. Antrim; Toome Bridge, Co. Derry; near Lough Gilly, Co. Armagh. Rather frequent in the North of Ireland.
- R. pulcherrimus**, Neum.—Toome Bridge, Co. Derry.
- R. Lindleyanus**, Lees.—A pretty form of this grew near Lough Gilly, Co. Armagh.
- R. pallidus**, Bab. *non* Weihe.—Near Toome Bridge, Co. Derry.
- Rosa villosa**, Linn., var. **nuda** = *R. mollis*, Sm., var. *nuda*.—A form of this species with the peduncles and calyx-tube free from bristles grew on Cave Hill, Co. Antrim. The type occurred on Harbour Island, Co. Derry, and elsewhere in the four counties.
- R. mollissima**, Willd., var. **subglobosa** = *R. tomentosa*, Sm., var. *subglobosa* (Sm.)—Near Bushmills, Co. Antrim.
- R. glauca**, Vill.—Cave Hill, Co. Antrim; near Lough Neagh, Co. Derry; near Mullaghmore, Co. Armagh. Two or three different forms were observed.
- R. glauca**, Vill., var. **cæsia** (Sm.) = *R. coriifolia*, Fries.—Cave Hill, Co. Antrim. Lough Neagh, Co. Derry.
- R. dumetorum**, Thuill.—Near Lough Gilly, Co. Armagh; near Toome Bridge, Co. Derry.
- R. dumalis**, Bechst.—Glenarm, &c., Co. Antrim. Lough Neagh, &c. Co. Derry.
- Agrimonia odorata**, Mill.—Near Glenarm, Co. Antrim.
- Alchemilla vulgaris**, var. **fillicaulis** (Buser)—On the Cave Hill, Co. Antrim.
- Callitriche obtusangula**, Le Gall.—Mr. S. A. Stewart has already recorded in the *Irish Naturalist*, 1899, p. 114, our discovery of this near Belfast, in Co. Down, in brackish ditches near the Victoria Park.
- Galium verum**, Linn., var. **litorale**, Brébisson.—On the sandhills at Newcastle, Co. Down.
- G. Mollugo**, Linn., var. **angustifolium**, G. Beck.—Near Cave Hill, Antrim. Shown to me by Mr. S. A. Stewart. The Austrian botanists do not agree with us in regard to *G. erectum*, Huds. Beck places it as a variety of *Mollugo*. Plants referred to Beck's var. *angustifolium*, by Herr Freyn would be named *G. erectum*, Huds., by many British botanists. I am awaiting the opinion of H. Braun (who has made the form of *G. Mollugo* a special study for some time), on forms of the Irish *Galii* which Mr. Stewart has sent me.
- Arctium Intermedium**, Lange.—To this I should refer some plants gathered near Toomebridge, Co. Derry.
- ***Gentiana baltica**, Murbeck.—On the sandhills at Newcastle, Co. Down. I also found it on the Wigtown coast.
- †**Mimulus moschatus**, Douglas.—Naturalised in a small stream at Tollymore Park, Co. Down.

- Melampyrum pratense**, Linn., var. **hians**, Druce.—Abundant in the beautiful Glenariff gorge, Co. Antrim, and also by the river in Tollymore Park, Co. Down.
- Rhinanthus Crista-galli**, Linn., var. **fallax**, Wimm. and Grab.—Near Toomebridge, Co. Antrim.
- Galeopsis Tetrahit**, Linn., var. **nigricans**, Brébisson, Fl. de la Normandie, p. 246.—Near Lough Beg, Co. Antrim, and by Lough Neagh in potato fields, Co. Derry. This has the “Calyce noiratres munis de très longues dents.”
- Galeopsis Tetrahit**, Linn., var. **bifida** (Boenn.)—Toome, in Cos. Derry and Antrim.
- G. spectosa**, Miller.—Near Toome, plentiful, Co. Antrim.
- Thymus Serpyllum**, Linn., var. **Linnæanus**, Gren. et Godr. Fl. Fr. ii, 658.—Cave Hill, Belfast, *teste* Herr Freyn.
- Utricularia major**, Schmidel = *U. neglecta*, Lehm.—Mullaghmore, Co. Armagh.
- ? **Atriplex calotheca**, Fries—I think it probable that a plant from the coast near Newcastle, Co. Down, may prove to be this species, as it is closely allied to my Wigtown specimens which Herr Freyn names *A. calotheca*.
- Potamogeton gramineum**, Linn. = *P. heterophyllus*, Schreb.—River Bann near Toomebridge.
- Carex flava**, Linn., var. **lepidocarpa** (Tausch).—Mullaghmore Lough, Co. Armagh, *teste* the Ffarer Kükenthal. Near Harbour Island, Co. Derry.
- C. flava**, Linn., var. **œdocarpa**, Anders.—Lough Beg, Co. Antrim.
- C. œderl**, Retz. and Syme.—Shores of Lough Neagh, Co. Derry.
- C. Goodenowii**, Gay, var. **elatior**, Lange, f. **angustifolia**.—Harbour Island, Co. Derry.
- C. rostrata**, Stokes, var. **latifolia** (Ascherson) = *C. rhynchophysa* Praeger in Herb. Kew. ! Mullaghmore Lough, Co. Armagh. See *Journ. Linn. Soc.* (1899), pp. 276-9.
- C. rostrata**, Stokes, var. **sparganiformis**, Murray.—Mullaghmore Lough, Co. Armagh, *teste* the Ffarer Kükenthal.
- Agrostis alba**, Linn., var. **coarctata** (Hoffm.)—Abundant in the marshes near Lough Beg, Co. Antrim, and in islands in Lough Neagh, Co. Derry.
- Koeleria cristata**, Pers.—Portrush, Co. Antrim.

High-street, Oxford.

THE NAMES OF BIRDS.

A Glossary of Popular, Local, and Old-fashioned Names of British Birds, by CHARLES LOUIS HETT. Brigg: Jacksons. London: Simpkin, Marshall, & Co. Price 6*d*.

Mr. Hett has reprinted, with some additional matter, the glossary of local bird-names which appeared as an appendix to his "Dictionary of Bird-Notes." As it had little connection with the subject-matter of the Dictionary, it was there rather thrown away, and to have it separate is a distinct improvement. The additions now made are also very welcome. Some two thousand local names were printed in the original glossary, and about four hundred others are now added, giving as an average rather more than six local English names to every British bird. The most regrettable feature about the book is that the old and new matter have not been dove-tailed, but appear as two separate glossaries. It is of less consequence that the B. O. U. list of 1883, which the author uses, does not contain all the birds now recognized as "British," for of course none of the mere stragglers added of late years have any right to "local or popular" names. Mr. Hett appears to have made out a very exhaustive list, containing nearly five times as many names as appear in the similar glossary appended to Gordon's "Our Country's Birds, and how to know them"; and we think he has succeeded in including most of those commonly used in Ireland. Among the omissions, however, are "Sally-pecker" (the all-but-universal rustic appellation in this country for the Willow-wren and Chiffchaff); "Ground Lark" (applied somewhat miscellaneously, but chiefly to the Sky-lark); "Royal Gull" for *Larus marinus*; "Kite" for any Harrier, and "Cat-Owl" for *Asio otus*. Some of our local names are but slight variations on others which appear in Mr. Hett's book; e.g., with us the Mistle-thrush is "Jay," not "Jay-pie," and the Hooded Crow "Scald Crow," not "Scale Crow"; while the Wren (about Dublin) is not a "Scutty," but a "Scut." "Tweet," a local name for the Meadow Pipit, might also have been given. It is in common use in the Isle of Man, and probably elsewhere. Mr. Hett invites those of his readers who can supply further additions to communicate with him, and in doing so they will materially increase the value of what is already a very excellent little book.

C. B. M.

A BOOK ON INSECTS.

Insects: their Structure and Life. A Primer of Entomology. By GEORGE H. CARPENTER, B.SC., Lond. London, 1899: J. M. Dent & Co. xii. & 404 pp.; 183 figures. Price, 4s. 6d. net.

Mr. Carpenter modestly prefaces his "Primer" by saying "Not one, even of the many books made in these days, is likely to be thought superfluous by its author." Although publishers' lists are increasingly flooded with "popular" works on Entomology, the present volume is certainly not at all unnecessary, but will be the very thing that young students of limited means have long been anxious to obtain, and should stimulate the "mere collector" to regard his captures more as material for morphological or biological investigations. There is not another work—in the English language, at least—of similar size and inexpensiveness, which presents a general sketch of Entomology so exhaustive and withal so lucid and interesting in its treatment.

It is necessarily largely a compilation, but the selection of subjects has been very judicious—scarcely a point of general interest having been omitted—and the space devoted to each topic is fairly distributed. There are one or two slight inaccuracies here and there, and there are several points at which the captious critic could carp, but the reputation of the author will be an ample guarantee of its general accuracy, and the debatable subjects have still many supporters on both sides.

The work embraces six chapters, and is completed by a bibliography and an index. The chapters are entitled as follows:—

- I. The Form of Insects, pp. 1-83.
- II. The Life-history of Insects, pp. 84-127.
- III. The Classification of Insects, pp. 128-159.
- IV. The Orders of Insects, pp. 160-280.
- V. Insects and their surroundings, pp. 281-343.
- VI. The Pedigree of Insects, pp. 344-378.

The opening chapter is devoted to a general consideration of the "Form" of Insects, the familiar Cockroach being selected as a type. We of the human race are not sufficiently grateful to "Nature" for having preserved to us an insect so little specialised, so easy of access, so sufficiently numerous in individuals, and of so convenient a size for examination.

The account has evidently been largely drawn up from Miall and Denny's classic monograph, modified and extended by a practical knowledge of the subject and a sagacious acquaintance with entomological literature, particularly perhaps from Marlatt and Benton's papers in the publications of the U. S. Dept. of Agriculture. After a general description of the external morphology, the nerves and sense organs are discussed, followed by a resumé of our knowledge of the muscular, circulatory, respiratory, alimentary, and reproductive systems.

Although the nomenclature adopted for genera and species is not always in accord with the strict law of priority, it is refreshing to find that the usurping "*Periplaneta*" has been discarded, and the ancient "*Blatta*" restored.

There is one point here, however, upon which, as a candid critic, I cannot congratulate Mr. Carpenter, and that is his morphological nomenclature. "Segment" is rightly substituted for the erroneously but unhappily almost universally employed "joint," but where such terms as, for example—"thorax," "abdomen," "antennæ," "tibia," "tarsus," "salivary glands," etc., are in constant use by workers in all countries, it seems a mistaken policy to employ such uncouth terms as *"fore-body," "hind-body," "feelers," "shin," "foot," "spittle-glands," etc., and the substitution of the hideous "in-pushing" for "invagination" cannot be commended.

Chapter 2 sketches the life-history of insects from the egg, through fertilisation, and the development of the embryo to the emergence of the imago, while the author has not forgotten to touch upon such obscure and interesting phenomena as virgin reproduction, larval reproduction and hypermetamorphosis.

The third chapter sets forth the classification of Insects, or rather—the nomenclature of their classification. "Variety" and "Species," and the causes of variation are discussed—*Polyommatus astrarche*, its varieties and allies, being taken as instances—leading to the origin of species, natural selection, the utility of specific characters, etc. It is in this chapter that the author displays more particularly his originality of treatment, and it is one that every young student ought to read carefully.

Mr. Carpenter sets forth very clearly the various theories now holding the field, but though he wisely cautions the reader to "suspend judgment," he openly and boldly refuses to "subscribe to the 'all sufficiency' of natural selection." It is remarkable, however, that many theories tend to point back to "natural selection" in the end, e.g., the last-named is dismissed as inapplicable in dealing with the atrophy of vision in cave insects, but the alternative "economy of nutrition" is really only natural selection under another name (p. 288).

Chapter 4 deals with the orders of insects, concisely enumerating the salient characteristics of the various families, and although these are not in every instance rigorously accurate when applied to extra-Britannic forms, they appear to be sufficient to enable the young student to locate any British Insect in its proper family. Fifteen orders are considered more or less valid, and are arranged in the following sequence. (pp. 162-4):—Collembola, Thysanura, Dermaptera, Orthoptera, Platyptera (Stone-flies, etc.), Thysanoptera, Hemiptera, Plectoptera (Mayflies), Odonata, Neuroptera (Lacewings, etc.), Coleoptera, Trichoptera, Lepidoptera, Diptera, and Hymenoptera.

* "Body" (*corpus*, *corps*, *Körper*, etc.) being used to denote the whole insect) "fore-body" is surely strictly equivalent to the head, and not to the thorax!

There is one positive mistake in this chapter that I call attention to, although it does not strictly refer to the British Fauna, and that is the inclusion of the *Belostomatidæ* among the *Nepidæ* ("Some tropical *Nepidæ* attain a gigantic size," p. 191). The true position and affinities of the *Nepidæ* are extremely obscure, but they are probably as far removed from the *Belostomatidæ* as a Sesiid from a Pierid! Our present scanty knowledge points to their descent from Reduvioid ancestors, the *Belostomatidæ* proceeding from an Acanthioid through a Naucoroid stock; the *Corixidæ* and later *Notonectidæ*, are doubtless from the last-named. The *Nepidæ* differ entirely from the other Hydrocorisæ, in facies, in structure, and in habits; the long posterior respiratory tubes (modified pleura) which are so marked a feature of the *Nepidæ*, are quite absent in the *Belostomatidæ*, where the pleura are more or less normal, while the short strap-like processes in the latter are connected with the sexual organs.

In the Lepidoptera, Mr. Carpenter does not consider the old divisions of Rhopalocera and Heterocera scientific, nor does he adopt the Jugatæ and Frenatæ of Comstock, the Incompletæ and Obtectæ of Chapman, nor Packard's exclusion of the *Micropterygidæ* to found a sub-order (Iaciniata), distinct from all the other families (Haustellata). "On the whole it is better not to adopt any division of the Lepidoptera between the order and the family." Forty-six families are recognised, the principal being placed in the following order:—*Micropterygidæ*, *Eriocraniidæ*, *Hepialidæ*, *Zygenidæ*, *Psychidæ*, *Cossidæ*, *Sesiidæ*, *Tortricidæ*, *Tineidæ*, *Pterophoridæ*, *Pyralidæ*, *Lasiocampidæ*, *Lymantriidæ*, *Arctiidæ*, *Noctuidæ*, *Sphingidæ*, *Geometridæ*, *Uraniidæ*, *Bombycidæ*, *Saturniidæ*, *Hesperiidæ*, *Lycænidæ*, *Papilionidæ*, *Pieridæ*, and *Nymphalidæ*. The author does not agree with Grote that the *Parnassi-Papilionidæ* should terminate the series, but considers the *Nymphalidæ* as the dominant family, and ends the Lepidoptera with the *Satyrinæ*.

The Diptera are divided into three groups: Aphaniptera, Orthorrhapa, and Cyclorrhapa; the recent researches, however, of Heymons (*Zool. Anzeiger*, xxii. 1899, pp. 223-40), lend support to the view that the Fleas should form a separate order.

The fifth chapter deals with Insects and their surroundings. The sub-joined list of topics shows that very little of importance and interest has been omitted, viz.: Abundance of Insect life, Cave Insects, Freshwater and Marine Insects, Geographical Distribution, Vegetable-feeders, Scavengers, Insects of Prey, Parasites, the various significances of colouring, Sexual Modification, Family and Social Life, and Insects in relation to Man.

Chapter 6 briefly sketches the relationship of the Insect-orders, not only among themselves—past and present—but in comparison with the other orders of the Arthropoda.

"The names of authorities are not mentioned in the text, but reference figures in heavy type call attention to the bibliography at the end of the book," where 217 representative and well up-to-date titles will be found. These should prove very useful to the young worker. The book is

liberally illustrated with 183 figures, of which many are from Miall and Denny's "Cockroach" (19 per cent.), and still more from the publications of the U.S. Dept. of Agriculture (56 per cent.). A good index completes the volume, which is well printed and suitably "got up."

In fine, I can cordially recommend the book to young entomologists as one admirable in every way.

Mr. Carpenter has headed each of the chapters with one or two quotations from various authors, from Cowper to Darwin! It may not therefore be inappropriate to close this critique—or rather, appreciation—by applying to the author himself the well-worn, but ever fresh lines:—

"Felix, qui potuit rerum cognoscere causas,
 " Atque metus omnis et inexorabile fatum
 " Subiecit pedibus"

G. W. KIRKALDY.

NOTES.

We have received from Mr. H. Lyster Jameson, a paper on the anatomy and histology of *Thalassema Neptuni*, which formed his inaugural dissertation for the degree of PH.D., at the Heidelberg University. We heartily congratulate Dr. Jameson on his memoir, which shows traces of careful research. We hear that he is now on his way to the Conflict Islands, in the Coral Sea, near Papua, where he is to survey a proposed pearl-fishery. All Irish naturalists will wish him godspeed.

Dr. Forsyth-Major, whose fame as a palæontologist is world-wide has been working through the fossil mammals, &c., preserved in the Dublin Museum of Science and Art. Some interesting papers may be expected as the result of his researches.

An important outcome of the recent visit of Dr. Forsyth-Major to Dublin has been the formation of a committee to carry out further investigations of the cave deposits of this island. Caves which sheltered the men and wild animals of former days abound in many parts of the country, and only one or two of them have been systematically examined, so interesting results may be expected. The committee consists of Dr. Scharff (Chairman), Dr. Major, R. J. Ussher, Professor Cole, George Coffey, and R. Lloyd Praeger (Secretary). They are to be congratulated on having secured the active co-operation of Dr. Major, the first authority in Europe on the subject. Work will, it is hoped, be commenced next spring.

Our readers who collect worms for the Rev. Hilderic Friend, will please take note that he has removed from Ocker Hill, Tipton, to Chichester, Sussex.

BOTANY.

Cybele Hibernica and its Critic.

In the *Journal of Botany* for July, the editors of *Cybele Hibernica* reply to the remarks of Rev. E. S. Marshall, which appeared in the June number, and on which we briefly commented in our last issue. The August number of the *Journal of Botany* contains a further paper by Mr. Marshall, "On the probable status of some Irish Plants," containing some interesting statements and arguments on the subject of certain plants of doubtful standing. The discussion is an interesting one, and will no doubt be attentively followed by Irish botanists.

Geranium pyrenaicum in South-east Galway.

As *Geranium pyrenaicum* has not been recorded from District VI. in *Cybele Hibernica* (1898 Ed.), it may be worth mentioning as found growing plentifully by the roadside in one locality in the parish of Kilconicky, near Craughwell, in July and August of the present year.

MARGARET E. JOYCE.

St. Cleran's, Craughwell.

Isoetes lacustris in Lough Neagh.

The small part of County Down which touches Lough Neagh is separated from County Antrim by a streamlet that enters the lough at a little bay at Annadroughal. A very short distance from this point, *Isoetes lacustris*, which is there to be claimed for both counties, occurs in considerable quantity, as I had the pleasure of observing in the middle of last June. Doubtless that part of the shore just indicated has oft times been botanically examined, but the plant growing, as it does, where the water has a depth of three or four feet, can hardly be seen save in passing over it in a boat.

J. H. DAVIES.

Lisburn.

ZOOLOGY.

Ireland and Kamchatka.

In the *Scottish Geographical Magazine*, 1899 (pp. 225-256), Mr. G. E. H. Barrett-Hamilton gives an interesting account of his visit to Kamchatka, when in the far north-east in connection with the Fur-seal Enquiry. Several comparisons are made between the fauna of Kamchatka, and that of the British Isles. Among the sea-birds such familiar species as the Common Gull, the Kittiwake, and the Guillemot were observed, but not the Little Auk or the Razorbill. "The Magpie and the Carrion Crow are as evident as in England, but one misses the familiar forms of Rook, Jackdaw and Starling." One point of similarity between the Kamchatka and Irish faunas is "the intermingling of Arctic forms with those which we are more accustomed to associate with the sunny south."

