

New Series.—Vol. VIII., No. 1—issued Sept., 1907.] [Price Two Shillings.

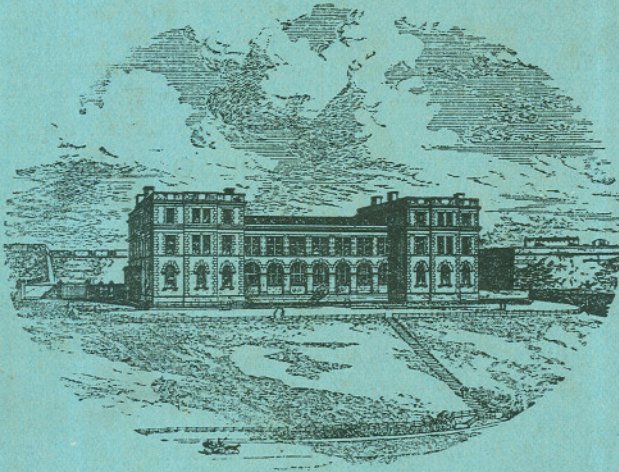
Journal

OF THE

MARINE BIOLOGICAL ASSOCIATION

OF

THE UNITED KINGDOM.



THE PLYMOUTH LABORATORY.

PLYMOUTH :

PRINTED FOR THE MARINE BIOLOGICAL ASSOCIATION BY W. BRENDON & SON, LTD.,

AND

PUBLISHED BY THE ASSOCIATION AT ITS OFFICES ON THE CITADEL HILL.

SENT FREE BY POST TO ALL MEMBERS OF THE MARINE BIOLOGICAL ASSOCIATION :

ANNUAL SUBSCRIPTION FOR MEMBERSHIP, ONE GUINEA.

Agents in London :—Messrs. DULAU & Co., 37 Soho Square, W.

PATRON.
HIS MAJESTY THE KING.

OFFICERS AND COUNCIL.

President.

Sir RAY LANKESTER, K.C.B., LL.D., F.R.S.

Vice-Presidents.

The Duke of ABERCORN, K.G., C.B.	The Right Hon. JOSEPH CHAMBERLAIN, M.P.
The Duke of BEDFORD, K.G.	The Right Hon. AUSTEN CHAMBERLAIN, M.P.
The Earl of ST. GERMANS.	Sir EDWARD BIRKBECK, Bart.
The Earl of DUCIE, F.R.S.	A. C. L. GÜNTHER, Esq., F.R.S.
Lord AVEBURY, F.R.S.	Sir JOHN MURRAY, F.R.S.
Lord TWEEDMOUTH, P.C.	Rev. Canon NORMAN, D.C.L., F.R.S.
Lord WALSINGHAM, F.R.S.	EDWIN WATERHOUSE, Esq.
The Right Hon. A. J. BALFOUR, M.P., F.R.S.	

COUNCIL.

Elected Members.

G. L. ALWARD, Esq.	S. F. HARMER, Esq., Sc.D., F.R.S.
Prof. T. W. BRIDGE, Sc.D., F.R.S.	E. W. L. HOLT, Esq.
F. DARWIN, Esq., F.R.S.	J. J. LISTER, Esq., F.R.S.
Sir CHARLES ELIOT, K.C.M.G.	H. R. MILL, Esq., D.Sc.
G. HERBERT FOWLER, Esq., Ph.D.	P. CHALMERS MITCHELL, Esq., F.R.S.
J. STANLEY GARDINER, Esq., M.A.	Prof. D'ARCY W. THOMPSON, C.B.
Prof. W. GARSTANG, D.Sc.	R. N. WOLFENDEN, Esq., M.D.

Governors.

G. P. BIDDER, Esq., M.A.	Prof. G. C. BOURNE, D.Sc. (Oxford University).
Sir RICHARD B. MARTIN, Bart. (Prime Warden of the Fishmongers' Company).	A. E. SHIPLEY, Esq., D.Sc., F.R.S. (Cambridge University).
E. L. BECKWITH, Esq. (Fishmongers' Company).	Prof. W. A. HERDMAN, D.Sc., F.R.S. (British Association).

Chairman of Council.

A. E. SHIPLEY, Esq., D.Sc., F.R.S.

Hon. Treasurer.

J. A. TRAVERS, Esq., Tortington, Arundel.

Hon. Secretary.

E. J. ALLEN, Esq., D.Sc., The Laboratory, Citadel Hill, Plymouth.

PERMANENT STAFF.

Director—E. J. ALLEN, Esq., D.Sc.

Assistant Naturalist—L. R. CRAWSHAY, Esq., M.A.

Assistant Naturalists for the International Investigations—

W. WALLACE, Esq., D.Sc.	J. O. BORLEY, Esq., M.A.
R. A. TODD, Esq., B.Sc.	A. E. HEFFORD, Esq., B.Sc.

Hydrographer (International Investigations)—D. J. MATTHEWS, Esq.

Statistical Assistant (International Investigations)—Miss R. M. LEE, M.A.

The Fishes collected by the "Huxley" from the North Side of the Bay of Biscay in August, 1906.

By
L. W. Byrne.

With one Figure in the Text.

ONLY one species met with on this cruise appears to have been previously undescribed.

Although all the other species were already known from similar localities in the North-east Atlantic, attention may be called to an interesting series of the young of *Synaphobranchus pinnatus* and to the capture of numerous young examples of *Onus biscayensis*.

When compared with the results of the hauls taken by H.M.S. *Research*, a little farther south and over very much deeper soundings, the list of species taken by the *Huxley* is chiefly remarkable for the entire absence of *Stomias boa*, *Gonostoma microdon*, and *G. bathyphilum*, the range of none of which seems to extend into waters as shallow as those fished by the *Huxley*.

STOMIATIDAE.

Maurolicus borealis, Nilsson.

The small fish trawl took two damaged larvæ (about 7.5 mm. long) at Station VIII.* and very many young, one of 27 mm. and 98 others of all sizes between 20 and 12 mm., at Station X.

ANGUILLIDAE.

Conger vulgaris, Cuv.

A *leptocephalus* of this species (kindly identified for me by Dr. Schmidt) 141 mm. long was taken in the small fish trawl at Station VIII.

SYNAPHOBRANCHIDAE.

Synaphobranchus pinnatus, Gthr.

Fourteen specimens, 105 to 270 mm. in length, were taken at Station XII., on fine sand at a depth of 246 fathoms.

This series serves to connect the small specimen taken by the *Helga* (Fisheries, Ireland, *Sci. Invest.*, 1905, ii. [1906]) with examples having

* For the positions of the Stations see Table on p. 5.

the form and characters of the adult, and dispels any doubt as to the correct identification of the former specimen.

The relative distance of the origins of the dorsal and anal fins from the snout is subject to considerable individual variation; and the length of the head is contained $2\frac{1}{2}$ to $3\frac{1}{4}$ times in the distance from the snout to the origin of the dorsal fin, 2 to $2\frac{1}{4}$ times in the distance from the snout to the origin of the anal fin, and half to slightly more than once in the interval between the origins of the two fins, which is relatively shortest in the two smallest examples.

The belly of the smallest specimen, 105 mm. long, was distended by the vertebra of another fish about 4 mm. long and 3 mm. in diameter, to which fragments of flesh still adhered.

SCOPELIDAE.

Scopelus (Myctophum) glacialis, Reinhd.

Nine specimens, 38 to 12 mm. in length (without caudal fins) were taken at or near the surface at Station VIII.

S. (M.) punctatus, Raf.

Ten specimens, 37 to 20 mm. in length (without caudal fins), were taken in the same haul as the last species. In these specimens the superanal photophores numbered 7-9 + 8-10, and the posterolateral varied somewhat in position, being either above the break in the superanal series or above the last photophore anterior to the break.