INSECTS.

Bembidium paludosum, Panz, at Lough Neagh.

On June 19th I made an expedition to Lough Neagh in the hope of meeting with either *Dyschirius obscurus* or *Silpha disfar*. A kind friend drove me from Portadown to the lake-shore at Derryadd. Finding, however, that the lake was too high for any hope of captures, I pushed on to Ardmore. Here again the high level of the water proved a drawback, and I soon saw that there was no chance of either of the species I had hoped to meet with. However there were some beetles to be found under debris, and accordingly I set to work, assisted by Mrs. Johnson and my friend's little daughter. I soon noticed *Bembidium bifunctatum* and along with it a *Bembidium* which was strange to my eye. This, on examination, proved to be *B. paludosum*, Panz. I did not get many, for there were but few insects stirring, but no doubt had the state of the shore been more favourable I should have met with a considerable number. I cannot find any recent record of its occurrence in Ireland. Haliday gives it in his list among beetles captured near Belfast, and Fowle adds Lough Neagh and Kerry. It is possible that this beetle may like others only be found in the perfect state at one period of the year, and, consequently, unless searched for at that particular time, will not be met with.

W. F. JOHNSON.

Poyntzpass.

Noteworthy Lepidoptera.

Readers of the *Irish Naturalist* may be on the look-out for certain interesting species of Lepidoptera which usually occur after a warm season, such as the present; more especially as it follows upon a preceding year of more than usual sun-heat. Already throughout the summer the Humming-bird Hawk-moth (*Macroglossa stellatarum*) has been exceedingly numerous in our gardens, and larvæ of the great Death's-head Moth (*Acherontia atropos*), have been reported to me by Mr. W. B. Thornhill, of Castle-Bellingham, feeding on the common *Euonymus* or Spindle-tree. They should be looked for in the potato fields, and an outlook should be kept for their large black pupæ at potato-digging. We may also expect an immigration of the beautiful orange-coloured butterfly *Colias edusa* in the United Kingdom; and probably other Hawk-moths beside those alluded to above will be reported as the autumn proceeds—such as *Deilephila galii*, *D. livornice*, and *Sphinx convolvuli*, flying about Honeysuckle and other flowers as dusk approaches.

WM. FRAS. DE V. KANE.

Drumreaske, Monaghan.

[Mr. Kane will notice that *Colias edusa* has been observed both in the north and south of Ireland (p. 208). We have received caterpillars of *Acherontia atropos* from Cos. Kildare, Wexford, and Waterford.—EDS.]

Colias edusa in Co. Donegal.

I saw during August near here a male specimen of the Clouded Yellow. Of course I did not attempt to capture it; but watched it for some minutes. As it is an unique experience for me in this part of the British Isles, I send the information, in case it may interest readers of the *Irish Naturalist*.

Convoy, Co. Donegal.

K. THOMPSON.

Colias edusa in Co. Waterford.

On the 10th August I saw four specimens of this butterfly, and succeeded in capturing one, a male. On the following day I saw another. The Clouded Yellow is decidedly rare about here in most seasons, and many years pass without my being able to see a single specimen.

Coolfin, Portlaw, Co. Waterford.

WILLIAM W. FLEMING.

Vespa rufa and other Wasps in Co. Wexford,

At Ballyhyland we have had the same remarkable abundance of the pale wasp, *Vespa rufa*, this year, as is reported by Mr. Cuthbert (p. 163) from Co. Clare, and by Mr. Buckle (p. 164) from Co. Derry. Along every hedge-bank its light yellow form was constantly to be seen throughout June. I took a considerable number of specimens in hopes of finding the rare *V. austriaca* among them, but unsuccessfully. *Vespa rufa* occurs in some numbers every year at Ballyhyland, but not in profusion as it has done this summer.

V. vulgaris is fairly, not remarkably, plentiful, and, like Mr. Buckle, have not seen a single specimen of *V. germanica*. The workers of this wasp often seem quite as plentiful at Ballyhyland as those of *V. vulgaris*, but the perfect females are always, I think, comparatively scarce. Still it is curious not to meet with one throughout the whole of May and June.

Vespa sylvestris is every year common at Ballyhyland, and may be taken in any number at flowers of either of the figworts, *Scrophularia nodosa* and *S. aquatica*, particularly the latter. The fondness of wasps for figwort is notorious, but I have never seen it noted that the majority of the wasps which swarm about this flower are generally *V. sylvestris*. At Ballyhyland I find *V. sylvestris* compose at least 75 per cent. of the figwort-hunting wasps; and this has been the case every summer since I first noticed the peculiarity in August, 1894; in that season, by the way, I could find no other wasp at figwort at all.

Vespa norvegica seems very rare here; I have not seen it this summer, but last year I caught a few with *V. sylvestris* at figwort, the only live specimens I had ever met with.

Ballyhyland, Co. Wexford.

C. B. MOFFAT.

Wasp Notes.

Although an occasional queen wasp may still be met with, the season during which they are to be caught in large numbers is now past, so that one can note the results of the season's catch.

I was away from Ireland till June 27th, but in the fortnight following that date I was paying visits in the North of Ireland, at Bangor, Co. Down, and near Kilrea, Co. Derry. While there I caught a considerable number of queens, and even so early as that I caught a good many workers, *Vespa rufa*, *V. norvegica*, and *V. sylvestris*, being the most common.

During my absence from home I instructed my gardener to catch queen wasps for me here, the following being the results of the catches in the three places named :—

	Fenagh, Co. Carlow.	Nr. Kilrea, Co. Derry.	Bangor, Co. Down.
<i>Vespa vulgaris</i> ,	28	—	2
„ <i>germanica</i> ,	1	—	—
„ <i>rufa</i> ,	148	72	41
„ <i>sylvestris</i> ,	43	6	—
„ <i>norvegica</i> ,	2	—	4
„ <i>austriaca</i> ,	4	4	6
	226	82	53

The vast majority were caught on bushes of *Colonaster Symondsii*. This shrub has a very great attraction for wasps when in flower, which this year was the end of June and early part of July.

I planted some of this shrub here some years ago for the purpose of killing queen wasps on it, and have been very successful for several years past in reducing the number of nests about, but before this year have not taken note of the various species killed.

The great fascination this plant has for queen wasps may possibly be of interest to collectors. A friend of mine tells me that one year he killed over a thousand queens on some plants of it in his garden. The great numbers of *V. rufa* this year, both in this part and in the north of Ireland is interesting, as I do not ever remember noticing this wasp here before.

I examined some hundreds of workers here last autumn, but found nothing but *V. vulgaris*. Nests of *V. rufa* should be common this year, and there should be ample opportunities for confirming Mr. Robson's observations on the inquiline nature of *V. austriaca* which also seems to have been met with in larger numbers than usual.

DENIS R. PACK-BERESFORD.

Fenagh House, Bagnalstown.

MAMMALS.

Supposed Occurrence of the Lesser Rorqual In the Swilly.

With reference to the note which appeared on page 30 of the current volume of the *Irish Naturalist*, might I suggest that, as the cetacean in question has not yet been identified, and that there is nothing to show in the note that it may not prove, when identified, to be quite another species, the title "Lesser Rorqual in the Swilly" is distinctly misleading, and likely to give a very erroneous impression to many readers?

But this is not my only complaint. On the previous page of the same number there is a letter from the correspondent who is responsible for the note to which I have already referred, in which he compares the stranding of the supposed Lesser Rorqual with that of a Black Fish on the same beach, and draws deductions therefrom as to the composition of the Irish fauna!

From whatever point of view we regard them, the printing of such uncertain communications in the *Irish Naturalist*, to which we all look for an example of scrupulous accuracy, is deplorable, and I trust that some small amends will shortly be made by the correction or confirmation of the objectionable note.

G. E. H. BARRETT-HAMILTON.

Kilmanock, Arthurstown, Waterford.

GEOLOGY.

Pleistocene Fossils from Co. Antrim.

In working out a small parcel of washings of the Estuarine Clay of Magheramorne, collected by myself, I find a number of unnoticed items that may be interesting to put on record as additional to the fauna of Estuarine Clay at this place.

DECAPODA—*Cancer pagurus*, *Carcinus menas*, *Pilumnus hirtellus*, *Portunus corrugatus*, *P. pusillus*, all represented by their chelæ.

ENTOMOSTRACA—*Cythere albomaculata* (1 valve), *C. convexa* (frequent), *C. lutca* (mostly female), *C. pellucida* (1 valve), *C. villosa* (rare), *Loxocncha impressa* (few, mostly male), *Pontocypris mytiloides* (few), *Zestolebris depressa* (2 valves).

BALANIDE—*Verruca stromia*, *Balanus* sp.

ECHINODERMATA—*Echinus esculentus*, *E. miliaris*, *E. norvegicus*, *Echinocardium cordatus*, all in detached plates and spines.

ANNELIDA—*Spirorbis corrugatus*, *S. heterostrophus*.

MOLLUSCA—*Aclis supranitida*, *Fissurella græca*, *Homalogyra atomus*, *H. rota* (v.r.), *Jeffysia opalina*, *Pherusa gulsoni*? *Rissoa cancellata*, *Skenea planorbis*, *Trochus (Solarium) acutangulatum*. (I figured in the Proc. Yorkshire Phil. Soc. in 1893 one of several examples collected in the interglacial deposit at Selsey, in Sussex, which M. Dolfuss thought might be a Mediterranean form; I am unable to correlate it with the young of any Northern shell, and as I have found several specimens believe it to be an overlooked Irish shell.)

POLYZOA—*Alysidora labrosa*, *Cellularia reptans* (common), *Cellepora pumicosa*, *Hippothoa catenularia* (inside of *M. modiolus*), *Microporella violacea*, *Mucconella Peachii*, *M. variolosa*, *Membranipora monostachys* (coating the outside of *P. opercularis*), *Schizoporella hyalina*, *Scrupocellaria scruposa*, mostly rare, in well preserved fragments.

MISCELLANEOUS.—*Melobesia*, sp., *Lithothamnion*, sp., *Zostera marina*, sponge tissue, and spicules perhaps of *Thensa muricata*.

ALFRED BELL.

Guildford, Surrey.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include three Spider-monkeys and a pair of Squirrels from Mr. J. Hogg, a Parakeet from Sir T. F. Brady, a pair of Knots from Mr. R. Warren, and a Kestrel from Mr. G. H. George. A Great Wallaroo, a Red Kangaroo, a pair of Bennett's Wallabies, a Striped Hyena, and a Nigger Monkey have been bought.

BELFAST NATURALISTS' FIELD CLUB.

This Society held their fourth field meeting for the present session on the 11th, 12th, and 13th July in Dungiven and the valley of the Roe. The conductor's whistle sounded 'to business,' and all were on the march to the beautiful grounds of Roe Park, on the left bank of the River Roe, and within a mile of Limavady. Here the party were met by the proprietor, Mr. J. E. Ritter, who conducted all to the summit of the reputed Drumcatt, where a great native assembly was held A.D. 575. At this spot the formal field meeting was constituted, and Mr. John Vinycomb, M.R.I.A., was elected chairman, who, after a brief address, asked the conductor, Mr. W. Gray, M.R.I.A., to explain the proposed programme, which was done, and a general discussion followed. O'Cahan's Rock and Castle were visited, and the very best views of the fine scenery of the river Roe were pointed out; and, coming to more matter-of-fact subjects, Mr. Ritter explained how he had succeeded in making use of the water power of the river to generate the electric power which is now used to work manufacturing machinery in Roe Park and to light Roe Park House and the town of Limavady. The naturalists walked on to Carrick Rocks, a very fine gorge cut out of the Silurian rocks by the River Roe. The banks at each side are about 60 feet high, and give capital sections for study. Being now four miles from headquarters, cars met the party, for the return journey, calling at Ardmore, where Mrs. Macrory entertained the explorers. A visit was paid to Drenagh, where Mr. M. McCausland conducted the party to the old church of Drumachose, and pointed out the reputed grave of Fin M'Quillan. The party then returned to the hotel for dinner, after which a walk was taken to the old fort on the Derry road. The banks above the pool are clothed

with the Beech Fern and numerous other plants. An excellent section of primitive limestone also occurs here, traversing the metamorphic rocks, and good specimens were secured, as well as very fine examples of quartz, which occurs sometimes in very clear, large crystals, and is known as "Dungiven diamonds." After a rest at Carniban, or the White Cairn, a visit was paid to Banagher old church, said to be built by St. O'Heuey. After exploring the venerable ruins the party found a good example of a bullaun on the bank next the gate, and the conductor pointed out its supposed history. Returning to Dungiven, the party visited Pellipar House by permission of Captain R. A. Ogilby, D.L. From Pellipar the party went on to the old church of Dungiven. On entering the graveyard there is a good example of the bullaun, which is here venerated as a holy font or well, and the surrounding bushes are liberally decorated with votive offerings in the shape of rags, strings, and coloured pieces of cloth.

On the 13th inst. the members started by train from Limavady for Dungiven, when they were received by Dr. Moore and others as cordially as on the morning of the day before. They at once proceeded to the residence of Rev. S. Thomson, whose very fine collection of geological specimens were arranged for inspection. The Sponges, Echinodermata, and Cephalopoda are exceedingly abundant, and many of the less known forms elsewhere are numerous here. Mr. Thomson was good enough to accompany the party up to the quarries on Benbradagh, where a considerable number of specimens were collected. A walk of about a mile on the crest of the hill enabled the party to reach by a gradual slope the highest point of the mountain, 1,536 feet high. From this point there is a most extensive view, and as the atmospheric conditions were most favourable, every feature of the grand panorama was distinctly visible. This was the grandest view enjoyed during the trip, and very appropriately terminated the naturalists' meeting at Dungiven, a locality well worthy the attention of tourists in general.

On Wednesday morning the naturalists left Limavady by rail for Dungiven. Here they were met by a number of local friends, who were anxious to aid in every way. Dr. Moore, of Dungiven, and J. Eakin, of Feeny, rendered special service. Moving off in vehicles Mr. Eakin conducted the naturalists to Banagher, where a survey was made of what remains of a vitrified fort, one of the very few that occur in Ireland. Unfortunately a former rector of the parish had the main structure removed in making what he considered "improvements" about his grounds. Proceeding up through Templemoyle, where a variety of plants were collected, and reaching the top of the hill a visit was paid to English stone circles, of which there are several. One is quite complete, and composed of about 50 stones about $2\frac{1}{2}$ feet high. Returning by the road at Carniban, at the north end of the valley of Lignapestia, while the naturalists walked through from the south.

SOME ANIMALS FROM THE MACGILLICUDDY'S
REEKS.

BY R. F. SCHARFF, PH.D., and GEORGE H. CARPENTER, B.SC.

[Collected for the R.I.A. Flora and Fauna Committee.]

IN September, 1898, having been deputed by the R.I.A. Flora and Fauna Committee to make a preliminary survey of the fauna of the MacGillicuddy's Reeks, we set out for that famous mountain-range. The long distance from Killarney to the foot of the Reeks led us to make Glencar, at the western extremity of the range, our headquarters. Accordingly we took train from Dublin to Killorglin, and drove thence by a road commanding fine views of our proposed collecting-ground. At the approach of evening the mists, which throughout the day had rested on the hills, slowly lifted, and, as we skirted Lough Acoose, the summit of Carrantuohill was plainly to be seen. We soon found ourselves comfortably settled for the night in the Glencar Hotel.

Early next morning we started for the mountains, the day being fine and almost cloudless. The road from the hotel rises steadily for about three miles to Lough Acoose, whence the ascent begins. Like the whole of Co. Kerry, the district is poor in animal life, and our stay being confined to two days we observed only a small proportion of lowland forms, our main object being to explore the higher regions of the Reeks. The weather being dry, Mollusca were especially scarce. Near the hotel the commonest species were the slugs *Arion ater* (both brown and black varieties), *Arion Bourguignati*, *Limax marginatus (arborum)*, and *Agriolimax agrestis*, while of snails only *Helix rotundata* was met with. Near Lough Acoose, *Vertigo edentula* was taken by sweeping Bracken, while *Hyalinia radiatula* occurred under stones. Flying around the trees or on the lake-shore we noticed very richly marked specimens of the "Vapourer" Moth—*Orgyia antiqua*.

We delayed only a short time collecting at the foot of the mountain, and pushed on towards Carrantuohill. The ascent up to 3,100 feet—a point named Caher—is easy, and by keeping high enough up on the side of the valleys, it is possible to avoid boggy ground almost entirely. Up to 1,500 feet some common arachnids were fairly numerous; the

Harvestmen *Liobunum rotundum*, *Megabunus insignis*, and *Acantholophus ephippiatus* were observed, while among the spiders we saw *Araneus diadematus*, *Meta segmentata*, *M. merianæ*, *Lycosa pulverulenta*, *Paradosa pullata*, and *P. amentata*, in numbers. More noteworthy were single specimens of *Erigone promiscua* and *Diplocephalus latifrons*. Among the beetles¹ we found, about the same elevation, *Cychnus rostratus*, *Notiophilus biguttatus*, *Nebria brevicollis*, *Bradycellus cognatus*, *Pterostichus vulgaris*, *P. diligens*, *Anchomenus albipes*, *Trechus minutus* var. *obtusus*, *Quedius boops*, *Lathrobium fulvipenne*, *Platystethus arenarius*, *Choleva angustata* (hitherto unknown in the south-west), *Coccinella hieroglyphica*, *Byrrhus pillula*, *Lochmæa suturalis*, *Apion striatum*, and *Sitones lineatus*. The handsome red-legged fly, *Bibio pomonæ*, was abundant above 1,500 feet. From the foot of the mountain up to 2,000 feet the only molluscs observed were *Arion ater* and *Limax marginatus*.

At the height of 2,500 feet, however, we were greatly struck with the sudden appearance of a small, almost perfectly black slug looking like a very dark form of *Agriolimax agrestis*, which species abounds lower down in the large, white, unspotted variety characteristic of western Ireland. We found several specimens of this interesting slug between 2,500 feet and Caher (3,100 feet); it often crawls over the surface of the large rock-fragments which strew these higher slopes, and its black colour makes it very conspicuous. On closer examination the wrinkles on the back showed the structure peculiar to *Limax*, with which the form also agreed in the absence of the milky slime so characteristic of *Agriolimax agrestis*. We were puzzled by this peculiar form, which is certainly quite absent on the lower slopes of the mountain. Careful study afterwards led to the conclusion that it must be a small dark form of *Limax marginatus*, which is certainly worthy of a distinct varietal name.

***Limax marginatus*, var. nov. *niger*, Scharff.**

Colour almost black, sides a little lighter, but no trace of bands, stripes, or spots. Foot-fringe black; sole light grey. Length, when fully extended, 35 mm. Keel strongly developed on posterior half of body.

¹ We have to thank our colleague, Mr. J. N. Halbert, for identifying the Coleoptera and Hemiptera we collected.

This slug is so much like *Agriolimax agrestis* in general appearance (except colour), that we at first sight naturally mistook it for an *Agriolimax*. Examination of the reproductive organs showed however a close correspondence with *Limax marginatus*, while Professor Simroth (to whom a specimen was sent) drew attention to another limacine character—the six convolutions of the intestine; *Agriolimax* has only four. Indeed the internal organs of this slug from the Reeks agree in all respects except size with those of an ordinary *Limax marginatus*, which is generally double the size of the present variety.