S. (Lampanyctus) crocodilus, Risso.

A single damaged specimen 21 mm. long (without caudal fin) was taken in an Agassiz trawl at Station XII. There is nothing to show the precise depth at which it entered the net.

The small fish trawl at Station X. contained the remains of *Scopelus* larvæ, too broken for specific determination.

Paralepis sp.

"Long-anal" larva. Holt & Byrne, *Trans. Linn. Soc.*, x. p. 199.

A damaged specimen about 29 mm. long from Station X.

SYNGNATHIDAE.

Nerophis aequoreus, var. *exilis*, H. and By., was taken by the small fish trawl, worked as near the surface as possible, at Stations VIII. (nineteen; 177-43 mm.) and X. (two; 220 and 105 mm.). The smallest ovigerous male captured was 150 mm. long.

GADIDAE.

Phycis blennioides, Brunner.

Nine specimens (145 to 85 mm. long) were taken at Station IX. on

fine sand in about 240 fathoms of water, and a single specimen (108 mm. long) at Station XII. on similar ground at about the same depth.

Onus sp.

Six specimens of a tricirrate *Onus* from 60 to 109 mm. long from Station VII. cannot at present be satisfactorily referred to any described species and, in view of the difficulties attending the satisfactory determination of isolated specimens belonging to this genus, it seems best to await further material before applying any name to them.

Drs. Schmidt and Jensen have kindly compared the specimens with *O. Reinhardti* of a comparable size, and inform me that they certainly do not belong to that species, while they also appear to be distinguishable from *O. Carpenteri*, Gthr., and *O. macrophthalmus*, Gthr.

The specimens were taken with the Agassiz trawl, which came up filled with large masses of coral.

Onus biscayensis, Collett.

Small examples occurred as follows, in each case on sandy ground:

Station II.—One, 61 mm.

Station IX.—Two, 62 and 54 mm.

Station XIII.—Seven, 64 to 48 mm.

The broken remains of two small fishes from Station XIII. are probably referable to either this or the preceding species.

Specimens of the size captured appear to have the back ordinarily greyish-brown in colour with obscure marblings of a darker shade which become less conspicuous with growth.

PLEURONECTIDÆ.

Arnoglossus laterna (Walb.).

Two specimens, 89 and 40 mm. long, at Station II. (75–80 fathoms), and two, 140 and 37 mm. long, at Station XI. (146 fathoms).

The larger example taken at the latter station showed the character of "*A. lophotes*."

Zeugopterus megastoma (Donov.).

A single specimen of 175 mm. at Station II. and three smaller ones (73–53 mm.) at Station XI.

Damaged larvæ (about an inch long in each case) were taken by the small fish trawl at Stations VIII. (one) and X. (one).

Solea variegata (Donov.).

A single specimen, 110 mm. long, at Station VIII.

GOBIIDÆ.

Gobius Jeffreyssi, Gthr.

A single specimen of 21 mm. at Station X. and fourteen others of 32 to 20 mm. at Station XI.

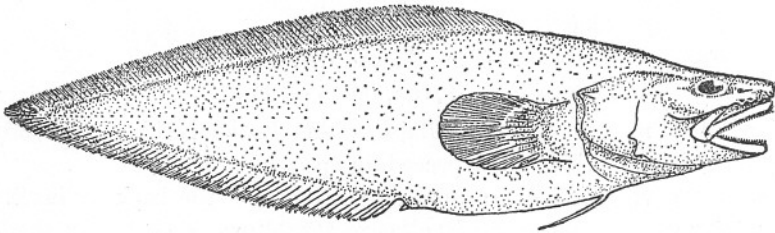
LYCODIDAE.

Pteridium Alleni, Byrne.*

The specimen on which this species was founded was taken at Station VII. in about 444 fathoms. The specimen was taken with the Agassiz trawl, which came up filled with large masses of coral.

The original description and sketch of this species are (by the kind permission of the editor of the *Annals and Magazine of Natural History*) repeated below:—

Form stout; body compressed in caudal region, its greatest height about 4 times in its length (without caudal fin). Head depressed, $3\frac{1}{2}$ times in length (without caudal), nearly twice as long as broad, its breadth about equal to its height at isthmus. Snout rounded, with numerous mucous glands, about $4\frac{1}{4}$ times in head. Eye of moderate size, longer than the flat interorbital space is wide, 6 times in head and less than $1\frac{1}{2}$ times in snout. Gape $2\frac{3}{8}$ times in head, barely reaching



Pteridium Alleni, $\times 1$.

beyond the level of the hind margin of orbit; maxilla weak, and but little expanded distally. Villiform teeth in both jaws and in a V-shaped band on vomer.

Marginal fins continuous, their bases covered with skin and scales; fin-rays difficult to count, probably D. *ca.* 90, A. *ca.* 55. Ventrals each with two closely apposed rays.

Body covered with a copious mucous secretion; scales very small, approximately 105 in a longitudinal and 35 in a transverse series. Lateral line very indistinct and broken.

Colour, after preservation, umber-brown, darker on top of head and front part of dorsum, paler on belly. Rays of marginal fins dark.

Length of type, 101 mm. (96 mm. without caudal).

Hab. Mouth of English Channel, near La Chapelle Bank, *ca.* 450 fath.

* *P. Alleni*, Byrne, *Ann. Mag. Nat. Hist.*, Ser. 7, vol. xviii. p. 448 (Dec., 1906).

Station No.	II.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
Latitude, N.	48° 24'	47° 36'	47° 30'	48° 7'	48° 7'	48° 10'	48° 7'	48° 7'
Longitude, W.	6° 28'	7° 31'	7° 31'	8° 13'	8° 13'	8° 11'	8° 13'	8° 13'
Fathoms	75	$\frac{7}{444}$	Surface.	240	Surface.	146	246	412
STOMIATIDAE.								
Maurolicus borealis	-	-	2 l.	-	99	-	-	-
ANGUILLIDAE.								
Conger vulgaris	-	-	1 l.	-	-	-	-	-
SYNAPHOBRANCHIDAE.								
S. pinnatus	-	-	-	-	-	-	14	-
SCOPELIDAE.								
Scopelus glacialis	-	-	9	-	-	-	-	-
„ punctatus	-	-	10	-	-	-	-	-
„ crocodilus	-	-	-	-	-	-	1	-
SYNGNATHIDAE.								
N. aequoreus v. exilis	-	-	19	-	2	-	-	-
GADIDAE.								
Phycis blennioides	-	-	-	9	-	-	1	-
Onus sp.	-	6	-	-	-	-	-	2?
„ biscayensis	1	-	-	2	-	-	7	-
PLEURONECTIDAE.								
Arnoglossus laterna	2	-	-	-	-	2	-	-
Zeugopterus megastoma	1	-	1 l.	-	1 l.	3	-	-
Solea variegata	1	-	-	-	-	-	-	-
GOBIIDAE.								
Gobius Jeffreyssii	-	-	-	-	1	14	-	-
LYCODIDAE.								
Pteridium Alleni	-	1	-	-	-	-	-	-

The Alcyonaria, Antipatharia, and Madreporaria
collected by the "Huxley" from the North Side
of the Bay of Biscay in August, 1906.

By

Sydney J. Hickson, M.A., F.R.S.

(Professor of Zoology in the Victoria University of Manchester.)

THE principal feature of interest in these collections is the presence of a single fine specimen of *Corallium maderense*. Only one other specimen of this species has hitherto been obtained, and no specimen of the family has hitherto been recorded from the Bay of Biscay.

The occurrence of *Sympodium coralloides* in the Bay is also a feature of some interest, but not very surprising, as it is in other localities usually associated with the Madreporarian corals on which it was found.

ALCYONARIA.

FAMILY **ALCYONIIDÆ.**

Alcyonium coralloides, Pall.

Gorgonia coralloides, Pallas, *Eleuch. Zoophyt.*

Alcyonium coralloides, von Koch, *Zool. Jahrb.*, v. 1891, p. 76.