Limax marginatus (formerly known as *L. arborum*), has a very wide range in Europe, but it is more common and variable in the west than in the east. One of us has taken it as far south as the Canaries, and it is recorded from Scandinavia, the Faroes, and the Shetlands. The beautiful variety *maculata*, described by Roebuck, and recorded by him from Co. Mayo, seems to be confined to western Ireland; in the south-west it has been noticed only around Killarney and Berehaven. The present form (var. *niger*) occurs, according to Professor Simroth, also in Transylvania. It approaches very closely var. *rupicola* of Lessona and Pollinera, which occurs in the Piedmontese Alps up to 7,000 feet, and has been recorded by Roebuck from the Mourne Mountains, but differs from that form in being entirely unicolorous above. Other varieties (*Bettonii* and *memorosa*) are also known from Ireland.

Besides this interesting slug, *Arion ater* (the black variety only) *A. subfuscus* (a small dark brown form) and *A. intermedius* were found sparingly above 2,700 feet. At that height *Hyalinia alliaria* occurred, but no snails were noticed beyond. The flies *Tipula hortensis* and *Sepsis cynipsea* and the spiders *Bathypantes variegatus*, *Leptyphantes Blackwallii*, *L. tenuis*, and *Textrix denticulata* were noticed up to 2,500 feet, but not higher. Other species however were to be found right up to the summit of Caher:—*Tapinopa longidens*, *Porrhomma pygmæa*, *Tmeticus prudens*, *T. Huthwaitii*, *T. abnormis*, *T. bicolor* var. *concinus*, and *Walckenaera nudipalpis*. Of the mountain beetles, *Carabus catenulatus* occurred as high as 2,700 feet, while from that level up to the summit of Caher we met with *Leistus*

montanus, *Nebria Gyllenhalii*, and *Patrobis assimilis*. Earth-worms taken at this high elevation have been identified for us by Rev. H. Friend as *Lumbricus rubellus*, and *Allolobophora subrubicunda*.

Caher is a conical peak, commanding magnificent views of Dingle Bay and peninsula, and of the beautiful mountain ranges which stretch away westwards towards Valentia. From Caher to the summit of Carrantuohill it is necessary to follow the grand ridge of the Reeks, whence a sheer precipice drops on the left 1,600 feet, to the tarn known as Lough Eagher, and a steep slope on the right to the Black Valley. By keeping along this slope a few feet below the ridge the walk presents no difficulty on such a day as we were favoured with; though in a mist or a high wind, the journey would be more exciting than pleasant. From Caher the ridge dips several hundred feet, then rises again to another peak with magnificent scarped cliffs to the north, and then dips again before rising to the summit of Carrantuohill (3,414 feet). From Carrantuohill the ridge stretches away eastward to the Gap of Dunloe, but unfortunately we had not time to follow it further. On the ridge a specimen of the rare spider *Leptyphantes pallidus* was found beneath a stone, its only other known Irish habitat is Mitchelstown Cave! On the actual summit of Carrantuohill the only animals observed were the beetle *Nebria Gyllenhalii*, the springtail *Entomobrya multifasciata* (very common under stones), the spider *Pedanos-tethus lividus*, the harvestmen *Mitopus alpinus* and *Nemastoma lugubre*, and the centipede *Lithobius variegatus*. Of these only *Nebria Gyllenhalii* and *Mitopus alpinus* can be considered mountain forms; the others are all common lowland animals. The *Lithobius* was observed in numbers all the way up the mountain; the specimens are smaller and more brightly marked than typical *L. variegatus*, but in structure they agree altogether with that species.

Returning along the ridge to Caher, we descended a steep slope to Lough Eagher, a good-sized tarn, situated at a height of 1,550 feet right beneath the grand precipices of Carrantuohill. The only mollusc which rewarded our search here was *Ancylus fluviatilis*, but of the two water-beetles taken,

Haliphus lineaticollis and *Agabus guttatus*, the latter is new to the south-west of Ireland. We also found the interesting dark variety of the water-bug *Corixa nigrolineata* (*Fabricii*). Next day we returned to the tarn, and secured a freshwater sponge, which on examination proves to be the North American species *Heteromeyenia Ryderi*, Potts, recorded by Hanitsch¹ from Lough Doon, near Dingle. This species will probably therefore be found widely distributed in the south-west. The present specimen is remarkable in possessing a number of perfectly plain spicules in the dermal skeleton, in addition to the typical spiny spicules as figured by Potts and Hanitsch, intermediate forms of spicule with very few spines also occur. According to Potts the spicules in this species are very variable, and he describes two varieties (*Walshii* and *Baleni*) in which the number of spines is greatly reduced. Both kinds of amphidiscs in the gemmules of the sponge from Lough Eagher are altogether typical in form.

The best descent from this tarn to the road (probably also the best ascent to the Reeks, though rather longer than the route we had taken) would be to follow the course of the stream which flows from it, keeping to the left bank. But we were unwise enough to try a short cut to Lough Acoose, and so had to cross some very broken and boggy ground, which delayed progress so much that it was quite dusk before we again stood on the high road. The stream which we should have followed flows under the road about half a mile below Lough Acoose.

Next day, in addition to revisiting the tarn, we did a little collecting at the foot of the mountain, near Glencar. Besides such common insects as *Sympetrum striolatum*, *Philopotamus montanus*, *Agabus bipustulatus*, *Carpocoris baccarum*, *Stygnus pedestris*, *Scolopostethus decoratus* and *Orthotylus ericetorum*, we secured a plant-bug, *Calocoris chenopodii*, new to Ireland, and a beetle, *Haltica pusilla*, of which no certain Irish specimen is known. The spider *Araneus Redii* was observed near the hotel, and some of our fellow-guests having told us of a wonderful long-legged spider in their bedroom, we instituted a hunt on the morning of our departure, and captured several specimens of *Pholcus phalangioides*.

¹ *Irish Nat.*, vol. iv., 1895, p. 128, pl. 4, fig. 6.

The few remarkable varieties of well-known species which we found in our hurried expedition to the MacGillicuddy's Reeks show that much more interesting results could be expected from a more systematic survey. We must confess that we found the work of collecting while hill-climbing in the soft Kerry air decidedly tiring, and much more work might be done if a party of naturalists could arrange to camp out on the shores of Lough Eagher, or at some point half-way up the mountain. The higher and lower slopes could thus be well searched with the least amount of fatigue, while nocturnal insects could be studied. But we feel ourselves happy to have been able to work even so little at the fauna of this lovely district, and the favourable weather we had enjoyed while collecting was brought vividly to our remembrance, as we drove twenty miles through peiting showers of rain to catch the up express from Killarney.

Science and Art Museum, Dublin.

MIGRATORY BUTTERFLIES IN SOUTH-WEST CORK.

BY J. J. WOLFE.

ON June 7th I saw *Pyrameis cardui* for the first time this year, and for a week or ten days after they were very numerous; they appeared to have arrived in thousands simultaneously or nearly so. I saw no *Colias edusa* in June, but my little son told me he saw one. So I watched for their re-appearance. The *P. cardui* immigrants remained with us; after resting they did not move inland, and others continue to arrive, for day after day the same individuals returned to the same spots—for instance one was in our yard for several successive mornings, and when disturbed flew to the same slate on an adjacent roof.

In the first weeks of July larvæ of *P. cardui* were abundant all over the neighbourhood, wherever I went. On Sherkin Island, which I visited on July 6th, they were very plentiful. On the 17th most of the larvæ had left the thistles, and on the 19th I saw the last, three or four full fed.

On July 30th I saw about a dozen *C. edusa*, some worn, others apparently quite fresh, doubtless descendants of June migrants. I captured a fresh male and a worn one, and a fresh female, and confined them on the morning of July 31st by four panes of glass and gauze tied on top, over some short Red Clover in sunshine, putting in a bunch of wild flowers in water. On the following morning there were several eggs on the clover and the worn male was dead, and on the morning of August 3rd the second male was dead, and there were many eggs scattered over upper surfaces of clover leaves—two on a vetch spray put with flowers and at least one on grass near the clover. I then liberated the female.

On the morning of August 7th many young larvæ were out, and all the eggs had hatched on the following morning. Duration in the egg stage is, therefore, but five or six days in fine weather and sunshine. The young larvæ were not, however, nearly as numerous in a day or two as the eggs had been, so I removed all I could find to four glasses, some of which I kept indoors and some out, and fed some on Red Clover and some on Birdsfoot Trefoil (*Lotus corniculatus*). Five, which were fed on the latter indoors, in a north window, grew most rapidly. One of them, always considerably in advance of all the others, pupated on September 9th, after two days' suspension, during which it hung with its back very much arched, thus making the suspending band unusually long. As the wing cases are now remarkably broad the long band appears necessary. One other is now (September 12th) suspended for its change, and five or six seem full grown, while others in the same glasses are not yet more than half the size. This variation in rate of growth (probably increased in nature, where conditions of situation and food might vary much), doubtless accounts for *C. edusa's* long presence with us, as it seems not a long-lived butterfly. All through August I saw a few wherever I went, especially near the sea, but towards its close they were getting scarcer, and I saw the last, I think, of that generation on September 5th. To-day I saw a fresh specimen, the first of the new brood I take it, and as larvæ are doubtless now plentiful I expect an abundance of the beautiful butterflies up to the middle of October, if the weather continues fine, and the nights not frosty.

In its early stages the larva remains quietly on upper surface of clover leaves, and holds on very firmly. After very heavy thunder-showers or high wind they were still on same leaves, and the leaf might be plucked and carried without danger of larva dropping. Its appearance is then very like the young larva of *Pieris rapæ*, but the full-grown caterpillar is, I think, a very pretty one, with a bright lateral stripe, shading in each segment from white through yellow to bright red in the middle, and back through yellow to white. The spiracle comes just in front of the red spot, and underneath each red spot and in connection with it is a black one. The ground colour is a velvety green sprinkled with minute black spots. In its last pretty coat the caterpillar rolls up and drops very readily, concussion of the footstep or the shadow being sometimes apparently sufficient cause.

Larvæ of *P. cardui* being so remarkably abundant in the first half of July, I looked for a swarm of the butterflies at end of the month or early in August. The weather was beautiful, and I saw, I think, three, and even though I am kept most days busy indoors, I was also at my work in June, when I saw them in scores. It seems to me that some strange instinct caused each individual as it emerged to leave. I suppose they went to the north. The very dry weather has not ripened off all our thistles, and we still have food everywhere for the larvæ, now nearly full grown again, but they are very scarce—perhaps one for fifty in July.

Skibbereen.

MATRICARIA DISCOIDEA DC. IN WEST IRELAND.

BY NATHANIEL COLGAN, M.R.I.A.

With a note by R. LLOYD PRAEGER, B.E., M.R.I.A.

WHEN recording the first recognition of this North American alien in a wild state in Ireland some five years ago (*J.N.*, vol. iii., p. 215), the opinion was hazarded that the plant had come to stay with us. Further observations made this year in the Co. Mayo show that this opinion was justified. Driving into Westport from Leenane on the 20th July last, I found the roadsides about half a mile from the town in the direction of Knappa lined with a luxuriant growth of the plant, and on passing through the town it re-appeared in great abundance on the open space between the head of the Mall and the railway station, spreading up to the station, where it occupied the goods platform and adjacent waste places. There was no time available at Westport to examine the town and its outlets; but at Newport, which was reached the same evening, I made a few days' stay for the purpose of exploring some of the higher points of the Mayo mountains, and so had ample opportunity of searching for this interesting but unlovely stranger. Here it seemed to have become even more firmly established than at Westport. It turned up first of all at the railway station and its approaches, next appeared in profusion on waste ground by the river near the new railway bridge, and again in greater profusion along the grass-grown quays, whence it continued at intervals all along the road skirting the O'Donel demesne. On walking out to Borrishoole, some two miles from the town, the plant was observed, abundantly in many places, along the main-road and the bye-road leading to the old abbey. On another grass-grown bye-road branching off northward from the main-road it spread in profusion for a distance of nearly a quarter of a mile, and scattered plants continued to appear along the main road to beyond Deraddha, fully three miles out of Newport. In another direction, along the road leading north-east to Lough Beltra, the plant was traced

for a distance of three miles, thinning out rapidly about a mile beyond the town; and on the eastern or Castlebar road it appeared in several places for a distance of about a mile and a half from Newport. Though appearing frequently in dense patches along the roadsides at considerable distances from dwellings, it usually became more abundant where the road passed a cabin or farm-yard.

The peculiar manner of the plant's occurrence here at Newport seems to point to its diffusion from many independent centres. The seeds are most probably imported with damaged American corn for fowl feeding, so that every hen-wife in the country who uses American corn may become an unconscious agent in the enrichment of our flora. As a matter of fact, American corn is, and long has been, imported to Newport, and the minute seeds of the *Matricaria* could very easily become mixed with and imported along with the grain. A few plants once matured by a roadside, their countless small and light seeds would be carried by wind and surface drainage for considerable distances, and left enveloped in a matrix of road mud under most favourable conditions for germination. Railways, of course, play their part as distributors too. On the journey down to Athlone on the 10th July last I noticed a dense mass of the plant growing on the cattle platforms at Ballinasloe, and on the return from Newport it appeared on the permanent way at Castlebar, at Manulla junction, and at Claremorris. Mr. Praeger tells me that he has observed the plant this year in many other localities in Ireland. At Carrickmines, Co. Dublin, one of its first observed Irish stations, it has maintained itself for five years; at Westport and Newport it has all the appearance of being long established. On the whole, the evidence available up to the present is more than sufficient to justify the admission of this prolific annual as a member of the Irish flora.

Dublin.

N. COLGAN.

As Mr. Colgan has referred to further stations recently discovered for *Matricaria discoidea*, some more definite information concerning them may be useful. I first met with the plant this year on June 10, when it turned up on the roadside near Carrick-on-Shannon railway station, in Roscommon, and the same afternoon I found it again on the railway at Ballaghaderreen, East Mayo. Next day it appeared again, this time in Co. Sligo, growing in profusion on roadsides at Ballysadare, on the southern side of the river, half a mile from the railway. On my way back to Dublin I saw it in profusion about the cattle-platforms at Ballinasloe. On July 2 I found it in immense abundance along the railway at Athlone, especially about the cattle-platforms on the Roscommon side, more sparingly on the Westmeath side, and next day it was seen swarming about the cattle-platforms at Mullingar, extending to the road and canal bank adjoining. It turned up at Tuam on July 15, growing by roadsides on the western outskirts of the town, well removed from the railway, where it was quite absent. On August 25 I found it by a bye-road near a cottage four miles north-east of Galway—a spot remote from any railway or port; and lastly, on August 30, it was noticed forming a close carpet on the fair-green at Clara, King's Co.

That this alien is thoroughly established in Ireland is beyond a doubt. Its present head-quarters are the towns from the centre to the west coast, the original station in Dublin being quite an outlier. Its favourite haunts are cattle-platforms and railway tracks in the vicinity of stations, and in such situations it often occurs in immense profusion, forming a close green carpet and crushing out all other vegetation. So far it has not been reported from Ulster, nor have the vigilant botanists of the South yet given notice of its arrival in Munster. It appears to be still absent from the South-east, as I saw it nowhere during a good many days spent in Waterford, Kilkenny, and Carlow. A census shows that this plant is now known to grow in nine out of the forty Irish county-divisions, six of these belonging to Connaught, and three to Leinster.

R. LLOYD PRAEGER.

Dublin.

POA COMPRESSA, LINN., AS AN IRISH PLANT.

BY J. H. DAVIES.

With a postscript by the Editors of *Cybele Hibernica*.

Poa compressa, hitherto believed to be extremely rare in Ireland, and for which, in District XII., only one locality is on record, I had the pleasure of gathering in July last both in County Down and County Antrim, namely:—

DOWN.—Old wall on the left hand side of the approach to Hillsborough church. (New county record.)

ANTRIM.—Old walls at Lisburn. In several places on the walls by the site on which stood Lisburn Castle, and in great abundance on a wall at the rear of the Convent.

The Lisburn plant is very typical of the species. That at Hillsborough is less so. The nodes of the latter are more numerous, the uppermost knot being much above the middle of the stem, which is less compressed. It may be the form which has been named *P. polynoda*; but the slight dissimilarity is of little importance, and is owing probably to the greater dryness of the situation in which it grows.

In view of its history in Ireland, to meet with the plant here was a surprise to me, and was in a great measure due to my friend Mr. William Foggitt, who gives heed with much interest to the progress of Irish botany, and who in a recent letter expressed an opinion that it had been overlooked, and would be found to be less rare than was supposed. Singularly enough I had the good fortune to find it on the first old wall on which I specially sought it, and again on other walls. It may therefore be anticipated that, if kept in mind, it will be found to occur elsewhere in suitable situations. An inconspicuous, and what some might consider an unattractive grass, growing amongst other grasses, may easily escape recognition. That it has been so in the case of this species I have little doubt.

Of the three districts for which, in the first edition of *Cybele Hibernica*, the plant is recorded, the localities for two are discredited on supposition of mistaken identification, leaving only one station "North of Ireland—Londonderry only." The second edition passes over without notice Moore and More's doubts as to the stations cited for Districts IV. and V.,

but gives a recent addition for District IV. (Moffat) and also one for District X., "Roadside between Portadown and Lurgan" (W. MacMillen). Mr. MacMillen, whom I lately had the pleasure of meeting, informs me that the date of his discovery of the plant at this place was 1866, and that it occurs in several spots on a dry bank by the footpath. No date is given for the Derry station, but Dr. Moore was there about 1836, and it was probably at that time that he detected the grass on the walls of the city. Mr. Stewart has shown me specimens gathered there by himself in 1888, and for aught that is known to the contrary it still exists there, and is probably to be found on other old walls in the vicinity.

When reference was made to the *Cybele* for information as to its distribution in our island, it was disconcerting to discover that *Poa compressa*, which by our veteran northern botanist, Mr. Stewart, and others, was always held to be native, had been degraded, as an intruder, to a place without the Irish flora proper.

Unless Mr. Colgan and Dr. Scully (in whose meritorious book so very few questionable conclusions are to be found), have reasons which do not appear, I think—and hope it will not be held presumptuous in me to say—that in their treatment of this grass they have been rather arbitrary.

The first edition of *Cybele* gives the obelisk mark to signify that the species may possibly have been introduced at a remote period. The second edition goes beyond this and states, "introduced in all of its stations." In what manner introduced? Its habitats are old walls for the most part, sometimes dry banks and old gravel pits. A plant of European and Asiatic distribution, in Britain, where it has always been adjudged as a true native, it was first distinguished by Sherard in 1724 "on the walls about Eltham." It is not a plant of cultivated ground. What, then, is there to arouse suspicion? When specially searched for it has been found and will most likely prove to be more widely distributed than has been supposed. In like manner *Poa nemoralis* was regarded as very rare in the North, and had not been seen by Stewart and Corry. But Rev. C. H. Waddell, Rev. H. W. Lett and others have recently shown that it is not of infrequent occurrence. Mr. Waddell writes:—"It is probably not uncommon. I find

it plentiful at Saintfield" (*I.N.*, p. 142, *supra*). But the standing of *P. nemoralis* as an indigenous Irish plant has not been doubted, although, considering its habitats, it seems to me that it is much more likely to have been introduced by human agency than is *P. compressa*.

One may not at all times be conscious of the bias which is inseparable from "botanical patriotism, an amiable but pernicious weakness." Yet with this consideration in mind, and with some regard for scientific exactness, nothing, so far as appears to me, can be discovered to lend support to the view that *P. compressa* is not indigenous in Ireland. To my mind it is as truly native as is any other Irish *Poa*.

J. H. DAVIES.

Lisburn.