Sympodium coralloides, de Lacaze Duthiers, *Archiv. de Zool. Expér.*, 3^o, viii. 1900, p. 360.

STATION VII. Lat. N. 47° 36'. Long. W. 7° 31'. $\frac{1}{444}$ fathoms.

A few small specimens evidently belonging to the white variety of this species are found encrusting the dead bases of the Oculinid corals. None of the specimens are large enough to enable me to reopen the question whether the species belongs to the genus *Sympodium* or the genus *Alcyonium*. Notwithstanding the very able discussion of this question by de Lacaze Duthiers, who retains the species in the genus *Sympodium*, I am inclined to consider the reasons given by von Koch for transferring it to the genus *Alcyonium* as unanswerable. In any case, it is an extremely interesting connecting link between the Stolonifera and the Alcyonacea. In the Mediterranean Sea the

spicules are usually purplish red to pale pink in colour, but, according to de Lacaze Duthiers, pure white varieties also occur.

The species was not recorded from the Bay of Biscay either by the *Caudan* or the *Hirondelle* expeditions.

***Alcyonium digitatum*, Linn.**

STATION I. Lat. N. 48° 25'. Long. W. 6° 28'. 75 fathoms.

A small white unbranched specimen of this species was obtained at this station. It is noteworthy that no specimens of the species were found in the dredgings in deeper water. The *Caudan* expedition obtained the species at a depth of 570–600 metres.

FAMILY CORALLIIDÆ.

***Corallium maderense*, Johnson.**

Pleurocorallium maderense, J. Y. Johnson, *Proceed. Zool. Soc., London*, 1899, p. 60, Plates V. and VII., figs. 1 and 4.

STATION XIII. Lat. N. 48° 7'. Long. W. 8° 13'. 412 fathoms.

The type of this species was obtained by Rev. Padre Ernesto Smith, to whom it was given by a fisherman, who told him it was brought up by a fishing-line from deep water off Camara de Lobos, a village six miles to the west of Funchal. No other specimen of the species has been described. The species was placed in the genus *Pleurocorallium* by Johnson, but for reasons pointed out by Kishinouye (*J. Imp. Fish. Bureau*, xiv. 1, 1904), which I can confirm by my investigations on the Coralliidæ of the *Siboga* expedition, to be published shortly, it is inconvenient to subdivide the known species of the Coralliidæ into generic groups, and I have therefore referred it to the genus *Corallium*.

The specimen is 110 mm. in length, flabellate in growth, with the verrucæ all on one side of the colony and about 70 mm. in width. The main axis is kidney-shaped in section, 6 mm. × 4.5 mm. The base of attachment is broken off and the ends of many of the branches are missing, and consequently it may have been a good deal larger when in position at the bottom of the sea. The type specimen was considerably larger than this, being 300 mm. in length and about the same in width. The specimen resembles the type in all essential respects. The ramification is not quite so profuse, and there are not so many of the "double carafe" or "opera-glass-shaped" spicules as described by Johnson, but I can find no substantial reason for making a new species.

It is perhaps the most interesting feature of the collection of Anthozoa that has been sent to me for examination to find a specimen

of *Corallium* in the Bay of Biscay. No specimens of *Corallium* were found by the *Challenger*, *Lightning*, *Porcupine*, or *Caudan* expeditions in their explorations of the deep-sea fauna of the west coasts of France and the British Islands, but a single specimen of *Corallium johnsoni* was obtained by the Irish Fisheries Department in 382 fathoms off the west coast of Ireland (Hickson, *Nature*, vol. 73, 1905, p. 5, and *Fisheries, Ireland Sci. Invest.*, 1905, v. [1906]). It is established therefore that *Corallium* does occur on the Atlantic slope of the European shores, but it is apparently very rare, or else very local in its distribution. The axis is pure white, but very hard and somewhat translucent. The coral is not of a character to command a high price, but it is possible that if a locality could be found where it occurs in considerable quantities the thicker branches would have a market value.

A series of sections through a small branch shows that the colony is female, but the ova are not, I believe, nearly mature.

Like all the other species of the genus that have been examined, *C. maderense* is dimorphic. The ova are borne by the siphonozooids and not by the autozooids. In this respect the species differs from *C. nobile*, in which the gonads are borne by the autozooids only, and resembles *C. japonicum*, *C. konojoi*, *C. elatius*, and *C. reginae*.

FAMILY ISIDÆ.

Isidella elongata, Gray.

Isidella elongata, Gray, *Cat. Lithophytes*, 1870, p. 14.

Isis elongata, Esper (see von Koch, *Fauna and Flora, Naples*, Monog., xv. 1887, p. 90, plates and figures).

STATION XIII. Lat. N. 48° 7'. Long. W. 8° 13'. 412 fathoms.

The name of this species has been subject to many changes, and it would form an interesting subject for a specialist in such matters to determine which, according to the rules of nomenclature, is the correct one. It was described as a new species by von Koch in 1878 (*Morph. Jahrb.* iv. 126), by the name *Isis neapolitana*. In 1882 he changed the name to *Isidella elongata*, Esper (*Mitt. Zool. Stat. Neapel*, bd. iii. 537). In 1887 it is described by the same author as *Isis elongata*, Esper, but in a "Nachtrag" is referred back again to the genus *Isidella*. I am in agreement with Wright and Studer (*Chall. Reports*, xxxi., 1889) in thinking it is doubtfully synonymous with *Isis elongata* of Esper, but it may be the same as *Mopsea elongata* of Philippi and *Mopsea mediterranea* of Risso. There can be no doubt, however, that it is the same as the *Isidella elongata* of Gray, and for that reason I have attributed the species to him. The species was obtained by the

Caudan in $5^{\circ} 55' W.$, $46^{\circ} 40' N.$, 400-500 metres. The specimen is 200 mm. long, and gives off one slender branch 100 mm. from the base. The axis is 2 mm. in diameter at the base, and tapers gradually to a very slender filamentous thread at the extremity. The internodes are from 10 to 15 mm. in length.

***Acanella arbuscula*, Johnson.**

Mopsea arbusculum, Johnson, *Proc. Zool. Soc.*, 1862, p. 245, Pl. XXXI. figs. 1, 1a.

Acanella arbuscula, Gray, *Cat. Lith.*, 1870, p. 16, woodcut.

STATION XIII. Lat. N. $48^{\circ} 7'$. Long. W. $8^{\circ} 13'$. 412 fathoms.

This is a characteristic species of the Atlantic slope. It was first described by Johnson from Madeira. It was found by the *Challenger* in 1525 fathoms S.W. of the Canaries. It was found in no less than four stations at depths of from 950 to 1710 metres in the Bay of Biscay by the *Caudan*.

Being very brittle owing to the alternating calcareous and horny joints of the axis, the specimens always reach the systematist considerably broken.

In the *Huxley* collection there is a main axis with nearly all the branches broken off that is 150 mm. in length, the calcareous internodes 10 mm. in length, and the greatest diameter of the stem 5 mm.

The most perfect "bushy part" of a colony is 105 mm. in height by 55 mm. in diameter.

FAMILY **MURICEIDÆ.**

***Acanthogorgia ridleyi*, Wright and Studer.**

A. ridleyi, Wright and Studer, *Challenger Reports*, vol. xxxi. 1889, p. 95, Plates XXII. and XXV.

STATION VII. Lat. N. $47^{\circ} 36'$. Long. W. $7^{\circ} 31'$. $\frac{444}{444}$ fathoms.
1 specimen.

STATION XIII. Lat. N. $48^{\circ} 7'$. Long. W. $8^{\circ} 13'$. 412 fathoms.
5 specimens.

I have had a great deal of difficulty in determining the species of the specimens of *Acanthogorgia* obtained by the *Huxley*. A great many species of this genus have been described by authors, and in most cases from the examination of a single specimen. There is no account of the range of variation within the limits of a single species. There can be little doubt, I think, that when the genus is overhauled the number of species will be materially reduced. Having compared our specimens with the species in the British Museum, I have found

that they resemble very closely those attributed to *Acanthogorgia ridleyi* obtained by the *Challenger* off Patagonia.

This species was also discovered by the *Caudan* expedition at their station 6° 21' W., 45° 47' N., 1410 metres. The species obtained by the *Hirondelle* expeditions from the Golfe de Gascoyne are attributed by Studer to *A. truncata* and *A. horrida*, but these came from much shallower water (240 metres and 200 metres respectively). The spicules are much larger than those of the type of *Acanthogorgia ridleyi*, and resemble more closely the spicules of *A. muricata*, Verrill. The longest of the bent spindles are 1.2 mm. in length. In the other three species they do not attain to a length of 1 mm. There is another difference between our specimens and the type in that on many of the branches the zooids are very closely crowded together, especially at their extremities, instead of being separated by intervals of 3-4 mm. The observations I have made on a small piece of a branch of one of the type specimens do not quite agree with the description given by Wright and Studer, and in so far as they differ, agree more closely with our specimens. On comparing them I have come to the conclusion that they cannot be regarded as anything but varieties of the same species.

I may add, in conclusion, that I have compared our specimens with a small dried piece of *Acanthogorgia* (*Blepharogorgia*) *schrampi* of Duchassaing and Michelotti, and find them to be closely related.

THE ANTIPATHARIA.

FAMILY ANTIPATHIDÆ.

Stichopathes spiralis, Pourtalès.

Antipathes spiralis, Pourtalès, *Bull. Mus. Comp. Zool.*, 1880, p. 114, Pl. III.

Stichopathes pourtalesi, Brook, *Challenger Reports*, xxxii. 1889, p. 89.

STATION VII. Lat. N. 47° 36'. Long. W. 70° 31'. $\frac{1}{44}$ fathoms.
2 specimens.

STATION XIII. Lat. N. 48° 7'. Long. W. 8° 13'. 412 fathoms.
4 specimens.

This species was obtained by the *Caudan* at Stations IV. and X., in 1410 and 1220 metres respectively.

Parantipathes larix, Esper.

Antipathes larix, Esper.

Parantipathes larix, Brook, *Challenger Reports*, vol. viii. 1889, p. 142.

STATION XIII. Lat. N. 48° 7'. Long. W. 8° 13'. 412 fathoms.

There are six specimens in the collection, varying in length from 225 mm. to 325 mm. The species was obtained by the *Caudan* in 1220 metres.

FAMILY SCHIZOPATHIDÆ.

Schizopathes crassa, Brook.

STATION XIII. Lat. N. 48° 7'. Long. W. 8° 13'. 412 fathoms.
1 specimen.

Schizopathes crassa, Brook, *Challenger Reports*, xxxii. p. 147.

This species was originally found by the *Challenger* in 1900 fathoms off Monte Video, but it was subsequently discovered by the *Caudan* at Station XVI., 5° 53' W., 45° 38' N., in 1220 metres.

The specimen is broken at the base, and is about 530 mm. in total length. The lateral branches arise sometimes in pairs, sometimes alternately, sometimes irregularly, from a strip of about one-third the width of the total circumference of the main axis, and are in two series, inclined at an angle of about 30° to each other. The lateral branches in the middle region are 250 mm. in length, those at the distal end very much shorter. At the proximal end the branches are broken.

The zooids seem to be about the same size as the type specimen, that is about 3 mm. in a diameter transverse to the axis, but the tentacles are much more contracted than those of the *Challenger* specimen, and are not more than 3 mm. in length (cf. 4-7 mm. in the type).

The character of the spines on the axes corresponds with the description of the type. Although there is a difference in the manner in which the lateral branches arise from the main stem between the *Huxley* and *Challenger* specimens, there is no good reason, in my opinion, for regarding them as distinct species.

The species was also found in the Bay of Biscay in 1220 metres by the *Caudan*.

THE MADREPORARIA.

FAMILY TURBINOLIDÆ.

Caryophyllia clavus, Scacchi.

Caryophyllia clavus, de Lacaze Duthiers, *Archiv. de Zool. Expér.*, 3^o, v. 1897, p. 37, and 3^o, vii. 1899, p. 529.

STATION I. Lat. N. 48° 25'. Long. W. 6° 28'. 75 fathoms.

STATION II. Lat. N. 48° 24'. Long. W. 6° 28'. 75 fathoms.

STATION V. Lat. N. 47° 48'. Long. W. 7° 46'. 109 fathoms.

STATION VII. Lat. N. 47° 36'. Long. W. 7° 31'. $\frac{111}{4}$ fathoms.

This is a common species off the coast of Ireland (Stephens), in the Bay of Biscay (Roule), and in the Mediterranean Sea.

The Mediterranean species of Caryophyllia have been carefully studied by de Lacaze Duthiers, and on the diagnoses given by the distinguished French naturalist I have no difficulty in assigning all the specimens that I have examined to the species *C. clavus*. It is true that a few specimens appear to approach *C. Smithii*, which de Lacaze Duthiers regards as a distinct species and not a mere variety of *C. clavus*. The following measurements taken at random will express better than words the fact that the crown has the characteristic oval outline of *C. clavus* rather than the round outline of *C. Smithii*:—

Height	26 mm.	21	18	16	13
Maximum diameter	22 mm.	19	19	18	14
Minimum diameter .	14.5 mm.	12	12	12.5	9

There is a complete series of specimens from the maximum size, the measurement of which is given in the first column to specimens less than 1 mm. in diameter. The collection would be of great value to any one willing to undertake a systematic study of the variations of the species.

The species was also obtained by the *Caudan*, and is common in deep and occasionally found in shallow water in the Mediterranean Sea (de Lacaze Duthiers).

***Desmophyllum cristagalli*, Milne Edwards and Haime.**

Desmophyllum ingens, Moseley, *Challenger Reports*, vol. ii. 1881, p. 160.

STATION VII. Lat. N. 47° 36'. Long. W. 7° 31'. $\frac{1}{44}$ fathoms.

There are four specimens of this species in the collection. The name *D. ingens* was given to some "gigantic" specimens obtained by the *Challenger* in 345 fathoms in the fiords of Patagonia. I am inclined to agree with Roule that these specimens cannot be separated from the older species *D. cristagalli*.

The following measurements may be of some interest:—

	Extreme length.		Greatest diameter of the calyx.		Shortest diameter of the calyx.
Largest <i>Challenger</i> specimen	135	...	82	...	50
Largest <i>Huxley</i> specimen	100	...	37	...	25
<i>Huxley</i> specimens 2 and 3	75	...	33	...	25
<i>Huxley</i> specimen 4	55	...	22	...	17

OCULINIDÆ.

Lophohelia prolifera, Pall.

Amphihelia oculata, Linn.

Amphihelia ramea, Müller.

STATION VII. Lat. N. 47° 36'. Long. W. 7° 31'. $\frac{44}{4}$ fathoms.

STATION XIII. Lat. 48° 7' N. Long. 8° 13' W. 412 fathoms.

There can be no doubt that the corals obtained by the *Huxley* at these stations are the same as those obtained by the *Porcupine* at 59° 56' N., 6° 27' W., 363 fathoms, and some other localities in the same part of the ocean. Duncan has given a description and several excellent figures of these corals (*Trans. Zool. Soc.*, viii. 1872, p. 330), and commented on their extreme variability. The difficulty of expressing in a diagnosis in words the difference between the species has not yet been overcome, and after carefully studying his work and that of Moseley (*Challenger Reports*, vol. ii. p. 178) and of de Lacaze Duthiers (*Arch. Zool. Expér.*, 3^o, v. 1897), I have been unable to determine what should be, on scientific or historical grounds, the proper limits of the species. The difficulties the systematist finds in dealing with this group are: (1) the great range of variation that each species exhibits in the size of the calices, the manner of growth and ramification of the colonies, the size and even the presence of a columella, the size and the degree of exertion of the septa, etc.; (2) the accommodation of the growth of the cœnenchym to the worm-tubes and other objects which the colonies encrust; (3) the amalgamation of the colonies of the different species.