The absence of sufficient evidence that *Poa compressa* existed in considerable quantity in any of its Irish stations when the 2nd ed. of *Cybele* went to press induced us to remove the plant to the appendix. Mr. Stewart informed us that he found it but sparingly in its chief station, the old walls of Derry, in 1888, and we had no means of judging whether it had appeared more than casually in its stations for Districts X. and XII. However, the fresh evidence supplied by Mr. Davies in the foregoing valuable note, in our opinion, warrants the re-admission of the plant to the Irish flora. Whether it is to take rank there as an indigenous species, we should prefer to leave an open question, while admitting that our statement, "introduced in all of its stations," should have been qualified in some way. Mr. Davies has courteously allowed us to read his MS., and to append these few lines of comment.

NATHANIEL COLGAN.

REGINALD W. SCULLY.

NOTES.

The British Association.

A public meeting, convened by the Lord Mayor (Mr. Otto Jaffe J.P.), was held on Sept. 11th, in the Council Chamber at the City Hall, for the purpose of considering the desirability of inviting the British Association to visit Belfast. The Lord Mayor presided. The Lord Mayor said he thought it hardly required words of his to emphasize the pleasure of the citizens of Belfast at the fact of a requisition for that meeting having been served upon him. They would heartily welcome the British Association if they selected that city for their place of meeting in 1901 or 1902. The Earl of Shaftesbury moved the following resolution:—"That we, the citizens of Belfast, assembled in town meeting, duly convened by the Lord Mayor, and held on the 11th September, 1899, hereby invite the members of the British Association to meet in Belfast at an early date, and we desire that this invitation be conveyed to the British Association at its forthcoming meeting in Dover by the following deputation:—The Lord Mayor, Professor Fitzgerald, Godfrey W. Ferguson, William Gray, M.R.I.A.; Professor Morton, Professor Symington, Alex. Tate, C.E.; J. Smyth, C.E.; Professor Thompson, and Thomas Workman, J.P.; with power to add to their number." Mr. Samuel Young, M.P. seconded the resolution, which was supported by Mr. Wm. Johnston, M.P., and the Right Honourable Thomas Sinclair, and the resolution was then put to the meeting, and carried unanimously. Rev. Dr. Hamilton moved:—"That the following local executive committee be appointed to carry out the resolution of this meeting—The Lord Mayor, the President of Queen's College, the President of the Chamber of Commerce, the President of the Trades Council, the Presidents and Secretaries of the Natural History and Philosophical Society, the Belfast Naturalists' Field Club and the Ulster Medical Society, with Sir William Q. Ewart, Bart.; Sir James Musgrave, Bart.; Sir James Henderson, Right Honourable W. J. Pirrie, Right Honourable Thomas Sinclair, Professor Fitzgerald, Professor Symington, Professor Thompson, and Messrs. John Brown, Samuel Davidson, John Horner, William Swanston, F.G.S.; John Vinycomb, M.R.I.A.; and Alexander G. Wilson, with power to add to their number, Professor Fitzgerald being convener." Sir William Q. Ewart, Bart., seconded and Sir James Henderson supported the resolution. Mr. Alex. Tate said, as a member of the British Association for forty years, he would like to express his sympathy with the movement. The resolution was unanimously carried. Lord Shaftesbury having taken the second chair, Mr. Thomas Workman moved, and Dr. J. A. Lindsay seconded a vote of thanks to the Lord Mayor for presiding. The meeting then terminated.

We understand that at the Dover meeting, just concluded, the Belfast deputation presented a cordial invitation to the Association for 1902, while Professor Hartog spoke strongly on behalf of Cork. The claims of the rival Irish cities will be decided at Bradford next year. At any rate we rejoice to think that the Parliament of Science is soon again to meet on this side of St. George's Channel.

 BOTANY.

Cystopteris fragilis In Wicklow.

Last month I was in Co. Wicklow, and got *Cystopteris fragilis* growing abundantly on the walls of an old mining building high up on the side of Lugduff beyond the Waterfall, above the upper lake of Glendalough. As this fern is decidedly rare in Wicklow the record may be worth noting.

CHARLES F. D'ARCY.

Ballymena.

Chicory In Co. Mayo.

Cichorium Intybus grows at Cloghans, Co. Mayo, in great profusion, producing a very brilliant effect. It was unknown in the locality until late years.

ALICE C. LEWIN.

Castlegrove, Tuam.

 ZOOLOGY.

 INSECTS.

Collas edusa In Co. Cork.

There seems a good sprinkling of these butterflies all round here. I saw one close by the city, several along the line to Queenstown, and on August 21st took five specimens, two males and three females, at Little Island, in a clover field, while several others escaped me. *Macroglossa stellatarum* is also plentiful, while larger numbers than usual of *Orgyia antiqua* are flying about. Is there anything in the theory of these butterflies recurring every fourteen years, as stated in some books?

JOHN L. COPEMAN.

Cork.

Collas edusa In Co. Westmeath.

I see in the last number of *Irish Naturalist* some notices of *Colias edusa* having been seen in Ireland. I saw a yellow butterfly bordered with black in the garden here, but did not capture it; another of same description was seen on the shores of Derevaragh Lake about middle of August. I presume they were *C. edusa*.

H. E. REYNELL.

Killynion, Co. Westmeath.

Collas edusa In Co. Waterford and Co. Cork.

On August 10th I captured a fine male specimen of the Clouded Yellow, and saw another near Kilbarry. A few days later, on the 14th, I took two more male specimens of it on the sandhills near Tramore, and missed a third. Both these localities are in the Co. Waterford. I subsequently spent a few days at Passage West, Co. Cork, and met with *Colias edusa*

commonly in the environs of the town. It was especially partial to fields in which the oats had just been cut—not clover fields—and nearly all my captures were effected in such places. On August 22nd, a very fine sunny day, I saw nine or ten specimens of this beautiful butterfly, and succeeded in taking four (males) in fine condition. I may remark that during the railway journey from Waterford to Passage West I observed single specimens of the Clouded Yellow in widely different localities, viz., Kilmeadan, Carrol's Cross, and Darrow, Co. Waterford; Blarney, and near Passage West, Co. Cork, which facts point to the wide distribution of this butterfly in the South of Ireland during the present season.

L. H. BONAPARTE-WYSE.

Newcastle, Co. Down.

Probable occurrence of *Collas edusa* In Co. Wexford.

I have little doubt that this county may be added to the list of those in which the occurrence of this butterfly has been recorded for the present year by correspondents in the September number of the *Irish Naturalist*. I have on two occasions recently seen butterflies which were almost certainly of this species, but, as I did not actually catch them, I cannot well record the species positively. It has occurred in previous years in this locality.

G. E. H. BARRETT-HAMILTON.

Kilmanock, Arthurstown.

***Collas edusa* In Co. Wexford.**

On the 6th June I saw one of these butterflies for the first time near the sea-shore, opposite to the Tuskar Lighthouse, flying at an immense pace, but alighting at times on a small patch of short grass. Though carefully looked for it was not seen again in this locality until the 23rd July. It appeared within the limits of this place on the 30th and 31st July, and a very good specimen of the male was captured by my eldest daughter on the 9th August. Since then, and up to the present time, it has been very frequently seen, both here and on the roads to the distance of five or six miles inland, but, so far as my experience goes, not more than one specimen was visible at a time. Residents in this neighbourhood do not recollect having seen the Clouded Yellow prior to this year. My daughter has secured several good specimens, both male and female.

EDMUND T. BEWLEY,

Ballytrent, Co. Wexford.

B I R D S.

White Wagtails In Co. Cork.

Mr. W. T. Crawstay writes in the *Zoologist* for September that he observed a specimen of *Motacilla alba* on the River Lee on April 20th. The wind on April 15th, 16th, and 17th was N. and N.E.; on 18th, 19th, and 20th S. and S.W.

Rose-coloured Pastor in Donegal.

A beautiful specimen of the Rose-coloured Pastor (*Pastor roseus*) was shot by Mr. A. Brooke, of Killybegs, in his garden on the 20th July. The bird is an adult male in perfect plumage. This is the first specimen I have met in an experience of twenty-five years.

E. WILLIAMS.

Dublin.

Occurrence of the Golden Oriole and Night Heron in Co. Wexford,

On the authority of my friend, Mr. F. A. Gibbon, I have to record the occurrence of a female Golden Oriole (*Oriolus galbula*, L.) in Wexford, early in May or late in April of this year. Mr. Gibbon saw the bird in the shop of Messrs. Wheelocks, gunsmiths, at Wexford, on May 4th, and ascertained that it had been picked up still warm and recently dead, and with the head much injured, under a tree near Kilmore, by a working man. While still at Wheelock's the skin of this specimen was unfortunately destroyed by a cat. The Golden Oriole is a very rare spring or early summer visitor to the County Wexford, and, as far as I am aware, the present is the fifth known occurrence of the bird in this county.

A much rarer bird, and I think, new to the county fauna, is a fine male Night Heron (*Nycticorax griseus*, L.), now in the Museum of Science and Art at Dublin, and which was obtained in a little stream near the old castle close to Killinick, by a man who, in ignorance of its value, was about to throw it away. Fortunately, however, the bird was recognised by a neighbour and purchased for half-a-crown. It is said that a second bird frequented the same stream at about the same time, but eventually took its departure uninjured. I am indebted for this information to my friends, Dr. Scharff (of the Museum), Messrs. C. B. Moffat and E. A. Gibbon. So far as I know, there are not fifteen recorded instances of the occurrence of the Night Heron in Ireland, and some of these took place many years ago: the bird has occurred both in spring and autumn.

G. E. H. BARRETT-HAMILTON.

Kilmanock.

The Black Grouse—A Correction.

I wish to point out an error which has escaped my notice in my paper on "The Introduction of the Black Grouse and of some other Birds into Ireland," which was printed in the *Irish Naturalist* for February, 1899, pp 37-43. At page 38 it is stated that Mr. Lyddeker discovered in the Dublin Museum of Science and Art "two bones" which he identified as those of a Black Grouse. The number should, however, be *one*, and not two, and I am indebted to my friend, Mr. R. J. Ussher, for calling my attention to the mistake.

G. E. H. BARRETT-HAMILTON.

Kilmanock.

CALLS OF OWLS.

Referring to C. B. M.'s mention of the above on page 184 of the current volume, I have syllabised the shriek of the Barn Owl at different times as "schkree—r" and "ske—r—arke." The snore of the young I render as "skee—rep" or "see—rep" pronounced as if with an indrawn breath. The resemblance to a snore increases as the nestlings grow older.

I have a note giving the call of the young Tawny Owl as a kitten-like "mew."

I should be glad of opinions as to the correctness of my rendering of the Barn Owl's calls, and also as to whether the mewing is a call used by the young of both the Tawny and Long-eared Owl.

I should be glad of any observations which would act as "aids to identification without slaughter," with the view of incorporation in the next edition of my Dictionary of Bird Notes.

CHAS. LOUIS HETT.

Springfield, Brigg.

WOOD SANDPIPER IN CO. WATERFORD.

A Wood Sandpiper (*Totanus glareola*) was obtained on the 26th of August, by Mr. J. F. Knox, on the Back Strand, Tramore, Co. Waterford. This is the fifth recorded occurrence of this species in Ireland, three having been obtained in Calary Bog, Co. Wicklow, and one near Lough Cullin, Co. Mayo, Sept. 5, 1898.

E. WILLIAMS.

Dublin.

WOOD PIGEON COOING BY MOONLIGHT.

A Wood Pigeon seemed to have mistaken the bright moonlight of the night of February 26th for daylight, as I heard him cooing in the trees near the house here at 10.45 p.m. Again on the night of April 23rd one was cooing very distinctly at 11.20 p.m. Lastly on August 25th the moonlight seemed to have an exciting effect on a bird of this species, for he began to coo loudly at 11 p.m., but only continued to do so, as far as I am aware, for a few minutes. I am a good deal away from home, so that it is possible that the habit of cooing at night is more universal among Wood Pigeons than I imagine it to be. My experience is not an isolated one for this county, as Mr. C. B. Moffat, to whom I mentioned the subject, wrote me that at Ballyhyland, near Enniscorthy, "the Wood Pigeons cooing at night have been one of the sensations here this spring. When I came down here on March 25th I was told that they were to be heard at all hours, and the statement was fully confirmed to me the same night, when I heard them in full voice at twenty minutes after midnight. I have heard them at it frequently since." (Lit. of 16th May, 1899). I may add that the thunder and heavy rain which we experienced here from about 5 to 9 a.m. on August 18th, 1898, in no way interrupted the cooing of Wood Pigeons, whose voices could be very distinctly heard between the claps.

G. E. H. BARRETT-HAMILTON.

Kilmanock, Arthurstown, Co. Wexford.

Montagu's Harrier In Co. Wexford.

On the 14th of August two specimens of Montagu's Harrier (*Circus Montagui*) were trapped on the property of Sir Thomas Gratton-Esmonde, M.P., Ballinastragh, Gorey, Co. Wexford. The birds were male and female birds of the year evidently the one brood, and their occurrence so early in the season as August raises the very interesting question as to the possibility of their being bred in Ireland. A curious circumstance in connection with the appearance of this bird is that all the specimens, I think seven in number, taken in Ireland have been captured between Wexford and Dublin.

Dublin.

E. WILLIAMS.

GEOLOGY.

The Granites of Tyrone and Derry.

In a recent paper (*Q. J. Geol. Soc.*, vol. lv., 1899, pp. 273-6,) Professor G. A. J. Cole discusses the age of the granite of eastern Tyrone with reference to the similar rock at the base of Slieve Gallion (*Trans. R. D. S.*, vol. vi., 1897, p. 243). The Surveyors regarded this granite as intrusive in the Old Red Sandstone, but as pre-Carboniferous. But the examination of a new section has convinced Professor Cole that the sandstone is derived in large part from the granite, fragments of the latter being scattered through the former rock. The granite must therefore be pre-Devonian, but is possibly post-Silurian, like so many masses throughout Ireland.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a Cockatoo from Sir Thornley Stoker, a pair of Swans from Lord Castlestewart, a Hare from Mr. R. E. Nulty, Seals from Mr. T. D. Pile and Mr. Petrie, a Goose from Mr. W. E. Peebles, a Canary from Mr. F. W. Powell, a Black-headed Gull from Dr. C. J. Patten, a Flying Phalanger from Miss Reynardson, five Ichneumons from Mr. W. H. Godwin, a Heron Mr. W. W. Despard, a pair of Swans from Mr. Justice Madden, a King Parrot from Sir T. Brady, a Chameleon from Mrs. Wilson, and three Gulls and a Jackdaw from Sergeant M'Goldrick. A Gibbon, a pair of Chacma Baboons, a Polecat, an Otter, a Leopard, an Indian Antelope, a pair of Axis Deer, a pair of Emus, and Cockatoo have been bought.



THE SOCIABLE PLOVER,
Vanellus gregarius (Pall.)
Co. Meath.

[Photo. by Chancellor, Dublin.

THE OCCURRENCE OF THE SOCIABLE PLOVER IN IRELAND.

BY EDWARD WILLIAMS.

[Plate 10.]

ON the 3rd of August, in the present year, I received a bird from Robinstown, near Navan, Co. Meath, which puzzled me very much. At first I thought it was a variety of the common Green Plover, but on closer examination I found the legs were much longer.

Upon looking over the collection of skins of the *Charadriidæ* in the Dublin Museum, I was able to identify the bird as the Gregarious Plover (*Charadrius gregarius*, Pall.), or as Mr. Howard Saunders calls it, in the last edition of his "Manual of British Birds," the Sociable Plover (*Vanellus gregarius*).

As will be seen further on, in the extract from that valuable work, its claims to rank as a British bird were, to say the least, resting on a very slender basis, but the occurrence in Ireland of a second example firmly establishes its right to a place in the British list, and adds a new bird to our Irish fauna.

Upon communicating with the owner as to its capture, he informed me that on the 1st August one of his men whilst grubbing turnips noticed this fancy bird, as he called it, running about the field, and went in for his master, who came out and shot the specimen.

As far as I can make out by comparison, the bird is a female, and I think in the second year's plumage. The following is a full description :—

Top of head very dark brown dappled with light buff; a broad light-coloured band extends right over the eye from the bill to the back of the head. Back ash-grey with a number of new feathers of a dark brown tint, with a rufous edge coming out all over, which I take to be the winter plumage. Lower part of breast blackish, with a band of chestnut not very clearly defined extending right across behind the legs. Vent and lower tail coverts white; upper tail coverts snow white. Tail consisting of twelve feathers, two outer ones white, the rest

white with a band of black near the end, widest in the middle ones and narrowing as it approaches the sides of the tail. Primaries black, secondaries pure white, tertiaries and wing coverts ash grey with dark feathers coming out same as back.

I am indebted to my friend, Dr. C. J. Patten, for the following very accurate measurements of the Sociable Plover compared with our Lapwing :—

<i>Sociable Plover.</i>	<i>Lapwing.</i>
Leg { Tibio-tarsus, 6·5 cm. Tarso-metatarsus, 6·9 cm. Hallux = 6 mm.	Leg { Tibio-tarsus, 4·5 cm. Tarso-metatarsus, 4·5 cm. Hallux = 8 mm.
Length of bill = 2·9 cm.	Length of bill = 2 cm.

The following notes are extracted from Mr. Howard Saunders' "Manual" (pp. 537-8.)

"In the autumn of the year 1860, or thereabouts, an immature example of this south-eastern species was shot from among a flock of Lapwings near St. Michael-on-Wye, in Lancashire, and having been placed in a case with many other stuffed birds which impeded the view, it was first erroneously recorded as a Cream-coloured Courser.

"It afterwards came into the possession of Mr. W. H. Doeg, when it was correctly identified, and was exhibited by the late Mr. Sebohm at a meeting of the Zoological Society of London on Nov. 21st, 1888. It has not yet been observed in Heligoland or the northern part of western Europe, but as long ago as March, 1838, an adult was shot near Rome, where a young female was obtained in Nov., 1872, while a third example was killed near Sienna. On the Riviera an adult male was taken near Nice in April, 1883.

"The Sociable Plover inhabits the steppes of the Crimea, and of the district between the Don and the Volga, and the Caucasus, as well as the Aralo-Caspian area and Turkestan. In September it crosses the Pamirs to the dry uplands of Sindh and the sandy plains of India, and wanders southward to Ceylon in the cold season, when it also visits Arabia, Egypt, Nubia, and Abyssinia. The food consists of spiders, grass-hoppers, beetles, and their larvæ.

"Von Hugel, who had opportunities of observing this bird in Kordofan and Senaar, says that it frequented sandy localities and ground that had been burnt; it was as a rule quite silent, but every now and then he heard it utter a short whistle."

Dame-street, Dublin.

MARINE SHELLS FROM SOUTH-WEST DONEGAL.

BY EMILY M. TATLOW.

[Collected for the R. I. A. Flora and Fauna Committee.]

DURING my nine weeks' visit to South-west Donegal last summer no day passed on which I did not spend a few hours on the shore of some one of the bays so numerous there.

My headquarters were at Narin, about eight miles from Glenties, and a more charming place for a restful holiday it would be hard to imagine. There is a fine stretch of strand, known as Narin Beach, and here the majority of the bivalves were found; they were by no means numerous, and it was only by constant search—generally twice a day—that I discovered a considerable number of species.

At the Black Rocks, where Narin strand ends, there were always streaks of finer stuff at high tide; Rissoas and Lacunas were to be found, but the shells were interesting chiefly on account of their lovely colours, specially *Nassa incrassata*, which was in every shade of purple, pink, and crimson.