(1) As regards the first difficulty, the calices of *Lophohelia* vary from 4 to 15 mm. in diameter across the rim of the calyx, of *Amphihelia oculata* from 3 to 5 mm., of *Amphihelia ramea* from 2 to 3 mm., the measurements of the larger zooids only of each colony examined being taken. The presence of a columella in *Amphihelia* cannot be relied upon as a trustworthy character to distinguish that genus from *Lophohelia*. On two branches of a colony I regarded as clearly belonging to *Amphihelia oculata* I found that some calices had a columella, others had not, and in others the columella was rudimentary.

(2) All three species exhibit a remarkable power of forming a growth of cœnenchym over worm-tubes or other objects with which they come into contact. This power ("La puissance blastogénétique" of de Lacaze Duthiers) by determining the character or shape of the support also determines to a great extent the general character of the facies of the colony, and as all three species appear to be partial to a tubular encrusting growth round the tube of the Polychæte worm

Eunice philocorallia, many of the colonies of the three species are very similar in their manner of growth. Many of the specimens in the collection exhibit these tubular growths of cœnenchym with the worm inside. (See F. Buchanan, *Proc. R.D.S.*, viii. (N.S.), 1893, p. 169, and Haddon, l.c., part iv. 1895.)

(3) If we are prepared to agree with the current views that the three species are really distinct, then we must suppose that very frequently a larva of one species becomes fixed to a colony of another, and the cœnenchym of the two colonies becomes fused or amalgamated. So intimate is this amalgamation of the cœnenchyms that it is impossible to tell by surface views or the examination of the ground surface of the coral where the cœnenchym belonging to the one colony begins and the other ends. This difficulty has been observed by de Lacaze Duthiers. He writes (l.c., p. 149): "Les deux espèces [*Lophohelia prolifera* and *Amphihelia oculata*] très souvent sont greffées l'une sur l'autre et se ressemblent extrêmement." And in attempting to distinguish between them he writes (p. 151): "J'avais pensé que peut-être la texture intime microscopique donnerait quelques indications. Après avoir fait des coupes minces bien polies, je n'ai pas trouvé de grandes différences entre la tige de l'*Amphihelia* et celle du *Lophohelia*."

The position of the problem appears to be as follows: All the authors who have examined the species agree that they are very variable, but no one has yet made a serious attempt to determine the range of variation in any one species. Until we know whether the species really merge and overlap, or do not, it is little better than a waste of time to attempt to determine the species by the ordinary methods of the systematist. To throw some light on the problem a systematic study should be made of the range of variation in one or more large colonies of the three "supposed" species. The collection obtained by the *Huxley* affords sufficient and excellent material for such an investigation, and it may be suggested that such an investigation might be undertaken.

**The Hydroids collected by the "Huxley"
from the North Side of the
Bay of Biscay in August, 1906.**

By

Edward T. Browne.

(University College, London.)

With PLATES I. AND II. and one Figure in the Text.

INTRODUCTION.

THE Hydroids collected on the northern edge of the Bay of Biscay during a five days' cruise in August, 1906, by Dr. E. J. Allen, were entrusted to me for examination. I thank my friend Dr. Allen for giving me the opportunity of working through the collection, which contained thirty-seven species, including two new species (*Bimeria arborea* and *Bimeria biscayanana*) and several rare deep-sea forms.

Our knowledge of the area occupied by the British Hydroids has been increased by this cruise. All the species taken at six out of the eight stations have been previously recorded for the British area. It was only at the two stations over 400 fathoms that foreign species occurred. Bathymetrical distribution has also made an advance, as several species were taken at a depth considerably greater than that hitherto recorded for them.

I have followed Hincks's nomenclature very closely, because the names are so familiar to us, though I foresee that a day is not far distant when other generic names, which at present are only known to specialists, will have to be introduced into our faunistic lists.

The geographical distribution of nearly all the British species mentioned in this report has already been given by Dr. Allen in his paper on the "Fauna of the Eddystone Grounds," published in this journal in 1899, so that it is scarcely necessary to repeat the same records again. But since that date several important works on Hydroids have been published, and from these I have selected such records as are of geographical and bathymetrical importance.

LIST OF SPECIES, AND THE STATIONS AT WHICH
THEY OCCURRED.

Station No.	I.	II.	III.	IV.	V.	VII.	IX.	XIII.
Latitude, N.	48° 25'	48° 24'	48° 24'	47° 48'	47° 48'	47° 36'	48° 7'	48° 7'
Longitude, W.	6° 28'	6° 28'	6° 33'	7° 25'	7° 46'	7° 31'	8° 13'	8° 13'
Fathoms	75	75	75	109	109	444	240	412
GYMNOBLASTEAE.								
<i>Bimeria nutans</i> (Wright)	+	+	-	-	-	-	-	-
„ <i>vestita</i> , Wright	-	+	-	-	-	-	-	-
„ <i>arborea</i> , n. sp.	-	-	-	-	-	-	-	+
„ <i>biscayana</i> , n. sp.	-	-	-	-	-	-	-	+
<i>Eudendrium ramosum</i> (Linn.)	-	-	-	+	-	-	-	-
„ <i>rameum</i> (Pallas)	-	+	-	-	-	+	-	+
<i>Tubularia</i> sp.	-	+	-	-	-	-	-	-
CALYPTOBLASTEAE.								
<i>Clytia johnstoni</i> (Alder)	+	+	-	-	-	-	-	-
<i>Campanularia hincksii</i> , Alder	+	+	-	-	+	+	+	+
„ <i>raridentata</i> , Alder	-	-	-	+	-	-	-	-
<i>Calycella fastigiata</i> (Alder)	+	-	-	+	-	-	+	-
<i>Lafoëa dumosa</i> (Fleming)	-	+	-	-	+	-	-	+
„ <i>fruticosa</i> (M. Sars)	+	+	-	-	-	-	-	-
„ <i>pinnata</i> , G. O. Sars	-	-	-	-	-	-	-	+
<i>Filellum serpens</i> (Hassall)	-	+	-	-	-	-	+	-
<i>Perisiphonia pectinata</i> , Pictet and Bedot	-	-	-	-	-	-	-	+
<i>Cryptolaria humilis</i> , Allman	-	-	-	-	-	-	-	+
<i>Cuspidella grandis</i> , Hincks	+	-	-	+	-	-	-	-
„ <i>costata</i> , Hincks	+	-	-	-	-	-	-	-
<i>Halecium sessile</i> , Norman	-	-	-	-	-	-	-	+
<i>Sertularella polyzonias</i> (Linn.)	+	+	+	+	+	-	+	-
„ <i>gayi</i> (Lamouroux)	-	-	-	-	-	+	-	+
<i>Diphasia pinaster</i> (Ellis and Solander)	+	+	-	+	+	-	-	-
„ <i>tamarisca</i> (Linn.)	+	+	-	-	-	-	-	-
„ <i>pinnata</i> (Pallas)	-	-	+	-	-	-	-	-
„ <i>alata</i> , Hincks	-	-	-	+	+	-	-	-
<i>Sertularia abietina</i> (Linn.)	-	+	+	-	-	-	+	-
<i>Hydrallmania falcata</i> (Linn.)	+	-	-	-	-	-	-	-
<i>Plumularia elegantula</i> , G. O. Sars	-	-	-	-	-	+	-	+
„ <i>setacea</i> (Ellis)	+	-	-	-	-	-	-	+
„ <i>frutescens</i> (Ellis and Solander)	-	-	-	-	-	-	-	+
<i>Antennularia antennina</i> (Linn.)	+	+	-	-	-	-	-	-
„ <i>ramosa</i> (Lamarck)	-	+	-	-	-	-	-	-
<i>Antennopsis norvegica</i> (G. O. Sars)	-	-	-	-	-	-	-	+
<i>Aglaophenia myriophyllum</i> (Linn.)	+	+	-	-	-	-	-	-

STATIONS AND THEIR CHARACTERISTIC HYDROIDS.

STATION I. East side of Parson's Bank. 75 fathoms.

At this station an ordinary dredge was dragged for about a mile over a sandy bottom. Here were found rooted in the sand *Aglaophenia myriophyllum* and *Antennularia antennina*, which may be regarded as the characteristic Hydroids of this ground. Attached to shells and worm-tubes (*Chaetopterus*) were colonies of *Sertularella polyzonias*, *Diphasia pinaster*, and *Diphasia tamarisca*, and on a broken pecten shell was a nice compact colony of *Cuspidella grandis*. Eight other

species were found, nearly all of them being fixed to the larger Hydroids, *Aglaophenia*, *Antennularia*, and *Sertularella*.

STATION II. This station is a continuation of Station I., but here an Agassiz trawl was used in the place of a dredge. There is a distinct decrease in the number of *Aglaophenia myriophyllum* and *Antennularia antennina*. The dredge, no doubt, is a better instrument for digging out these rooted Hydroids than the trawl. On the other hand, *Sertularella polyzonias* and *Diphasia pinaster*, both attached to worm-tubes, show an increase in number in the haul taken by the trawl over that of the dredge.

The species taken at this station are nearly the same as those found at the first station, but *Sertularia abietina* is an addition. The latter is a fine old colony with branches thickly covered with other small Hydroids.

STATION III. A large otter trawl was used at this station, which was a few miles south-west of Station II. The trawl brought up a fine large colony of *Diphasia pinnata*, and a large colony of *Sertularia abietina*. Upon the latter were attached small colonies of *Sertularella polyzonias*.

The great falling off in the number of colonies at this station must be put down to the use of the otter trawl.

All the Hydroids taken at Stations I., II., and III. have been recorded for the Eddystone Grounds. There is a remarkable similarity between the Hydroid fauna of the two regions, though they are far apart.

STATION IV. Near La Chapelle Bank. 109 fathoms. Bottom deposit—coarse sand and broken shells.

This station was about fifty miles to the south-west of Station III., and here a dredge was used. It brought up a large colony of *Sertularella polyzonias* attached to a worm-tube, a very fine colony of *Diphasia alata*, and a small colony of *Diphasia pinaster* on a worm-tube. Four other species were found upon these Hydroids.

STATION V. 109 fathoms. Bottom deposit—coarse sand and shells.

An Agassiz trawl was used at this station, which was not far from Station IV.

Here *Diphasia alata*, *Sertularella polyzonias*, and *Diphasia pinaster* were again the principal Hydroids. *Diphasia alata* may be regarded as the characteristic Hydroid for Stations IV. and V. It was not taken at any of the other stations, and it has not been recorded for the Eddystone Grounds.

STATION VII. Over 444 fathoms.

Although this station was only a few miles south of Station V., the water is about four times as deep. An Agassiz trawl was used, but it

brought up very few Hydroids. Here were found some large colonies of *Sertularella gayi*, to which are fixed a few colonies of *Campanularia hincksii*, a large branch of *Eudendrium rameum*, and fragments of *Plumularia elegantula*.

STATION IX. 240 fathoms. Bottom deposit—fine sand.

This station belongs to another area, about forty miles north-west of Station VII. Only a few Hydroids were taken, and all were broken into fragments. *Sertularia abietina* and *Sertularella polyzonias* appear to be the principal forms.

STATION XIII. 412 fathoms. Bottom deposit—sand, mud, and hard ground.

This station was not far from Station IX., but it was on the side of the Atlantic slope. For Hydroids it is certainly the most interesting of all the stations, as it was just beyond the range of the British Hydroid fauna. At all the other stations every Hydroid (except *Plumularia elegantula* at Station VII.) had been previously recorded within the British area, and described in Hincks's classical monograph.

At this station an Agassiz trawl was used, and it struck a large bed of the coral *Lophohelia prolifera*, to which many Hydroids were attached.

Amongst the larger Hydroids were *Eudendrium rameum*, *Halecium sessile*, *Sertularella gayi*, and two new species of *Bimeria* (*B. arborea*, *B. biscayana*). The foreign species include *Laföea pinnata*, *Perisiphonia pectinata*, *Cryptolaria humilis*, *Plumularia elegantula*, and *Antennopsis norvegica*. The occurrence of *Perisiphonia pectinata* and *Cryptolaria humilis* extends their geographical range further north.

Several species have their bathymetrical distribution considerably extended into deeper water, namely, *Eudendrium rameum*, *Campanularia hincksii*, *Halecium sessile*, *Plumularia elegantula*, *Plumularia setacea*, and *Plumularia frutescens*.

Two more foreign species were taken, which are not mentioned in this report. They look something like a *Cryptolaria*, but possess an operculum. If the colonies had been complete and in better condition I would have described them.

GYMNOBLASTEÆ.

BOUGAINVILLIDÆ.

Character of the family. Trophosome—hydranths with conical hypostome, tentacles filiform in a single verticil. Gonosome—gonophores, planoblasts, or hedrioblasts (Allman, 1888).

BIMERIA, Wright, 1859.

Generic character. Trophosome—hydrocaulus well developed, usually erect and branching; hydranths fusiform. Gonosome—gonophores in the form of sporosacs developed upon the hydrophyton.

The above description of the genus is almost identical with that given by Torrey (1902), who has emended Hincks's description and broadened it, so as to include the genus *Garveia*. According to Allman and Hincks, *Bimeria* is distinguished from *Garveia* by the perisarc, covering the lower part of the hydranth, extending over the proximal half of each tentacle, a character more suitable for a species than for a genus.

I am distinctly in favour of constituting the genus *Bimeria* in such a manner that it may stand in relation to *Bougainvillia* as *Coryne* does to *Syncoryne*, the trophosomes of the two genera being somewhat similar, but their gonosomes quite distinct, the former possessing sporosacs and the latter planoblasts.

It must be remembered that *Bimeria vestita* is the type species of the genus. Its trophosome in general appearance is very much like a *Bougainvillia*. Madame Motz-Kossowska (1905) has, however, transferred *Bimeria vestita* to the genus *Perigonimus*, which, like *Bougainvillia*, reproduces by means of planoblasts. The planoblasts of *Perigonimus* and *Bougainvillia* are not all alike, in fact they belong to two distinct medusoid families.

It would be an advantage to place *Pruvotella grisea*, Motz-Kossowska (1905), in the genus *Bimeria*. The generic character of *Pruvotella*, as given by Madame Motz-Kossowska, should make an excellent specific character.

I certainly prefer to place Hydroids, like *Bougainvillia*, with planoblasts, and Hydroids, like *Bimeria*, with sporosacs into separate genera, though there may be a few cases in which it is hard to draw the line. I notice that naturalists who have confined their attention solely to the trophosome completely disregard the nature of the gonosome in their classifications. They consider it is a matter of no importance whether the gonosome is a planoblast or a sporosac, and ignore the fact that medusæ have also a system of classification. I am strongly of the opinion that the gonosome should play an important part in the classification of Hydroids, especially in those Hydroids which liberate free-swimming medusæ.

Bimeria (Garveia) nutans (Wright).

This Hydroid occurred at Station I., 75 fathoms, on *Sertularella polyzonias*, and at Station II. it was common on *Sertularia abietina*. The colonies are without gonophores.

Bimeria nutans is generally found in the form of an erect arborescent colony, but here it was growing as a creeping form, without branches. The hydrocaulus has become a creeping stolon giving off at intervals single hydranths, which are on fairly long stalks.