My friends at Narin, interested in my occupation, kindly gave me all the shells they found, so the collection may be said to be a fairly representative one of the neighbourhood, though, no doubt, dredging would have produced much more varied results.

It was, however, on the island of Iniskeen, accessible from the mainland at low water, and in the smaller island of Inisbarnog that some fascinating stuff was abundant, rich in the smaller univalves. In variety it did not equal Roundstone, but considering the poverty of the main beach and of the many bays around in the smaller shells, it was remarkable to find so close at hand, concentrated on a tiny strip of shore, this material, which almost entirely consisted of small mollusca, in which *Pleurotoma lævigata* and Lacunas were abundant, and *Pleurotoma striolata*, *P. septangularis*, and *Marginella lævis*, were found. The character of the shells in the islet of Inisbarnog was quite different. Here the colouring of the common Limpet, with its wonderful streaking of black and white, red and orange, was so exquisite as to give the beach the effect of being painted by the brush of some inspired artist, while *Littorina obtusata* was abnormally large and

brilliant of hue. Here it was that *Arca tetragona* was found; I did not see it elsewhere in the district. The specimens were all small. At Ardara, though the shore is extensive, there was nothing of interest in the way of shells; *Donax vittatus* and *Maetra solida* had it all their own way. At Clooney Bay *Cardium edule* was of enormous size; *Hydrobia ulvæ*, unknown at Narin, was in quantities.

Hoping to make discoveries if I went further from home, I bicycled to Killybegs, where I spent a week. There I found *Mya truncata* and *M. arcuaria* (not seen elsewhere), but only a few single valves of each; *Tapes decussatus* was abundant. *Scrobicularia piperata* was abundant and fine at Fintra Bay, and *Tellina balthica* was specially fine in colour and size.

As August approached the debris from the sea increased in interest; the shore was often strewn with *Vcllella*, its exquisite colour and graceful shape, at the time unfamiliar to me, suggested its being a foreigner, and gave hope of finding other rarities. Two waifs from the West Indies next put in an appearance, the large brown bean of *Entada scandens*, and the round grey nut of *Cæsalpinia Bonducella*.

The day before leaving Narin some friends picked up about a dozen specimens of the beautiful oceanic shell *Ianthina rotundata*, known as the "Blue Snail." They were quite fresh, the animal being alive; attached to many of the shells were young barnacles which must have somewhat interfered with the comfort of the "Blind Sailor."

My best thanks are due to Dr. G. W. Chaster, who kindly named many of the small shells, and to Professor Johnson for identifying the West Indian seeds.

ANNOTATED LIST OF SPECIES.

Anomla ephippium, Linn.—Young only.

var. **aculeata**. Iniskeen.

patelliformis, Linn.—Abundant, Inisbarnog.

Ostrea edulis, Linn.—Rare.

Pecten pusio, Linn.

varius, Linn.

opercularis, Linn.)

} Rare and small, but very brilliantly coloured.

maximus, Linn.—One specimen only.

Mytilus edulis, Linn.—Small at Narin, very large at Killybegs.

Modiolaria marmorata, Forbes.—Rare.

Arca tetragona, Poli.—Inisbarnog only.

- Lasæa rubra**, Mont.—Iniskeel and Inisbarnog.
Kellia suborbicularis, Mont.—Iniskeen only.
Lucina borealis, Linn.—Very large at Narin, $1\frac{1}{2}$ inch in diameter.
Cardium exiguum, Gmelin.—Very rare.
 edule, Linn.—Abnormally large at Clooney Bay.
 norvegicum, Speng.—Very rare.
Venus linctæ, Pult.—Frequent.
 exoleta, Linn.—Very rare and old.
 fasciata, Da C.—Beautifully coloured.
 verrucosa, Linn.—One valve.
 ovata, Penn.—Rare.
 gallina, Linn.—Common.
Tapes pullastra, Mont.—Very common.
 var. **perforans**.—Rare.
 decussatus, Linn.—Common at Killybegs.
Tellina balthica, Linn.—Fine at Fintra Bay.
 tenuis, Da C.—Common.
 fabula, Gron.—Rare.
 squalida, Pult.—A single valve and a complete specimen.
 donacina, Linn.—One specimen.
 pusilla, Phil.—Inisbarnog, rare.
Psammobia tellinella, Lam.—One specimen at Inisbarnog.
Donax vittatus, Da C.—Abundant on every shore.
Mactra solida, Linn.—Common.
 subtruncata, Da C.—Small.
 stultorum, Linn.—Frequent.
Lutraria elliptica, Lam.—A few.
Scrobicularia piperata, Bell.—Abundant living at Killybegs.
Solen siliqua, Linn.—Rare and broken.
Thracia papyracea, Poli.—Frequent.
Saxicava rugosa, Linn.—Rare.
Patella vulgata, Linn.—Abundant and beautifully coloured.
Helcion pellucidum, Linn.—Common.
 var. **lævis**.—Very large.
Tectura virginea, Müll.—Iniskeen. Common.
Emarginula fissura, Linn.—Not uncommon.
Fissurella græca, Linn.—Frequent.
Trochus magus, Linn.—Very few.
 clinerareus, Linn.—Common.
 umbilicatus, Mont.—Common.
 lineatus, Da C.—Abundant living and fine.
 zizyphinus, Linn.—Living commonly at low-water mark.
Phasianella pulla, Linn.—Islands, common.
Lacuna crassior, Mont.—Abundant at Iniskeen.
 divaricata, Fab.—Abundant
 var. **quadrifasciata**.—Iniskeen.
 puteolus, Turton.—Inisbarnog, Narin, Iniskeen.
 pallidula, Da C.—Common.

- Littorina obtusata*, Linn. }
rudis, Maton. } Common and brilliantly coloured.
- Littorea*, Linn. }
neritoides, Linn. } Common.
- Rissoa punctura*, Mont.—Iniskeen. }
costata, Adams. } Rare.
- parva*, Da C. }
var. *interrupta*. } Common.
- striata*, Adams. }
membranacea, Adams. } Frequent.
- cingillus*, Mont. }
violacea, Desm.—Rare.
- Hydrobia ulvæ*, Penn.—Clooney Bay. Common.
- Turritella terebra*, Linn.—Very rare.
- Odostomia lactea*, Linn.—Iniskeen and Narin.
- Scalaria clathratula*, Adams.—Iniskeen. Frequent.
- communis*, Lam.—Iniskeen.
- Ianthina rotundata*, Leach.—Narin.
- Natica Alderi*, Forbes.—Common.
- Aporrhais pes-pelecani*, Linn.—Scarce.
- Cerithium reticulatum*, Da C.—Very large at Iniskeen; $\frac{3}{8}$ -inch long.
var. *lactea*.—Narin.
- perversum*, Linn.—Frequent.
- Cerithiopsis tubercularis*, Mont.—Iniskeen. Rare.
- Purpura lapillus*, Linn.—Common.
- Buccinum undatum*, Linn.—Very rare.
- Nassa incrassata*, Ström.—Perhaps the most abundant of all the univalves.
- reticulata*, Linn.—Worn specimens.
- Defrancia linearis*, Mont.—Narin, Inisbarnog, Iniskeen.
- purpurea*, Mont.—Iniskeen.
- Pleurotoma lævigata*, Phil.—Very abundant.
- costata*, Don.—Not common.
- septangularis*, Mont.—Rare.
- striolata*, Phil.—Iniskeen.
- Marginella lævis*, Don.—One on Inisbarnog.
- Cypræa europæa*, Mont.—Common and large.
- Cylichna cylindracea*, Penn.—Several.
- Utriculus truncatulus*, Brug.—Narin. Rare.
- obtusus*, Mont.—Iniskeen. Rare.
- Actæon tornatilis*, Linn.—Iniskeen. Rare.

ADDITIONAL SPECIES FROM KILLYBEGS.

- Tapes aureus*, Gmel.—Frequent.
- Mya truncata*, Linn. } Rare.
arenaria, Linn. }

Dundrum, Co. Dublin.

THE HISTORY OF THE EUROPEAN FAUNA.

The History of the European Fauna. By R. F. SCHARFF, B.Sc., Ph.D., F.Z.S., &c. The Contemporary Science Series, edited by Havelock Ellis. London: Walter Scott, Limited, 1899 (pp. viii. + 364). Price 6s.

The latest volume of "The Contemporary Science Series" is the outcome of Dr. R. F. Scharff's paper "On the Origin of the European Fauna," which was published in the *Proceedings of the Royal Irish Academy*, 3rd ser., vol. iv., 1897. The paper should be well known to Irish naturalists: it was noticed in the *Irish Naturalist* of September, 1897, summarised in *Nature*, vol. lvi., 1897, and more fully abstracted and, to a certain extent, criticised in the *Geological Magazine*, n.s., vol. iv., 1897. As published in book-form the paper has, so the author tells us, been amplified and improved upon. It has also, of necessity, been altered in some respects so as to meet the needs of general readers, and in addition to the maps, a number of woodcuts have been introduced.

However one may feel inclined to differ from Dr. Scharff's deductions, and it is all but impossible that when a writer deals, as he does, with not only vertebrates and invertebrates, but even with plants, he should not fall foul of some of the specialists on whose particular ground he is treading, one cannot help admiring the broadminded way in which Dr. Scharff has completed his work, the enthusiasm which is manifested in all parts of it, and the industry with which he has sought out and pressed into his service facts taken from the works of zoologists, botanists, and geologists. It is, indeed, refreshing to read a book on the geographical distribution of animals where regions and sub-regions are no longer treated (as were formerly species) as things immutable and almost immortal, whereas, in fact, both the one and the other are terms invented for the convenience of zoologists, to be discarded or replaced by something better the moment they have served the purpose for which they were called into being. Bearing this in mind it can hardly, we think, be doubted that Dr. Scharff will realize his hope that the publication of his book may give a fresh impulse to the study of the geographical distribution of species.

Having thus shown our high appreciation of his work, we shall not, we hope, be misunderstood when expressing opinions, as we may have to do in several instances, which are not in accord with Dr. Scharff's. And first we would express regret that he should have considered it necessary to ignore "the latest views in revised nomenclature." It is true that to many of his readers *Lepus variabilis* is still the Mountain and *L. timidus* the Brown Hare, but it is surely the part of a popular instructor, which rôle Dr. Scharff has here taken upon himself, to assist the labours of recognised leaders in the special branches of zoology by adopting the nomenclature suggested to them by their matured thought, even if in doing so he should find it necessary to give a few words of explanation in each case.

The arrangement of the book itself is, we think, not an improvement on that of Dr. Scharff's paper as read to the Royal Irish Academy. He leads off with an introduction; this is followed by preliminary considerations, the two sections occupying 88 pages. Then follow six chapters dealing respectively with the British fauna, the Arctic fauna, the Siberian migration, the Oriental migration, the Lusitanian fauna and the Alpine fauna; but as each of these subjects has to a certain extent been discussed in the first three sections, the result is much repetition and frequent unnecessary quotation of the same matter. Thus Professor Boyd Dawkins' views on the mixture of remains of northern and southern animals are quoted or paraphrased no less than three times (pages 54, 73, and 209), while Prof. Bonney on the origin of the Boulder clay comes in for a very similar attention. The status of the usually alpine Mountain Aven, *Dryas octopetala*, as a plant of the sea-level in Co. Galway is described on page 76 and repeated on page 240, while the facts concerning the somewhat similar diversity of habitat of the "Edelweiss" (*Leontopodium alpinum*) are given us twice on pages 266 and 342, and so on. Lastly the Bibliography does not contain all the papers or works alluded to in the text, e.g., the papers by the present writer and Mr. Bonhote on Arctic Foxes (see footnote to page 149), that by the present writer on Dr. Gadov's find of remains of the Norway Lemming, (*Lemmus lemmus*) in Portugal (page 139), as well as a paper by Dr. John Hamilton alluded to on page 161. Worse still, a study of the Index, although it extends to a length of over nine pages, reveals some serious omissions, such as for instance, to cite a few out of many, the important allusions to the Reindeer, Hippopotamus and Hyæna in the above often-quoted statements of Professor Boyd Dawkins, and to the Beaver and Dormouse on page 63, while we fail to find the word "Woodlouse" included, in spite of the important genera, such as *Platyarthrus*, to which allusion is made in the book.

Dr. Scharff's views on the European fauna are (or ought to be) familiar to Irish readers from a perusal of his previous papers. Looking for a small area as a key to the larger one which he had under study, he selected the British Isles for that purpose, so that his main contentions allude to these islands in particular. These are briefly as follows:—recognizing the mixed nature of our fauna and flora, and believing that 95 per cent. of it reached our islands by the ordinary means of dispersal, he attempts to follow each component group to its original home, and to give us the road by which each dispersal was effected. The southern or Lusitanian element of our fauna, he thinks, must be of very great age, and part of it may have had its origin in a lost "Atlantis," or at all events from various local European centres. An Oriental section reached us from the countries south of the Caucasus and Altai mainly by way of the Mediterranean in times when the distribution of land and sea in that region was widely different from what it is now. A Siberian element (which, however, did not reach Ireland) had a more northern course, while two other sections, an Arctic and an American, reached us from the north by means of a great land-bridge, extending, perhaps,

through Scotland, Scandinavia, and Greenland. Africa, on the other hand, has never played a rôle of importance as the source of any of our fauna and flora. Dr. Scharff is never afraid to make use of now submerged continents as the stepping stones by means of which our animals and plants reached their present habitat, with the result that in his hands our present fauna and flora necessarily date back to an extremely ancient and in fact Pre-glacial age.

This Pre-glacial antiquity naturally leads to difficulties. How, for instance, if there was a Glacial age, did anything living survive it? The way out of the difficulty lies in the belittlement of the severity of the Glacial climate. It was not, argues Dr. Scharff, a period of extermination, but one of comparative mildness. Glaciers there were and the snow-line was lower than at the present date, but this was compatible with a far milder, moister climate than is generally attributed to it, so that life, during the summer at all events, may even have been luxuriant. This state of things Dr. Scharff attributes largely to the presence of an immense inland sea which stretched from the present Caspian to the White Sea, and which naturally had a powerful effect on the then climate of Europe and Western Siberia. To the presence of such a sea, and not to the action of land-ice, Dr. Scharff attributes the formation of much of the European Boulder-clay; and he seems inclined to believe with Mr. Mallet that many of the ice-striated and polished rock-surfaces, which have been regarded as quite indisputable evidence of glacier action, may be due to the slipping downwards of heavy masses of mud or gravel from the side of land in the course of emergence from the sea, a supposition which would seem to draw some support from the modern tendency to trace the origins of seismic movements to extensive landslips on continental slopes.

To support his arguments Dr. Scharff quotes freely from the works of authors, zoological, botanical, and geological, and it is with these facts and the conclusions drawn from them that the book is largely filled. With the applications of many of the facts quoted we cannot always agree. We cannot even always follow the arguments based upon them, especially as a study of the peculiar geological problems involved would occupy much time and could only be fully appreciated by a geologist. One thing is certain: Dr. Scharff has produced a book full of suggestions, a book which must make the reader think at almost every page of it, a book which even the opponents of his theories will find useful to keep handy, if only as a work of reference.

It is the duty of a reviewer to criticise as well as to praise. In our remarks we shall try to mix adverse and favourable comments in fair proportion, but in the case of a work of this kind, where the subject is of such great interest, it is obviously impossible to notice everything that one would wish; to do so, in fact, would be to write a second volume as big as, or bigger than Dr. Scharff's. And firstly, whatever may be thought of the minor details of Dr. Scharff's theories, we think he has made it abundantly clear that the exterminating severity of the Glacial period may well have been over-estimated. The experiences of travellers, such as Peary in northernmost Greenland and Nordenskiöld at the northernmost cape of Asia (Cape Chelyuskin), show us clearly

that a comparatively rich fauna and flora can and do survive in some of the coldest known regions of the globe. How much more may this have been the case in the far more southern Glacial regions of past times. But we think Dr. Scharff goes a step too far when he asks us to regard our mammals as survivors from a Pre-glacial age, and he certainly makes a grave mistake in expecting us to believe that the two forms of Stoat (*Putorius ermineus* and *P. hibernicus*), of Bullfinch (*Pyrrhula major* and *P. europæa*), or of Hare (*Lepus europæus* and *L. mediterraneus*) represent, in each case, a double influx to Europe of its respective species. Rather can we only regard these forms in the light of modern changes to suit peculiar climatic conditions. Mammals are so plastic, that were our mammalian fauna of anything like the age Dr. Scharff would like to make it, it would surely be the case that not only the few species which we know to have become more or less altered, but all our species would be distinct from those of Continental Europe, and might even have progressed far enough along the course of differentiation to have become distinct genera. We believe then that Dr. Scharff's views on this point, while they may apply to invertebrates like *Geomalacus maculosus*, to plants like *Arbutus Unedo* and *Euphorbia hiberna*, and even to the Natterjack Toad (*Bufo calamita*) cannot be applied to our mammals. As regards birds the case might be different, for they could always escape by migration from seasonal severity of temperature. Dr. Scharff does not pin himself down to the belief that our fauna survived in any supposed large extension of Western Europe. Such extensions there may have been in comparatively recent times, but a study of Mr. W. H. Huddleston's paper on "The Eastern Margin of the North Atlantic Basin" (*Geol. Mag.*, March and April, 1899, pp. 97-105 and 145-157) seems convincing that if there were such, they are not likely to have been of very great area, and it is questionable if they could have been of sufficient extent to support our whole fauna and flora. Is it possible that one place of refuge for the endangered species of Glacial times could have been the great tract of low-lying land which is presumed to have occupied the present basin of the Irish Sea?

In his eagerness to prove his case, Dr. Scharff seems to push his arguments as to the mildness of the Glacial period too far. It was right to reduce the over-estimates of other writers, but surely we must assume a rather severe climate in Glacial times to explain the dispersion of such forms of life as issued from the Arctic centre of origin which Dr. Scharff himself advocates, and to explain the forcing over the equator into Antarctic regions of such northern types as the *Camelidae* and the Skuas, and the migrations right over the equator of birds like the Gray Plover (*Squatarola helvetica*) which winter in the southern and summer in the northern hemispheres. (By-the-bye, why does Dr. Scharff assume (p. 255), that the Wagtails are of southern rather than northern origin, because, although most of them "have a somewhat northern range," "almost all of them pass the winter in southern latitudes?" Surely the converse is the obvious inference). Further we were of the opinion that a gradual amelioration of our climate had been well-nigh proved, even for early historical times (see Boyd Dawkins' "Pleistocene Mammalia"), and that the periods represented in Europe,

including Ireland, by the replacement of the Scotch Fir by the Oak really represent some of the stages in the retrocession of the Glacial age. Judging by the luxuriant growth of the Beech in the south of Ireland we have now reached a period, the climate of which is more suitable to that tree than to the Oak. Further there are some theories which base the occurrence of the Glacial period on a variation in the position of the earth's axis,¹ and some account of which might have been expected from Dr. Scharff. If they are to be believed in their entirety, they would surely be highly antagonistic to Dr. Scharff's views.

Next, as regards Dr. Scharff's extensive Glacial European sea, it is the part of a geologist to estimate the exact period in, or the limits to which such a sea must have attained, but there can be no doubt that some such sea is needed to explain the geographical distribution of animals in the Gulf of Bothnia, and the great lakes and inland seas of Asia. How can we explain the presence of a seal (*Phoca sibirica*, Sm.) in Lake Baikal, unless there was some direct and fairly easy communication thence with the Arctic Ocean?