A change in the mode of growth is not uncommon among Hydroids, and is one of the difficulties in connection with the drafting of precise generic characters. Arborescent colonies of *Syncoryne* and *Bougainvillia*, when so placed in small aquaria that a branch is in contact with the glass, will frequently send out a shoot which, on adhering to the glass, becomes converted into a stolon. The stolon develops single hydranths on long stalks, which seldom branch. The mode of growth of the new colony is distinctly that of a creeping form, whereas the old colony retains its arborescent growth.

***Bimeria vestita*, Wright.**

At Station II., 75 fathoms, this species was fairly common on *Sertularia abietina*.

It can at once be recognised by having the lower half of each tentacle sheathed with a layer of perisarc. When the hydranths are in a contracted condition the sheath is scarcely visible, and then a colony looks like a little *Bougainvillia*.

Distribution. Firth of Forth (Wright, Allman); Yorkshire, Whitby (Hincks); Devonshire, Torbay and Salcombe (Hincks); Start Bay, 20-23 fathoms (E.T.B.); Lancashire, Morecambe Bay (Allman); Irish Sea (Thornely); Ireland, Lough Swilly (Duerden); Heligoland (Hartlaub, 1897); Mediterranean, near Banyuls (Motz-Kossowska).

***Bimeria arborea*, nova species. Plate I., figs. 1-3. Plate II.**

At Station XIII., 412 fathoms, was taken a large tree-like Hydroid, which at first sight looked like an aged colony of *Bougainvillia*, but since the gonophores were found to be true sporosacs, it showed the generic character of *Bimeria*.

Description of the species. Trophosome—hydrocaulus well branched, attaining a height of about $3\frac{1}{2}$ inches; branching irregular, with a tendency towards one plane; stems and branches fascicled; hydranths with about twelve tentacles in a single verticil; perisarc continued over the lower part of the hydranths in the form of a cup, into which the hydranth contracts. Gonosome—sporosacs situated on the hydrocaulus.

The specimens consist of a large colony (Plate II.) and several small pieces. It is quite probable that they all formed part of one colony, which the trawl had torn off above the root.

The stem and branches have a central axial tube surrounded by a large number of delicate auxiliary tubes. Apparently all the

hydranths and gonophores are directly connected with the axial tube, and the auxiliary tubes only give rigidity to the stem and branches. The auxiliary tubes greatly increase the thickness of the stem and the principal branches, and extend, in decreasing numbers, almost to the extremities of the little branches, but do not run along the stalks of the hydranths.

The hydranths (Pl. I., Fig. 1) have rather a broad, cone-shaped hypostome surrounded by a single row of about twelve tentacles, but occasionally thirteen are present. It is not possible to say definitely that the tentacles during life naturally arrange themselves in two alternating series, one elevated and the other depressed, as in *Bougainvillia*. A few of the hydranths certainly show such an arrangement, but as nearly all the hydranths are in a contracted or semi-contracted condition, the tentacles are also contracted. Surrounding the lower part of the hydranth is a cup-like expansion of the perisarc, into which the hydranth withdraws on contraction. This cup is conspicuous owing to its being covered with very fine black or dark brown particles. A similar coating occurs in *Bimeria vestita* and *Bougainvillia*. The stalks of the hydranths are smooth, except at their origin, where there are a few slight wrinkles or corrugations. The axial tube is also smooth, but it is only exposed just at the tips of the branches.

The gonophores (Fig. 3) are situated upon the branches, and not upon the hydranths or their stalks. The male gonophore is globular in shape, and is upon a short pedicel. Sections (Fig. 2) show that it is a true sporosac. At the base of the spadix slight outgrowths of the endoderm indicate rudimentary radial canals, such as are found in the gonophore of *Garveia nutans*.

***Bimeria biscayana*, nova species. Plate I., figs. 4, 5.**

At Station XIII., 412 fathoms, six colonies of a small Hydroid, about 20 mm. or less in height, were found attached to the coral *Lophohelia*. As the colonies have compound branches of considerable thickness for the size of the colonies, and are without gonosomes, they are probably at an early stage in their growth, and may reasonably be expected to grow to a much larger size.

Description of the species. Hydrocaulus compound, composed of series of tubes bearing individual hydranths. Some of the stems of the hydranths become branches. Hydranths with about ten tentacles in a single verticil. Perisarc continued over the lower part of the hydranth in the form of a small cup, into which the hydranth contracts. Gonosome unknown.

Theoretically, the main stem of the colony should be a single unbranched tube carrying a hydranth at its top. The hydranth

manufactures the tube and also secretes inside it thin layers of perisarc, which form a kind of coarse network (Fig. 4). Then from the root arise auxiliary tubes (stolons), which creep up the stem. From the auxiliary tubes bud forth numerous hydranths. At first the hydranths are sessile, and later on some develop a stalk; some are more vigorous than others and develop a long stalk, which becomes a branch, and is similar in structure to the original stem. Along the branches there creep from the root more auxiliary tubes bearing

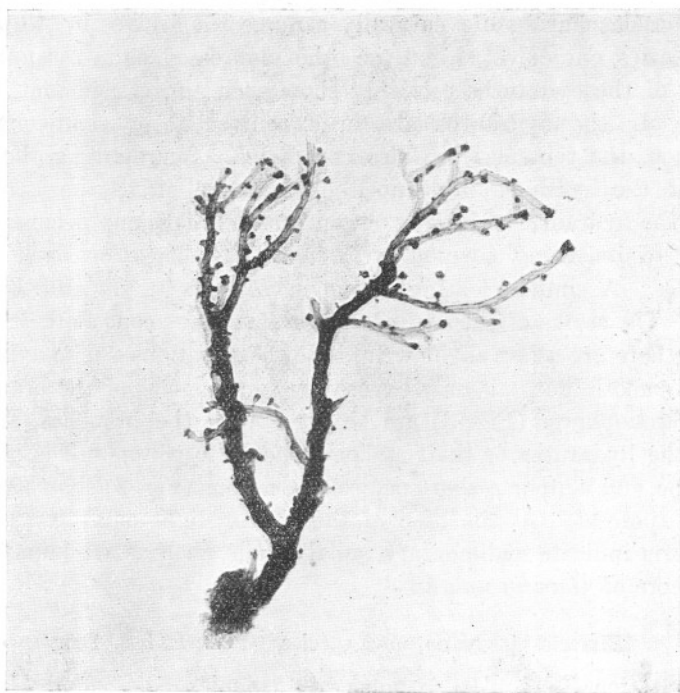


FIG. 1.

Bimeria biscayana, n. sp. $\times 4$.

hydranths. This process is repeated again and again, and results in the formation of an arborescent colony (Text Fig. 1).

The auxiliary tubes frequently anastomose with one another, and form a dense matted mass, which gives a considerable thickness to the principal branches.

The cœnosarc of a hydranth, which forms a branch, apparently has no direct communication with the auxiliary tubes growing over the external surface of its perisarc. It is, however, in communication with other hydranths by means of its own auxiliary tube, from which it originally developed. The tube formed by the hydranth even when

it lengthens into a branch does not produce lateral branches. Wherever I could trace the course of the internal cœnosarcal tube it always came from an auxiliary tube.

The auxiliary tubes are simply stolons arising from the root of the colony, growing over one another, and producing series of single hydranths, the stems of which do not develop hydranths or branch.

As all the hydranths are more or less contracted, their natural shape remains uncertain. They possess a broad conical hypostome, and generally ten tentacles, but occasionally eleven are present. The stalk of the hydranth is smooth, of about the same thickness throughout its whole length, and terminates in a slight extension to form the cup for the hydranth. The hydranths which remain sessile or nearly so upon the auxiliary tubes gradually become surrounded by tubes of a later growth, and embedded to such an extent that only their heads are visible.