With reference to centres of distribution, Dr. Scharff has a good deal of interest to tell us. We do not feel bound to follow Dr. Haacke's theory of an Arctic origin of life to its utmost limits, but the more we think of the marine faunæ of the Pacific and Atlantic Oceans, the more we feel the necessity for an extensive centre for the origin of living things in the Arctic Ocean, perhaps in those flourishing Eocene or Miocene times, when conifers such as *Sequoia*, *Thujaopsis*, and *Salisburia*, together with such well-known deciduous trees as beeches, oaks, planes, poplars, limes and magnolias (p. 144), flourished in the congenial climate of Greenland, and when the flora of Spitzbergen and of Alaska was not widely different. Such a centre of distribution is necessary to explain the curious presence of so many closely allied forms in both the N. Atlantic and the N. Pacific, some of them now separated from each other, while others extend the whole way around the arctic shores of Asia and Europe. Thus, to take vertebrates alone, we have the *Alcidae* and the *Phocidae*, represented in both oceans by species, some of which occur right around the northern coast of Eurasia, while others have separated themselves into two isolated settlements, one confined to each ocean: and the same remark applies to fish. This centre of distribution need in no way interfere with that advocated by Mr. Lydekker, and supported by Dr. Scharff, in the present Oriental region. It was broken up with the advent of the Glacial period, and the spread of numerous forms from it has given a different complexion to most other regions of the earth.

Dr. Scharff advocates the existence of several minor centres of origin of life in Europe, such as for the Molluscan genus *Clausilia* in the south-east (p. 262), and for the slugs of the family *Arionide* (p. 48) in south-western Europe, perhaps, even in the submerged Atlantis; but we hardly think that Europe can have ever competed with southern Asia in this respect, at least as regards vertebrates, since the actual area of land available has always been somewhat limited, and the little that has been available has occupied temperate or transitional regions, the Sahara

¹ See a paper by H. Trautschold in the *Bull. Soc. Nat. Mosc.*, 1896, No. 2.

having apparently existed, either as sea or desert, long enough to form a barrier to the extension of life northwards from the African Tropics. We agree with Dr. Scharff when he states that he cannot (p. 290) call to mind any large species of mammal which we might reasonably suppose to have originated in South-western Europe. *Myogale* is possibly such; *Talpa*, even if it occurs in French Miocene deposits, is old enough in the East to have reached Japan. The Rabbit (*Lepus cuniculus*) may be a case in point, as may also be *Muscardinus* (p. 316), of the ancestry of which, however, we know nothing, but we doubt if Dr. Scharff is right in branding *Myoxus* (now known as *Glis*) as of European extraction (p. 316), that genus having a representative, *M. elegans*, Temm., in Japan. Neither can we agree with Dr. Scharff in placing the origin of the genus *Fringilla* (p. 293), and especially of the Chaffinches, in south-western Europe, for the various sub-species found in Teneriffe, Madeira, the Canaries, and the Azores, are surely only instances of the adoption, by isolated colonies of a widely spread bird, of a dress suitable to local conditions. Even *Cyanopollus Cooki* (p. 293), the beautiful blue Magpie of Spain, must be the survivor of a once widely-spread species, now represented only by itself and the almost identical *C. cyanus* of eastern Siberia.

Among the vertebrate representatives of Arctic forms in our islands are the extinct Reindeer, Arctic Fox and Lemmings, the Varying Hare, the Stoat, Ptarmigan, Great Auk (extinct), the *Salmonidae*, the Sticklebacks, the genus *Cottus*, Perches, Cods, and Herrings. The North American fresh-water sponges and plants of Ireland belong to a slightly different section. With regard to these, we think Dr. Scharff is right in claiming that they reached our shores by land and not by passing over frozen arms of the sea, but when he talks of the Reindeer frequently crossing and recrossing Bering's Straits (why spell it "Behring"?) in winter, we think he is incorrect, for we believe the ice of these straits is never firmly fixed enough for such traffic, as the traveller De Wentt recently found to his cost. Other Arctic vertebrates, such as the Polar Bear and Musk Ox, are not known from the British Isles.

A pretty point is made by Dr. Scharff when he contends that the presence of arctic and alpine plants and animals is not necessarily indicative of a severe climate, but that they exist in such situations on account of the protection afforded to them by the snow from severe cold. In support of this he quotes the extreme delicacy of Arctic plants in gardens, and their inability to stand an ordinary winter uncovered, the fact that many of them are evergreen, that some of them such as the alpine Edelweiss and the Mountain Avens, are found elsewhere at sea-level, while all, or nearly all, have an extremely discontinuous range. If we are to follow Dr. Scharff, we shall be led to the conclusion that arctic and alpine animals are refugees, and have retired before other and more vigorous forms, to their present habitats, and we must admit that there seems to be a good deal to favour this supposition. As regards mountains, we have evidence that in Tibet and in Luzon a group of high mountains may form an island-like retreat for a peculiar fauna, while the last refuge of many animals formerly wide-spread has been in the far or intermediate North. To quote one or two, the Great Auk, the

Rhytina and many Whales have survived longest in regions near one or other of the poles, and it may be that similar reasons explain the extreme southern habitat of the Penguins. The Reindeer, the Musk Ox, the Polar Fox, and the Lemmings, have only retired northwards in recent periods, and may well have been driven from the more southern regions which they formerly occupied—the larger animals, perhaps, by man, the lesser by the competition of other forms. Lastly, where competition is less keen, as in islands and peninsulas, northern forms occur very much to the south of their ordinary range, witness the Reindeer and Arctic Fox in Kamchatka, and the Varying Hare, which is able to live at sea-level in Ireland in the absence of the competition of the larger *Lepus europæus*. But amongst these Arctic animals we must surely recognize the presence of a few members of dominant groups which spread and maintain themselves in all latitudes almost regardless of climate, and amongst them I would include the Stoat, found widely distributed in one form or another, and the Polar Bear, a species of a very dominant genus.

The members of Dr. Scharff's Siberian migration hardly reached westward of the east coast of England. It has left numerous survivors on the continent, and nine, including the extinct Beaver, in England. The Polecat, the Harvest Mouse, the Hamster, and the Brown Hare are instances of this group, with regard to which, Dr. Scharff, arguing mainly from Mollusca, upon which it appears the Glacial Period had hardly any effect (p. 196), and disagreeing with Prof. A. Nehring (pp. 210 and 211), is at some pains to show that it was not characteristic of steppe-like conditions. But surely what might be true of mollusca need not necessarily be so of mammals. The former, powerless to move from their haunts, might survive unhurt a short continuance of wholly changed conditions; the latter, with their ready means of locomotion and high intelligence, would readily follow on the heel of conditions which suited them best, so that it really needs no great Siberian migration to account for their presence in Western Europe. Appropriate mammals would necessarily fill up a treeless region, wherever such existed, and would as quickly retreat before the advent of forests. If, as Dr. Scharff supposes, the west had always the wetter and milder climate, then that is sufficient to account for the failure of the Siberian forms to penetrate to Ireland, but some of them must have got very near to our inaccessible shore, for we have the Common Shrew in Jura, and the Brown Hare in the otherwise quite hibernian Isle of Man.

We must at this point enter a protest against Dr. Scharff's use of the word "migration." The fact is that by many people the word migration is used in a very careless and loose sense to indicate what are three distinct sets of phenomena—we mean the ordinary periodic and seasonal movements of migratory birds, fishes, or other animals; the extraordinary and often evanescent irruptions of animals like the Sand-Grouse and the Lemming; and the steady, almost imperceptible dispersion of a species such as the gradual recent increase of the Woodcock and Starling as breeding species in the South of Ireland. There are statements in his book indeed, as where he states that the first and third of these

phenomena may be manifested in the same species at the same time, which seem to show that Dr. Scharff appreciates the difference between them; but right through the work he uses the word migration to apply to very different processes. It seems to us that it is high time that we should distinguish them, and that we should restrict the word "migration" to the periodic and seasonal movements. For the other two we might, perhaps, suggest such words as "irruption"¹ and "dispersal."

The Lusitanian group is but poorly, if at all, represented among Irish mammals; and this review has already reached such a length that we have hardly time to allude to its other constituents, or to the Oriental group in which Dr. Scharff would include such vertebrates as the Red Deer, the Fallow Deer, the Pheasant, the Fire-crested Wren; such mollusca as *Buliminus pupa*, and such plants as the Cedars. In the Lusitanian section he includes the Dartford Warbler, Bearded Titmouse, Natterjack Toad, the Brimstone Butterfly (*Gonopteryx rhamni*) the slug *Geomalacus maculosus*, the species of *Testacella*, the blind Woodlouse, *Platyarthrus*; and among plants the Strawberry tree, *Arbutus Unedo*, the Mediterranean Heath, and the Irish Spurge, *Euphorbia hiberna*.

One point at all events strikes us after reading the distribution of the various groups, and how Mediterranean forms, such as some of the above, hold their own in the south-west of England and on the west and north-west coastal districts of Ireland. It is the reality of the existence of what the Americans would call a Transitional, and we a Mediterranean region, inside the limits of which, if it be ever taken to include all forms of life, must certainly be included parts of the western and south-western sea-board of the British Islands.

We must conclude this notice with a word of warning. The subject is one of such immense difficulty, and one beset by so many complications, that it may well be that all our present beliefs may one day have to go to the wall. It may well be, as Dr. Scharff has suggested, that our fauna and flora, or much of it, is Pre-glacial; but, inclined as we are to believe him, we cannot help emphasising the great distance of time which undoubtedly separates us from the Glacial Period, as shown, for instance, by the result of the excavations made by a Committee of the British Association at Hoxne, in East Anglia.² Even the immensely ancient palæolithic implements of Hoxne are separated from the chalky Boulder clay by two distinct climatic waves accompanied by corresponding changes of flora! Who then can say that the long ages, the meagre history of which we owe to these excavations, may not some day be shown to have been of sufficient duration for the occurrence of all the changes and complications in our fauna and flora which form the subject of Dr. Scharff's volume? G. E. H. B.-H.

¹ A word used many years ago by Professor Newton with reference to the Sand-Grouse.

² See Report of Sir John Evans' Committee to British Association at Liverpool in 1896.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include a pair of Kestrels from Mr. J. Tutty, four Doves from Mr. D. E. Kirkpatrick, Redshanks from Dr. C. J. Patten and Mr. W. D. Latimer, a Monkey from Major Byres, a pair of Axolotls from Mr. V. W. Brown, a pair of Gulls from Dr. J. A. Baird, a Razorbill from Mr. R. Warren, five St. Kilda Sheep from Dr. C. Norman, two young Seals from Sergt. M'Goldrick, and a pair of Hares from Constable H. Murphy. Three Lion cubs were born in the gardens on Sept. 26th, and three more on October 12th. A Malayan Bear, a white Jackdaw, and three Land-crabs have been bought.

12,900 persons visited the gardens during September.

BELFAST NATURALISTS' FIELD CLUB.

AUGUST 12.—EXCURSION TO TOOMEBRIDGE.—An early train brought the party to Toomebridge, where the river banks and site of the ancient ford, famous for the splendid flint implements which it has yielded, were explored. The supply of antiquarian objects is not yet exhausted, for members of the Field Club party collected worked flakes during their survey on the 12th inst. The party was conducted by Mr. Grant over his Kieselguhr works, near the hotel. The well-known Bann clay is now known in commerce as Kieselguhr, and is used for a great variety of economical purposes, chiefly through the practical skill and enterprise of the Messrs. Grant, of Toome. Very fine pure-white clay occurs in large quantities on both banks of the Bann for several miles along its course, and for a considerable distance inland over the flat country around Toome. The thickness of the deposit varies from two to six feet thick. The clay is a pure silicate of alumina, the average analysis being as follows:—Silica, 72 per cent.; alumina, 9 per cent.; iron oxide, 5 per cent.; lime, 1 per cent.; water and organic matter, 13 per cent. Its specific gravity is about 5422, so that when dry it will float on water like peat. It is a non-conductor of heat and sound, and may be made into bricks which will float in water. It is used in the manufacture of dynamite and polishing preparations, and for a variety of purposes on board ship and public structures, where its extreme lightness, fire-proof, deafening, and non-conducting properties render it so valuable. It is prepared by Messrs. Grant in various conditions, but chiefly in bags of pure-white powder of the very finest texture. Although so very highly silicious it is of a vegetable and not of a mineral origin. It is, in fact, made up of the silicious flinty or glass cases of extremely minute single-belled plants, such as are at present living in and around the Bann—the plant organisms are known as Diatoms, the most abundant, indestructible, varied and beautiful forms known in the organic world. A cubic inch of the earth would probably contain seventy million separate organisms.

The Club party congratulated Messrs. Grant upon the result of their labours, and very heartily wished them all the ultimate success their manifest skill and enterprise so clearly merit.

A number of boats were now provided, and after an enjoyable row of an hour on the Bann, all were safely landed on Church Island, when the church, holy well, or bullaun, and the island's many other attractions were explored, and the return journey was as pleasantly accomplished.

The eel fishing is one of the most important of the local industries at Toome, where eels are taken by the ton during the season, and are sent by rail to the various markets, chiefly in England.

The district is one of the very best for the naturalist in search of fresh-water mollusca. On this occasion some fifteen species were collected, including the scavenging *Limnaea stagnalis* and *L. palustris*. Some large forms of the Bubble snail, *Physa fontinalis*, were captured. Of the Coil shells *Planorbis marginatus* was very abundant. The mud-loving *Pisidium amnicum* was plentiful about the roots of plants in muddy bottoms. On the shores of the rivers and at Church Island the beautiful Amber shell, *Succinea elegans*, was collected with several land shells.

The district around Toome is botanically rich. The botanical members secured fine examples of the rare Water-Starwort, *Callitriche autumnalis*, also *Potamogeton heterophyllus*, a curious attenuated form, in good condition. Fine fruiting specimens of *Potamogeton lucens* were abundant, and quite a mass of *Chara aspera* at the northern end of Lough Beg. Of land plants, the most important was *Spergularia rubra*, which in Ireland may be accounted decidedly rare. The submerged water plants were found to be almost entirely encrusted with Diatoms, such as make up the bulk of the Bann clay or kieselguhr.

After the investigations of the day, Rev. Mr. and Mrs. Fahy welcomed and hospitably entertained the party of some sixty members, who, rested and refreshed, were further entertained by a short address from Mr. Fahy, giving a most interesting account of the parish and its immediate surroundings, including its archæology and natural history. Mr. Adam Speers, B.Sc., acted as chairman of this, the formal meeting of the Club, which directed that a letter of condolence be sent to Mr. W. J. Browne, M.A., on his recent sad bereavement, so very deeply regretted by the Club; and after the transaction of some other formal business, a most hearty vote of thanks was passed to Mr. and Mrs. Fahy, and then the party returned to Toome to catch the last train for Belfast.

SEPTEMBER 2.—The last field meeting was held at Ballynahinch, The first item of the programme was an open country walk to Glassdrummond—the green ridge—which is crowned by a good example of a cashel or stone fort. The party returned to Ballynahinch, noting natural and artificial objects of interest along the way. The members obtained permission to enter the demesne of Montalto, which affords excellent opportunities for the study of many branches of natural history.

Returning to Ballynahinch, tea was provided at Fitzpatrick's Hotel, after which a formal meeting was held, under the chairmanship of Mr. W. H. Patterson, M.R.I.A. Among the business matters transacted was a vote of thanks to the Rev. Patrick Quail, whose extensive knowledge of the locality enhanced the pleasure and profit of the afternoon's ramble. A resolution was also passed strongly in favour of inviting the British Association to revisit Belfast at an early date, as it is now twenty-five years since the last meeting, in 1874.

DUBLIN NATURALISTS' FIELD CLUB.

JULY 22nd—EXCURSION TO LOUGH BRAY.—Some fifty members and their friends, by train, car, and bicycle rode to the head of Glencree and Lough Bray. Additional interest was given to the excursion by the presence of the botanical and geological science teachers attending the summer courses in the Royal College of Science. Mr. A. W. Davies, in charge of the geological members, gave an account of the origin of the Scalp and on the moraine at Upper Lough Bray, and enlarged on the Rev. Maxwell Close's illustrated account of the origin of the loughs.

The Ivy-leaved Bell-flower was seen at its best, and the Irish Quillwort was collected in its well-known habitat in the Upper Lough.

N O T E S .

ZOOLOGY.

INSECTS.

Noteworthy Irish Orthoptera.

A female specimen of *Locusta cinerascens*, Fab., captured at the South Aran lighthouse in August, 1898, has been given by Mr. R. M. Barrington to the Dublin Museum of Science and Art. This is the common migratory locust of South-western Europe, and occasional specimens have reached Great Britain on several occasions.

In June of the present year a female of the Mole-cricket, *Curtilla gryllotalpa*, Linn., was sent by Major Bruce, of Toome, Co. Derry, through Mr. R. Welch, who informed me that it was collected on an old Irish canoe taken out of the bed of Lough Neagh, at the outflow of the Bann at Toome, a few years ago. This is a well-known insect in the south of England, and the presence of a single specimen in the north of Ireland is remarkable. It is to be hoped that its range in this country may soon be more fully known.

Both of these specimens have been exhibited in the collection of Irish animals on the ground floor of the Natural History building.

GEO. H. CARPENTER.

Macroglossa stellatarum, etc., in Co. Down.

I took over half a dozen examples, and saw many others, of the Humming-bird Moth hovering over the flowers of fuchsia, chiefly in Donard demesne, Newcastle, during the first two weeks in September. It seems to be common in Ireland this year from all accounts, but its occurrence so far north may be worth recording.

Pyrameis atalanta was exceedingly abundant also in the same place, and I might have taken scores of them had I been so disposed.

I. H. BONAPARTE-WYSE.

Paris.

Notes on Lepidoptera.

I have seen three "Clouded Yellows" (*Colias edusa*) in North Tipperary this season, one early in August and two on the 29th September. I am not aware that it has yet been recorded from this locality. The Humming-bird Hawk-moth (*Macroglossa stellatarum*) was rather abundant in the gardens around Nenagh this summer. I have counted seven in one small corner together. I have also seen two specimens of the Irish Burnet (*Zygaena nubigena*) near Lough Derg. In 1894 I also met with it in the same place, but not in the intervening years. On the 16th August, when landing at Urra, on the shore of Lough Derg, I found myself actually surrounded by butterflies. A plant with a large flat pink-headed flower¹ grew along the shore for a hundred yards or so, enclosed in a wooded bay, and in and about this plant I counted over two dozen of *Pyrameis atalanta*, several *Vanessa io*, *Argynnis paphia*, two other Fritillaries I did not recognize, *Chrysothamus phlæas*, *Pararge egeria*, *P. megera*, and a few Whites. On the same day I caught a Clouded Yellow near by. Such a number and variety in one small spot was extraordinary.

MICHAEL GLIBSON.

Nenagh.

MOLLUSCS.

The Dispersal of Molluscs, &c.

A friend journeying from Belfast to Ballyshannon brought me from Co. Sligo what he was pleased to call "Fossil Ivy"—a piece of Carboniferous limestone very much weathered, the coral standing out just like the stems of Ivy.

The stone measured 5 inches by 2½ inches, was very rough and full of crevasses. When handling it I was attracted by a small beetle hiding in one of the holes. Making a careful search with a field microscope I discovered five beetles, all of one species (*Longitarsus melanocephalus*) and fifty-four live *Helix rupestris*. Only four or five of these were full grown.

The stone is used as the common fencing stone of the district.

HUGH L. ORR.

Belfast.

¹ Presumably Hemp-Agrimony, *Eupatorium cannabinum*.—EDS.

BIRDS.

Grey Phalarope in Co. Armagh.

Mr. H. W. Marsden writes to the *Zoologist* for October that he received from Mr. W. Keatley a male Grey Phalarope (*Phalaropus fulicarius*) shot on September 23th, near Lurgan.

Gannets on the Bull Rock.

Owing to the apparent uncertainty that prevails as to the above breeding-colony of the Gannet (the only other such colony on the Irish coast besides the Little Skellig), I have made enquiry of the principal light-keeper, from whom I have received the following reply:—

“Bull Rock light-house, Garnish, Sept. 16th, 1899.—In reply to your letter of 12th August, relative to birds in our district, particularly as to number of Gannets on the rock, I have made enquiry from a number of the natives, who should be most likely to know about the Gannets, and send you the result. The Gannets first began to build on the Bull Rock about twenty-five or thirty years ago, and for some years only about six or eight pairs had nests on it; during the four or five years of the building of the lighthouse the Gannets rather decreased in numbers; my own observations, extending back three seasons, are that Gannets are by far more numerous this year than any of the two previous years—in all I should say there are 500 to 700 nests on the rock. The Gannets come to the Bull in February, and appear to take from 1st April (when the first eggs are to be had), up to 1st September before the first young fly from nest, and all clear away about the 3rd or 4th October. What we take to be the young birds of the year before come to the Rock about the end of July. Rock Pipits also build on the Bull Rock—about half-a-dozen pairs. The Red-legged Jackdaws are still plentiful in the district; I counted over forty in the lighthouse ground ashore a day or two ago. The other birds building on the Rock are—Guillemots, Razor-bills, Puffins, Kittiwakes, and one pair of Common [Herring] Gulls built last year. No Gannets have ever been known to build on the “Cow” where all the above [birds breed] except Gannets, and, in addition, Cormorants and Black-backed Gulls. The sea-birds have been very plentiful around the rocks this last season. On the night of the 13th August last we had a regular invasion of Stormy Petrels on the rock, and over thirty were killed. Those birds, I think, build in the rock, but only a pair or so, and we have never been able to find the nest.—JAMES HIGGINBOTHAM, 1st Keeper.”

I may remark on the above that Gannets must have bred on the Bull Rock longer than Mr. Higginbotham or his informants suppose, for Mr. Hutchins, who visited it in June, 1868, found “certainly many hundreds” there (*Zoologist*, 1882, p. 110), and Major Vernon, who sailed past it about 1876, estimated them by thousands (*Field*, 1st July, 1876). I was not aware that Gannets laid before May, and I hope Mr. Higginbotham next year will note the date when the first eggs are found. We should also be glad to have a description of what he calls “the young birds of the year before.”

The Little Tern in Dublin Bay.

It seems to be a moot point whether the Little Tern (*Sterna minuta*) breeds every year on the North Bull, or only irregularly. In Dr. Patten's article in the *Irish Naturalist* for September, he gives (p. 195) details of nests found there in the summers of 1891, 1893, 1896, 1897, and 1899, but mentions that he observed none in 1892, 1894, 1895, or 1898, though the locality was visited at about the same season every year. This would seem to support the view that the site is not utilised every year, and that such is the case seems also to be Dr. Patten's own opinion, since in a former article (vol. vii., p. 237) he speaks of this tern on the North Bull as "remaining to breed during some seasons." However, I find on looking up my notes that on June 10th, 1892, I found a nest with eggs, and other nests with broken egg-shells, at this breeding-station; also, that on July 1st, 1894, I found seven nests with eggs, many fragments of hatched shells, and two newly-hatched birds. It thus appears that in the series of nine years, 1891-9, there were only two seasons, 1895 and 1898, in which no nests of the Little Tern were seen on the Bull either by Dr. Patten or by myself. Under the circumstances it seems to me probable that they breed there every year, and certainly the negative evidence is not strong enough to justify our setting them down as nomadic in that locality. Any positive evidence as to nests found in 1895 or 1898 would tend to set the question at rest.

Ballyhyland, Co. Wexford.

C. B. MOFFAT.

In reference to a communication entitled "The Construction of the Nest of the Little Tern," by Charles J. Patten, I was much interested to find that his remarks entirely agree with what I have myself observed. During the last two summers I have on several occasions gone to the South Bull (commonly called the Shelly Banks), beyond the Pigeon House Fort; at the extreme end of the sand hills is a large expanse of sand covered with shells and loose shingle; in the early summer this is covered by the nests of the Little Tern; I have counted as many as nineteen nests in one short walk. The conical depression carefully lined by small pieces of shells was always well marked, and frequently I noticed the belt of sand surrounding the nest, from which, it seemed evident, the lining shells had been gathered.

Sandymount, Co. Dublin.

R. ATKINSON STONEY.

MAMMALS.

Pine Marten and Common Badger in County Galway.

An aged specimen of Pine Marten (*Mustela martes*) was recently killed near Galway, and is now in my possession. The Badger (*Meles taxus*) is common in same locality, and Badger-hunting is a frequent pastime in the district. The nature of the surface—rocky, woody, partially under cultivation, and somewhat mountainous—affords suitable shelter and hunting-ground for both animals, and it is not likely that they shall, for many years, if at all, become extinct in County Galway.

Galway.

R. M. GILMORE.

RECENT OBSERVATIONS ON THE SEA-FOWL, OF
THE DUBLIN COAST.

BY CHARLES J. PATTEN, B.A., M.D.

ONE might almost have expected that the heavy gales, which raged so furiously during the middle and latter parts of last September, would have tended to turn out of their course large numbers of sea-fowl which happened at that time to be journeying on their southern migration. Observations made about the Dublin coast show this to be true to a certain extent, for some species appeared earlier than is usual, these having probably been wafted out of their direct line of migration. Indicative also of the rough weather many birds remained with us for a longer period than they generally have done, their numbers not thinning out so rapidly soon after their arrival as on previous occasions, but curiously enough, as far as I am aware, very few rare species have been recorded from Dublin Bay or its vicinity during this autumn.

Of the large and varied Order of Limicolæ, the GOLDEN PLOVER (*Charadrius plumbealis*) has been very numerous this autumn. It appeared on the North Bull, Dollymount, as early as the 20th of September. On that date I only can be certain that I observed a single bird, although sportsmen inform me that it is often seen in large flocks even earlier. On Monday, September 25th, Mr. E. Williams noted an enormous flock at Portmarnock. I have not seen large flocks of Golden Plover about Dublin Bay earlier than the middle of October.

GREY PLOVER¹ (*Squatarola helvetica*) have made their appearance since the beginning of October. Compared with previous seasons, their arrival was somewhat late, the middle of September being the usual time.

On October 7th I noticed three or four flocks, consisting each of ten to twelve birds.

TURNSTONES (*Streptilas interpres*) have been exceptionally numerous this autumn. I noticed an adult bird in summer plumage as early as August 2nd, 1899. Towards the end of the same month, viz., August 26th, hundreds of immature

¹Old birds in summer plumage seldom occur on our coasts. (See *Irish Naturalist*, vol. vii., p. 233.)

Turnstones appeared on the Dollymount strand. After a long and careful examination of a large flock I was able to distinguish many adult birds among them.

This interested me to a large extent, as it suggested that Turnstones, old and young, migrate together, differing in that respect from most other Limicolæ, the young of which migrate separately and often before the old birds.¹

All through September until the beginning of October this species was plentiful. However on the 7th October the numbers had diminished to about eight; indeed on the day previous to this Mr. Williams only noticed a few examples.

The OYSTER-CATCHER (*Hæmatopus ostragalus*) is never a scarce bird in Dublin Bay, but during the heavy gales of September it appeared in huge flocks, many of which allowed the observer to approach them closer than usual.

The SNIPE (*Gallinago cælestis*) is by no means common on the North Bull, Dollymount. During many seasons it failed to appear, but this year I rose three from the rushes, each on a different occasion. The dates were August 26th, September 14th, September 20th.

Since 1897 the LITTLE STINT (*Tringa minuta*) has not been observed in Dublin Bay until October the 6th this year. Mr. Williams noted one on that date, and the next day I noted a single example also. This was likely the same bird. It is very curious how irregular this little "wader" is as an autumnal visitor.²

The CURLÆW SANDPIPER (*Tringa subarquata*) is another species which occurs irregularly in autumn. It more than likely appears *every* year, but in varying numbers. I only noted one this year, and that on September 14th. It was in the midst of an enormous flock of very tame Dunlins, in the company of which species I have often noted it previously.

The KNOT (*Tringa canuta*) is also somewhat irregular in its numbers as an autumn visitor to the Dublin coast. This year it seems rather scarce. As far as my observations go, I

¹ On September 4th of this year, at Rossbeg, beyond Glenties, on the Donegal coast, a large flock of Turnstones appeared, and rested on the rocks. Many were old birds, still retaining part of their rich summer plumage. The flock only remained a few days, during which time the weather was calm and warm.

² See *Irish Naturalist*, vol. vii., p. 234.

believe it to be nearly as plentiful in the early winter (November to Christmas) as it is in autumn.

The usual number of SANDERLING (*Tringa arcnaria*), grouped together in small wisps of twenty birds or so, appeared about the middle of September. A month earlier than this (August 16th, 1899), I noted a large flock of about 100 Sanderling at the North Bull. This flock consisted of adult birds, many of which at this *early* date had moulted for the most part into their winter dress. They only remained about ten days. If any had been shot at the end of that period and examined, they would have been found to be almost, if not altogether, in full winter plumage. Sanderling in mid-winter are scarce on the Dublin coast, and it is likely that many of the specimens which one sees in collections, without the date of capture, of the Sanderling in *full winter plumage* are specimens taken in late autumn.

During the northern migration the Sanderling remained as late as the 7th June this year.

The RUFF or REEVE (*Machetes pugnax*), although decidedly rare on the Dublin coast, is, I think, a more regular migrant during autumn than hitherto supposed. The following records of its occurrence will bear out this statement:—

- (1.) September 1st, 1896, male Ruff shot at the North Bull. This specimen is in my collection.
- (2.) August 28th, 1897,¹ Mr. Williams shot a pair at the North Bull.
- (3.) Supposed to have been observed, but no specimens taken, in autumn of 1898.
- (4.) September 20th, 1899, female Ruff (called Reeve) shot at the North Bull by Mr. Walker, forwarded to me from Mr. Williams. This specimen is in my collection.
- (5.) October 3rd, 1899, Ruff (female) shot at Balbriggan by Mr. Tunstal-Moore (junior), and recorded by Mr. E. Williams.

N.B.—The last is a late date for the occurrence of this species.

It is almost needless to mention that the COMMON RED-SHANK (*Totanus calidris*) is a very plentiful bird all along the Dublin coast wherever mudslobs and tidal estuaries are

¹ See *Irish Naturalist*, page 235, vol. vii.

present. But its congener, the Greenshank (*Totanus canescens*), is much less common, and seems more conservative in its habits—preferring the muddy shores¹ of one part of the Dublin coast rather than another. It is oftener found about Malahide and Portmarnock than at Dublin Bay; indeed, on the North Bull it seems of late to have become a scarce bird.

The BLACK-TAILED GODWIT (*Limosa ægocephala*) is very rare in Dublin Bay. I cannot be certain that I have ever seen it till this year, when, on the 20th of September, Mr. Williams pointed one out to me which flew past us on the North Bull. Mr. Williams has observed this species at Portmarnock on previous occasions.

BAR-TAILED GODWITS (*Limosa lapponica*) remained at the North Bull as late as June 7th, 1899. I have never seen them later, although Mr. R. Warren records them as stopping until the 13th of June where he observed them this year, on the lands of Moyne Abbey, near Ballina, Co. Mayo (see *Irish Naturalist*, vol. viii., p. 187).

The WHIMBREL (*Numenius phaeopus*) appeared as early as the 16th of August, and has remained until the 15th October.

Among the order Gaviæ the LITTLE TERN (*Sterna minuta*) may be mentioned as having bred in considerable numbers this year about the Dublin coast. In one colony on the Dollymount Strand I counted sixteen nests. This was on the 21st May, 1899 (*Irish Naturalist*, vol. viii., p. 195).

Probably many eggs were hatched, as the young appeared flying about in large numbers during August and the early part of September.

Some of the Duck Family (Anseres) appeared at an early date. On the 26th August I observed two WIDGEON (*Mareca penelope*), and on the 14th of September a large flock had arrived at Dollymount Strand. I noticed the GOLDEN-EYE (*Clangula glaucion*) on October 7th, and on the day before (October 6th), a LONG-TAILED DUCK (*Harelda glacialis*) was shot at the North Bull by Mr. O'Connell, and forwarded to Mr. Williams for preservation. I have not heard of this bird occurring in Dublin Bay before, although I have two specimens from Malahide in my collection. They were shot last winter.

Trinity College, Dublin.

¹ Like the Turnstone, the Greenshank also inhabits rocks.

ENTOMOLOGICAL NOTES FROM UISTER

BY REV. W. F. JOHNSON, M.A., F.E.S.

LEPIDOPTERA.

THE past summer was a remarkably fine one, and as a result we have had an invasion of migratory lepidoptera. Those most noticed are the Clouded Yellow (*Colias edusa*) and the Humming-bird Moth (*Macroglossa stellatarum*), both of which seem to have spread themselves widely over the country. It is somewhat remarkable that the Painted Lady (*Pyrameis cardui*), which is a great wanderer, does not appear to have been noticed except in south-west Cork, as recounted in Mr. J. J. Wolfe's very interesting paper (ante p. 218). I observed a single specimen between Poyntzpass and Scarva on August 23rd. I did not capture it, as I had no net with me. It would be interesting to know whether any of the brood reared in Cork were noticed elsewhere, as evidently from Mr. Wolfe's account they dispersed themselves.

I noticed a good many Red Admirals (*Pyrameis atalanta*) in my garden and round the neighbourhood, and I saw one on the wing as late as October 1.

The Small Tortoiseshell (*Vanessa urticae*) was of course abundant. The autumn brood very soon go into hybernation; I see them coming into the house early in September. They will settle inside a window, then work their way to the ceiling, and then vanish into some cranny. I followed the movements of one down a passage where it day by day got into a darker place until at last it hid itself in the very darkest corner, and I had to get a lamp before I could discover its whereabouts. I took one that had come in, and killed and set it. It was a fine fresh specimen, and could not have been very long emerged from the pupa. The "Whites," as might have been expected, were in great force, and their larvæ were far too numerous for the good of the cabbages. I do not think anything is at all as efficacious for the destruction of these larvæ as hand-picking. It is troublesome of course, but where it is done thoroughly it is far the most effective remedy. Mr. Gleeson's experience at Lough Derg (ante p. 250) is probably that of most entomologists. There are certain spots which have

some peculiar attraction for insects, e.g., a particular corner of a field, part of a lane, or, as in Mr. Gleeson's case, a nook on the shore of a lake or edge of a wood. The curious thing is that there are other places apparently equally attractive to which the insects do *not* resort. *Zygæna loniceræ* and *Z. filipendulæ* were abundant, and I secured some fine specimens in my own fields.

I picked up a few moths in my garden at rhododendron blossom, among them being *Lophopteryx camelina*, *Leucania pallens*, *L. impura*, and *Hadena oleracea*. I boxed a nice specimen of *Eubolia palumbaria* as it was sitting in a hedge. Besides these I took *Euplexia lucipara* in a farm house, *Cucullia umbratica* and *Habrostola urticæ* in my garden, and *Aglossa pinguinalis* in this house. During October I tried sugar and Ivy blossom every suitable night. Moths were never numerous, but I obtained a nice little series of *Calocampa exoleta* and *C. vetusta*. In addition I took *Miselia oxyacanthæ*, *Agrotis suffusa*, *Noctua triangulum*, *Orthosia pistacina*, and *O. ferruginea*. Of the last three I only took single specimens. I saw a good many *Phlogophora meticulosa* at Ivy blossom, but even they were never present in any numbers.

COLEOPTERA.

My friend, Col. W. J. Alexander, while stopping at Narin, Co. Donegal, sent me a few beetles which he had picked up. Among them were several *Cicindela campestris*, which he told me were numerous, but hard to catch, owing to their activity; he also sent *Pristonychus terricola*, *Corymbitis cupreus* and *Phyllopertha horticola*. I happened to mention, in my letter acknowledging the arrival of these distinguished strangers, that the last named (*P. horticola*) was called the "Bracken Clock," and Col. Alexander, who was fishing, noticing that the beetle was abundant, tried the artificial fly which was called by that name, with the result that he had some excellent sport. I hope any of the piscatorial fraternity whose eye this may meet will note the advantage of entomology, and add fly-catching to fly-fishing.

I recorded (*I. Nat.*, vol. vii., p. 169) the capture of two specimens of *Lochmæa cratægi*, one in April and the second in June. Canon Fowler ("British Coleoptera," vol. iv.) says that

the beetle occurs "on flowers of Whitethorn," and I was consequently surprised not to be able to obtain more than a single specimen when I beat the Whitethorn in full bloom. I have, however, now solved the mystery, and found that the beetle, here at any rate, is not to be met with in numbers until long after the flowers are off the Whitethorn. In August last Mrs. Johnson and I were out in one of my fields, and took refuge from a shower of rain under the hedge. Almost immediately Mrs. Johnson called my attention to two beetles that were sitting on my coat sleeve. I recognised them to be *L. cratægi*, and when the rain had passed off returned with net and bottle, and began to beat the hedge. In a very short time I had as many as I wanted, but for curiosity I tried the Whitethorn in other parts of the Glebe farm, and found the beetle present there also. From this experience it would seem that the main brood of the beetle is present in autumn rather than in early summer.

The great heat and drought of this summer gave the Turnip "Fly" (*Phyllotreta undulata*) and the Wireworm fine opportunities for the exercise of their peculiar gifts. I slew *P. undulata* wholesale by tapping the cabbage and young turnip plants, and causing the beetles to spring into my net. I then either crushed them or drowned them. The Wireworm, which is here mostly *Agriotes obscurus*, did a great deal of mischief among turnips, corn, and potatoes. A neighbour of mine had the greater part of a field of potatoes ruined by these grubs eating through the tubers, and making them unfit for market purposes. As far as my experience goes nitrate of soda is the most useful dressing that can be applied to check the ravages of these grubs.

Part of this house is pretty old, and consequently harbours some of the *Ptinidæ*. I have taken *Ptinus fur*, a good many; *Niptus hololeucus*, freely; and *N. crenatus* sparingly. *Cryptophagus scanicus* and *Mus musculus*, though so far apart in structure, habits, &c., have a common liking which is equally destructive to both; they both love cream, so both tumble into the cream crocks in my dairy at night and their corpses are found in the morning, to Mrs. Johnson's intense delight, as all good housewives will understand. She tries to get me to take an interest in the

beetles, but I know that no respectable *Cryptophagus*, such, for instance, as *pilosus* or *ruficornis*, would get drowned in a cream crock, so I pay no attention to these gluttonous specimens. Perhaps it may be of interest to note that I captured nearly all my specimens of *Plinus fur* after dark. They were on the walls and ceiling of a pantry and passage which I pass through to reach the room where I had my incubator at work.

HYMENOPTERA.

Wasps have not been at all numerous here this year, owing probably to the wet spring. I saw very few nests, but noted those of *Vespa vulgaris*, *V. norvegica* and *V. rufa*. I had intended keeping the nest of *V. rufa* under observation, but the very day after I found it some mischievous person destroyed it. Most people destroy all wasps and their nests that they can, so acting through ignorance, for though wasps and their nests in the immediate vicinity of a dwellinghouse are to be discouraged, yet elsewhere they should be unmolested and allowed to carry on their work in the economy of nature, one very important part in which is the killing of flies. Of course I shall be reminded that wasps sting, but they won't sting if they are unmolested. I have stood by a pine tree when it was swarming with wasps, and caught any that I wanted, and no wasp tried to sting me, and I have lately stood by a nest of *V. vulgaris* every day to watch them at work and, though one would now and then examine me, I was not stung. I dare not have stood as near to a hive of bees as I did to these wasps, yet most people would say that wasps are far more vicious than bees.

Bombus smithianus is still here, and as cross as ever. They attacked and stung my man when mowing, and would have paid me the same attention, but I was too wary for them. I met with a few *Megachile centuncularis* in my garden busy cutting out the rose leaves.

The nest of wasps referred to above is still active at the time of writing (November 7), and I am very curious to see how long they will continue to work.

Acton Glebe, Poyntzpass.

PROCEEDINGS OF IRISH SOCIETIES.

ROYAL ZOOLOGICAL SOCIETY.

Recent gifts include six Walking Fish, an Electric Fish, and a Mud Fish from Dr. H. O. Forbes, a Ring-necked Parrakeet from Mr. A. S. Bellingham, and a pair of Swans from Miss Cotton. Five Monkeys have been purchased.

12,600 persons visited the gardens during October.

DUBLIN MICROSCOPICAL CLUB.

MAY 18.—The Club met at Leinster House.

Mr. GREENWOOD PIM showed specimens of *Mycorrhiza* from the roots of *Vaccinium* and White Poplar. The mycelium on the first creeps over the rootlets and in the second forms a kind of felted tissue, the root and the fungus living and working together symbiotically.

PROFESSOR T. JOHNSON showed a preparation of the embryo-sac of an angiosperm at the time of fertilization, and exhibited illustrations from the *Revue Générale de Botanique* of M. Guignard's recent discovery of antherozoid-like male generative nuclei and their functions in *Lilium Martagon*.

Mr. G. H. CARPENTER showed a female specimen of *Cordylochele malleolata* (Sars.), a rare Arctic pantopod of remarkable form. The specimen had been dredged in July, 1898, by Mr. W. S. Bruce, of Edinburgh, when cruising in the s.s. "Blencathra" off the south-eastern coast of Spitzbergen.

OCTOBER 19.—The Club met at Leinster House.

Mr. GREENWOOD PIM showed flowers of *Ceropegia Woodii*, a curious creeping or pendulous member of the *Asclepiadaceæ*. The corolla is tubular, swollen suddenly at the base, and divided above into four connate segments, curiously bordered with hair.

Mr. MCARDLE exhibited *Lejeunea Rossettiana*, Massal., which he collected last May on Ross Island, Killarney, to which district in Ireland it seems now confined, though reported to have been gathered near Dublin by Dr. Taylor in 1830. It is rare in England and also found in Italy. On account of the hyaline papillose leaves it is a beautiful object. The perianth capsule and spores were also shown; from the membranous capsule a number of long cilia, angular at the apex, grow, extending past the mouth, over which they curve in a remarkable manner and behave exactly as do the teeth in the peristome of some mosses. A figure and description will appear in the *Irish Naturalist* with Mr. McArdle's paper on the Hepaticæ of Ross Island.

BELFAST NATURALISTS' FIELD CLUB.

NOVEMBER 1.—ANNUAL CONVERSAZIONE.—The annual conversazione was held in the Public Library. There was a large attendance of the members and their friends. In the reading-room on the first floor there was a general exhibition of objects of interest, chiefly connected with the members' investigations during the summer, the sections represented being geology, zoology, botany, ethnology, and photography. The exhibitors included Miss M. K. Andrews, Mrs. Patterson, LL.D.; Professor Symington, F.R.S.E.; Professor Johnson, (D.N.F.C.); Messrs. J. St. J. Phillips, B.A.; F. J. Bigger, M.R.I.A.; A. Speers, B.Sc.; R. Welch, J. H. Davies, Alexander Milligan, W. Gray, M.R.I.A.; W. Swanston, F.G.S.; J. Donaldson, J. Wright, F.G.S.; J. Lizars, R. May, J. Hamilton, Chas. Bulla, R. Bell, G. P. Farran (D.N.F.C.), W. H. Phillips, Alex. R. Hogg, W. J. Fennell, M.R.I.A.I.; and H. L. Orr. The last-named took the Club's prize for a collection of Irish land shells. Mr. J. H. Davies exhibited freshly-gathered mosses of different species, which are to be found in fruit at this season, and the fructification of these was examined with much interest under Mr. Gray's microscope. Mr. Davies had also on the table freshly-collected tufts of *Poa compressa* lately detected by him on old walls at Lisburn. Mr. Robert Welch displayed a collection of fresh-water shells from Ulster lakes, and shells collected by Mr. Moore lately in Lake Tanganyika, Central Africa, survivals to our day of marine forms hitherto only known fossil in Jurassic rocks. Mr. Moore, Royal Botanic Gardens, Dublin, kindly sent a plant of the tropical yam, and Professor Johnson (D.N.F.C.) a number of carnivorous plants. North Antrim land shells, botanical lantern slides, and rubbings of armorial stones from County Antrim were shown by Mr. Bigger, and Mr. Swanston exhibited some maps of ancient Ireland from 1520 to 1700. Mr. H. L. Orr also exhibited a series of British moths and butterflies, mounted on a new plan on blotting paper with sunk cells for the bodies, and glass top and bottom, making each mount practically damp and mite proof. Mr. Gray, in addition to several other exhibits, slides, &c., showed a mass of the diatomaceous earth or Kieselguhr—"Bann Clay"—from Toome, with photographs of the sections on banks of the Bann. Other exhibits included the following:—Rev. C. H. Waddell, B.D. (President), a collection of mosses and liverworts, also botanical slides for microscope and miscellaneous objects; Mr. S. A. Stewart, a collection of small mosses, mounted for microscope; Mr. Wm. Porter, a finely-mounted collection of British grasses; Mr. N. Carruthers, a fine collection of dried flowering plants (mounted); Mr. A. Gulbransen, microscope slides (botanical).

After the President had extended a cordial welcome to all present, and referred to the work of the ensuing winter session, an optical lantern demonstration was given, the various views being explained by Mr. Gray, Mr. Fennell, and Mr. Phillips.

DUBLIN NATURALISTS' FIELD CLUB.

OCTOBER 25.—The winter session was opened with the usual conversation. In addition to the Club members and their friends, representatives of the Belfast and Limerick Field Clubs were present, to whom, on behalf of the Club, the President, R. H. Praeger, B.A., B.E., offered a hearty welcome, but especially to Professor A. C. Haddon, D.Sc., F.R.S., on his safe return from his successful expedition to Torres Straits and New Guinea. The lantern exhibit which the latter had agreed to give was the feature of the evening, the lantern being worked by Mr. Greenwood Pim, M.A.

Professor Haddon showed a series of slides illustrating sacred stones and shrines in the Murray Islands, Torres Straits. A shrine which consisted of one or two large clam shells gave an abundance of cocoa-nuts; another was a collection of clam shells containing small stones, which ensured a good fruit harvest; rudely carved stones placed in gardens made the yams and sweet potatoes grow. One block of lava on a small cairn on the shore was a fish charm, and if boys threw stones at it the fish migrated. A rude stone figure represents a woman who is supposed by the natives to have made a hill 600 feet in height. Photographs of other stones illustrating local legends were also shown. A couple of views were shown of Port Moresby, the capital of British New Guinea. This is the centre of a large pottery industry, and seventeen slides were shown illustrating all the stages in the manufacture of a pot by women.

The exhibition concluded with a series of slides illustrating various games of Pepuan children, beginning with a string puzzle like our cat's cradle, and ending with several round singing games, some of which bear some resemblance to games played at home.

The following exhibits were on view, being in many cases the results of the past summer's field work:—Mrs. D. R. Alcock, Australian and Swiss flowers; Dr N. H. Alcock (Hon. Sec.), photographs of bats, and a collection of living bats; Miss Bernard, sketches made on the Lough Ree excursion; G. H. Carpenter, B.Sc., and J. N. Halbert, new insect-cases for the Museum collection of Irish animals; G. P. Farran, a blind Pump Shrimp from Templeogue; Prof. Grenville A. J. Cole, F.G.S., and J. A. Cunningham, B.A., A.R.C.Sc.I., specimens and illustrations of the older rocks of County Donegal, collected in August, 1899; Mrs. G. A. J. Cole, water-colour drawings of sections of igneous rocks; Mrs. W. S. Green, *Spirula*, *Ianthina* shells from Inishbofin; Miss Hughes, drawings illustrative of British Ferns; Prof. T. Johnson, D.Sc. (Hon. Sec.), *Sclerotia* and other botanical objects; W. F. de V. Kane, M.A., F.E.S., *Bormina Lilljeborgii* (new to Britain) and other Entomostraca; Miss A. L. Massy, a series of marine shells from the Malahide estuary; D. McArdle, rare Irish liverworts and mosses; F. W. Moore, M.R.I.A., a collection of succulent and other plants, many new to cultivation; F. Neale (Hon. Sec. L.F.C.) Brimstone butterflies and Ichneumon imagos; A. R. Nichols, B.A., deep-sea animals from the "Challenger" Expedition; Miss Patton, Natural

History objects from the East; Dr. C. J. Patten, a few of the rarer Irish birds recently obtained from Co. Dublin; Greenwood Pim, M.A., *Physianthus*, in fruit; and a new Moss, *Hypopterygium* sp.; *Wistaria sinensis*, in fruit, from Rosanna, Co. Wicklow; *Ricinus*, in fruit, &c.; J. St. J. Phillips (Hon. Sec. B.N.F.C.), Torridon Sandstone (slide of); Dr. C. B. Plowright, a collection of Fungi presented to the Science and Art Museum; Mrs. Carleton Rea, drawing of *Agaricus strobiliformis* (from Lucan Demesne, 1898); A. Gore Rider, C.E., an Indian huntsman's fetich; Dr. R. F. Scharff, B.Sc., a collection of vertebrate and invertebrate animals from the Pyrenees; Henry J. Seymour, B.A., 1. Gold nuggets recently obtained from two different localities in Ireland; 2. A hammerstone used by the natives of Matabeleland for the extraction of gold from its matrix; Miss L. Shackleton, drawings of British flowering plants, &c.; Mrs. J. T. Tatlow, results of shore-collecting, shells, &c., in South Donegal, June and July, 1899; R. Welch (B.N.F.C.), British land and freshwater shells; Irish geological photographs.

One table was occupied by a large number of fungi, edible and poisonous, collected by a number of members the day before in the Dunran demesne, kindly thrown open by Mr. B. T. Patterson, C.E., a Club member, who added to the Club's indebtedness by inviting the party to afternoon tea.

Mr. Moore, the Keeper of the Royal Botanical Gardens, Glasnevin, had, as usual, an interesting group of plants, many of which have not been seen in cultivation before. Some of the succulent plants illustrated mimicry of rock, stone, lichen, and similarity of habit in widely-separated species. Dr. A. H. Foord, F.G.S., and H. Hanna, M.A., D.Sc., were prevented by illness from exhibiting.

CORK NATURALISTS' FIELD CLUB.

OCTOBER 19.—Under the auspices of the Cork Literary and Scientific Society the inaugural lecture of the new session of the Cork Naturalists' Field Club was delivered by the President, Mr. T. Farrington, M.A., who took for his subject, "Some of the relations of the Atmosphere to Plants." The lecture was illustrated by a number of limelight illustrations and experiments. Sir Rowland Blennerhassett, Bart., President of the Literary and Scientific Society, occupied the chair. The lecturer described the different elements of which the atmosphere was composed, showing by experiments the influence they had on one another, and proceeded with his lecture, showing what the atmosphere did for the plant at different stages of its growth. At the conclusion a warm vote of thanks was passed to Mr. Farrington.

O B I T U A R Y .

CHARLES EASON,

Died November 5, 1899.

It is with a sad satisfaction that we add our small tribute to the memory of the head of the publishing house which issues this magazine. Many individuals and undertakings in Ireland will be the poorer for the death of Charles Eason, and the *Irish Naturalist* loses in him a steadfast friend and helper. We believe that it would not be his wish that the part which he took in founding this Journal should even now be made known; but at least we may say that the *Irish Naturalist* would probably never have been started, and could certainly never have been carried on, without the help which he heartily and cheerfully gave us during its earlier years.

He was born at Yeovil, Somerset, in May, 1823. In 1856 he settled in Dublin as manager for Messrs. W. H. Smith and Son. From small beginnings he built up the great and successful business which thirty years later passed into his own hands. Essentially a man of books, his reading was varied and his interests wide. Though not a naturalist his mind was ever open to the teachings of science, and the bearing of modern biological thought on the great problems of existence was always a fascinating subject to him. His presence eleven years ago at a certain youthful essay on the life of Darwin was the beginning of a friendship which led him afterwards to freely place his technical knowledge and the resources of his great establishment at the disposal of the editors and supporters of the *Irish Naturalist*.

N O T E S .

ZOOLOGY.

The History of the European Fauna.

Professor Newton has very kindly called my attention to a curious slip which occurs in the review of Dr. Scharff's book (*Irish Nat.*, Nov., 1899, p. 244), where it is stated that the Musk Ox is not known from the British Isles. The words "British Isles" have been strangely substituted for "Ireland," in this sentence, as, of course, remains of the Musk Ox have been found in more than one English locality, such as, for instance, in the Pleistocene deposits of Maidenhead, Berks (part of a cranium), of Crayford (some teeth), and of Greenstreet Green (part of a cranium), both in Kent—see R. Lydekker's Catalogue of the Fossil Mammalia in the British Museum Collections, 1885, Part II., p. 39.

Professor Newton has also been good enough to point out that the Great Auk, which is alluded to on the same page as one of the Arctic forms in our islands, was never, so far as we know, more than a sub-Arctic species, there being but one instance (if that can be trusted) of its occurrence within the Arctic circle.

G.E.H.B.-H.

So much of the valuable space of the *Irish Naturalist* has already been taken up with the discussion of my book on the European Fauna that I cannot here enter fully into the criticisms which appeared in last month's issue of this journal. Perhaps, however, I may be allowed to make a few remarks which seem to me of special importance. The reviewer regrets that I should have considered it necessary to "ignore the latest views in revised nomenclature." I cannot really see any cause for such regret. My work was not so much addressed to the specialist as to those generally interested in the history of the living things surrounding us. It would have made the book very cumbersome and, I think, confusing to most readers to have had to explain in the case of almost every Latin name used what particular reviser of nomenclature I had followed; for the latest views on revised nomenclature are not at once adopted by all zoologists, since the revisers themselves are by no means agreed as to the extent and manner of revision.

The reviewer thinks that I should have given an account in my book of the theory which bases the occurrence of the Glacial Period on a variation in the position of the earth's axis. But had I done so the many other views as to the origin of the Glacial Period, especially that which attributes the phenomena of glaciation to changes in the eccentricity of the orbit should have been discussed, which would scarcely have been within the scope of my work.

As regards my statement that the Reindeer often cross the Behring or Bering Straits (I believe the hardy Dane who discovered the straits did not know himself whether to spell his name with or without an "h"—see *Encyclopædia Britannica*), I can only refer the reviewer to the paper by Brauer (quoted in my bibliography), in which full references are given.

R. F. SCHARFF.

Science and Art Museum, Dublin.

INSECTS.

Irish Fleas.

Dr. Scharff very kindly forwarded me last year some fleas. It may possibly be of interest to the readers of the *Irish Naturalist* to record the species. I received a large series of *Ctenopsylla musculi* from Dublin taken off the House Mouse, and a pair of *Ceratopsylla jubata* taken off the Hairy-armed Bat (*Scotophilus Leisleri*) from Bray River, September 7, 1898. In addition to these there were some others which I hope to record later.

So very little is known of even our British fleas that many new species must be forthcoming. I should much like to receive any Irish fleas collectors may be disposed to part with, and can give British birds and lepidoptera in exchange.

N. CHARLES ROTHSCHILD.

Tring, Herts.

BIRDS.

Bird Records In Co. Tipperary.

Mr. Warren, to whose opinion I at once yield, thinks I am mistaken in reporting the arrival of a Reed Warbler in the Co. Tipperary (see above, page 185). On referring to my note-book I find I put a query after it, 'Reed Warbler or what else?' I had on a few occasions previously seen a Warbler in the locality near the reedy shores of Lough Derg on the Nenagh River, but more particularly last May, when I had a good opportunity of a near examination with an opera glass. It certainly was not a Sedge Warbler, a bird quite common here and well known to me, although it resembled it generally in size and appearance. The general colour was a warm brown above, but without any streaks or markings of the Sedge Warbler; white on breast and stomach, with a surrounding tawny tinge, and with a pale eye streak.

I had no opportunity of catching it, if so inclined, even, and it certainly appeared to be the same bird which had been pointed out to me in the South of England as a Reed Warbler. Some weeks ago I noticed consorting with a flock of Long-tailed and other Tits several very bright yellow green-coloured small birds which resembled the Willow Wren, but were much brighter. Has the Wood Wren been recorded from this county, or would the Wood Wren be found in company with Tits?

MICHAEL GLEESON.

Nenagh.

Maternal Affection of Wild Birds and Vitality of some Eggs.

Crossing one of our Antrim hills in the company of a friend, we came to a piece of miry ground thickly studded with tumocks of grass. We were stepping from one to another of these when, as my foot touched one of them, up rose a Snipe. Being much surprised, I drew back my foot and remained motionless; the bird had risen about eighteen inches, and continued to hover over the spot with rapidly beating wing for over half a minute—I could easily have caught her with my hand—then flew ahead about a hundred yards and to a height of about thirty yards, when she commenced to make that noise which has been described as bleating. I had often heard it before, but not at so short a range or so long continued. On parting the long fine grasses which rose to the height of ten or twelve inches, we discovered the eggs, which they had completely hidden from view.

The eggs we took to compare with the previous ones taken in Downpatrick marshes thirty years before. Finding them hard set I put them in a basin of cold water, and placed them out of doors. On examining them next day I found the chicks still living in the shells, after having floated in cold water for over twelve hours.

They were extracted after the shells had been strengthened with glue and tow, but I never enjoyed looking at them, and finally brushed them aside ; but the memory of the ruthless deed still lingers with me.

Did the bird winnow the grass to close it over the nest, or was it to decoy me in pursuit, as the Green Plover often had done, or was it evidence of the maternal affection for her unfledged young, which I have often witnessed in the Robin and Hedgesparrow during the last stage of incubation, when they have allowed me to stroke them with my finger—the same birds proving wild at earlier stages of the hatching ? I have observed similar evidence of vitality in the eggs of wild birds, though the eggs of domestic fowls are very perishable.

H. L. ORR.

Belfast.

MAMMALS.

The Hedgehog and its food.

In searching our banks and hedgerows, especially our railway cuttings, I have observed countless numbers of broken shells of *Helix nemoralis* ; these are strewed in the runs which are overhung with grass and herbage and are, I strongly suspect, the work of the Hedgehog. Some time ago I was fortunate in finding one, a fine specimen, rolled up in a bushel of beech leaves. These were nicely compacted and apparently waterproof, placed in a tangle of briars in a glen. We kept the little beast for some time, and it was amusing to see how shy it was—the least noise or motion making it coil up. After a time it became quite tame.

I had heard it accused of eating eggs. I placed one on the floor overnight ; next morning I found the shell with a piece the size of a shilling broken out of one side, and the contents clean gone. I supplied it with some dozens of *Helix nemoralis*, and listened to it crunching them up, separating and rejecting the shells, and swallowing the snails with exceeding gusto. We cut a few of its bristles off to section for the microscope, and set it at liberty. Has its propensity for eating snails been noticed by others ? I have heard them sniffing in the early spring morning in the hedges, and have heard at the same time the crunching sound which I afterwards verified.

H. L. ORR.

Belfast.

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