Until the gonosome has been found, this species can only be provisionally regarded as a member of the genus *Bimeria*. As the Hydroid was found at a depth of over 400 fathoms, its gonophore is almost certain to be a sporosac.

EUENDRIDÆ.

Eudendrium ramosum (Linn.).

At Station IV., 109 fathoms, a few colonies were taken. They are very small in size and attached to worm-tubes.

Distribution. Some recent foreign records:—California (Torrey). Antarctic Ocean, lat. 71° S., long. 89° W.; lat. 71° S., long. 87° W.; lat. 70° S., long. 80° W.; 220 to 300 fathoms. (Species marked (?), Hartlaub, *Belgica* Expedition, 1904.)

Eudendrium rameum (Pallas).

At Station II., 75 fathoms, a small colony about 1 inch in height was taken. At Station VII., over 444 fathoms, the trawl brought up a piece which had evidently, from the thickness of the stem, been broken off from a large colony. At Station XIII., 412 fathoms, several small colonies were taken, and also a branch about 3½ inches in height. Some of the colonies have gonophores.

Distribution. Some recent foreign records:—Arctic Ocean, off Bear Island, lat. 74° 53', long. 15° 55' E., 180 fathoms (Bonnievie). S.E. of Iceland, lat. 62° 59', long. 10° 37' W., 250 fathoms (Broch, 1903). Portugal (Nobre). Off West Coast of Morocco, 33° 16' N., 8° 53' W., 65 fathoms (Billard). California (Torrey). Chile, about lat. 42° S. (Hartlaub, 1905). South Georgia, 135 fathoms (Jäderholm).

TUBULARIDÆ.**Tubularia** sp.

At Station II., 75 fathoms, a single *Tubularia* Hydroid was found attached to a worm-tube. It has the appearance of a young form.

CALYPTOBLASTEÆ.**CAMPANULARIDÆ.****Clytia johnstoni** (Alder).

A few colonies with gonophores were found at Stations I. and II., 75 fathoms. They were attached to *Sertularia abietina* and to other large Hydroids.

The bathymetrical distribution of *Clytia johnstoni* is from the shore down to about 100 fathoms.

Campanularia hincksii, Alder.

This species was fairly common at most of the stations, extending from 75 fathoms down to over 444 fathoms. It was usually attached to *Sertularella*, occasionally on *Antennularia*, but only once seen on a *Diphasia*. Colonies with gonophores were taken at Station II.

Campanularia hincksii is similar to *Clytia johnstoni* in its mode of growth and habitat, but differs in its method of reproduction. The gonophores contain fixed sporosacs which mature their products within the gonangium. *Clytia* liberates free-swimming medusæ which belong to the medusoid genus *Phialidium*.

It does not occur so close to shore as *Clytia*, but extends to a much greater depth.

Distribution. Some recent foreign records:—Off east coast of Greenland, 74° 7' N., 19° 4' E.; 50 fathoms; 0·19° C. Off Norwegian coast, 62° 17' N., 4° 57' W.; 145 fathoms (Broch, 1903). Morocco, off Cape Spartel, 60 fathoms (Billard).

Campanularia raridentata, Alder.

A few hydranths resembling Alder's figure were seen on *Sertularella*, and on a broken shell at Station IV.

CAMPANULINIDÆ.**Calycella fastigiata** (Alder).

A few colonies were found attached to *Sertularella* and to the roots of *Diphasia alata*, 75–240 fathoms.

Distribution. Some foreign records:—Norway, Aelesund, 55–100 fathoms (Bonnievie). Gulf of Gascogne, 225 fathoms. Off west coast of Morocco, 33° 16' N., 8° 53' W.; 60 fathoms (Billard).

LAFOËIDÆ.

Lafoëa dumosa (Fleming).

The erect form (var. *robusta*) was common at Station II., but scarce at Station V. The creeping form also occurred at Station II., and on *Lophohelia* at Station XIII., 412 fathoms.

The deepest record for this species is 450 fathoms, off Sombrero Island, West Indies (*Challenger* Expedition).

Lafoëa fruticosa (M. Sars), var. *gracillima*, Alder.

This species was very scarce; just a few colonies from Stations I. and II., 75 fathoms. At the second station it was growing over worm-tubes.

There appears to be a difference of opinion as to whether *Lafoëa gracillima*, Alder, and *Lafoëa fruticosa*, Sars, are the same species or distinct species. *Lafoëa gracillima* has its hydrotheca on a stalk which has one or two very loose twists, but *Lafoëa fruticosa* has three or four distinct spiral twists. The specimens in this collection belong to Alder's type, which is the type found in the English Channel, and which has usually been called *Lafoëa fruticosa*.

Distribution. Jäderholm has recently recorded *Lafoëa gracillima* for Falkland Islands and South Georgia.

One of the deepest records for *Lafoëa gracillima* is 274 fathoms, off the Norwegian coast, 62° 30' N., 1° 56' E. (Broch, 1903).

Lafoëa pinnata, G. O. Sars.

Lafoëa pinnata, G. O. Sars, 1873, p. 116, Tab. IV. figs. 25-28; Bonnevie, 1899, p. 69, Pl. VI. fig. 1.

Lafoëa halecioides, Allman, 1874, p. 472, Pl. LXVI. fig. 1.

Lictorella halecioides, Pictet et Bedot, 1900, p. 16, Pl. III. figs. 4, 5.

Lictorella pinnata, Broch, 1903; Broch, 1905, p. 11, fig. 3.

This species was taken at Station XIII., 412 fathoms, and was either growing over *Eudendrium rameum*, or fixed to the coral *Lophohelia*.

It was first described by G. O. Sars, who found it on *Eudendrium rameum* in the Hardangerfjord, on the coast of Norway. In 1874 Allman described a new species of *Lafoëa* under the name of *Lafoëa halecioides*, which was found by the *Porcupine* Expedition in the Faeroe Channel, and this appears to me to be identical with *Lafoëa pinnata*.

Allman (1888), in the Report on the Hydroida of the *Challenger* Expedition, considered a Hydroid from Torres Straits, North Australia, to be identical with *Lafoëa halecioides* from the Faeroe Channel, and on account of the structure of the hydrotheca of the Australian specimen, he transferred *Lafoëa halecioides* to a new genus called *Lictorella*.

Through the kindness of Mr. R. Kirkpatrick, I have examined at the British Museum the specimen of *Lictorella halecioides* from Torres Straits. It is not like *Lafoëa pinnata*, and it is not like Allman's figure of *Lafoëa halecioides* from the Faeroe Channel.

Pictet and Bedot record the occurrence of *Lictorella halecioides* in the Bay of Biscay. Their description and beautiful figures show that they refer to the form originally described by Allman from the Faeroe Channel.

The distinction between the two genera *Lafoëa* and *Lictorella* rests entirely upon the structure of their hydrothecæ. In *Lafoëa* the cavity of the hydrotheca is directly continuous with that of the stem or peduncle, but in *Lictorella* the cavity is distinctly differentiated from that of the peduncle.

In the lower part of the hydrotheca of *Lafoëa pinnata* there is a fine transverse circular line on the inner side of the perisarc. The line is more readily seen when the hydrothecæ are empty, and, better still, when the perisarc has been lightly stained. Two circular lines, close together, are not uncommon, and occasionally a hydrotheca was seen without a circular line. In mounted specimens one usually sees this line and nothing more, but occasionally in an empty hydrotheca a very fine membrane, with a central hole, was found stretching across the hydrotheca. The circular line is a very slight thickening of the perisarc, to which this membrane is attached. When the colony is alive the membrane extends from the body of the hydranth to the perisarc of the hydrotheca, and shuts off the lower part of the hydrotheca from the exterior. The membrane is so thin and delicate that it usually disappears on the death or absorption of the hydranth. Levensen (1893) has noticed a similar membrane in *Lafoëa fruticosa*. This membrane has commonly been called a diaphragm and considered homologous with the diaphragm of a typical Campanularian Hydroid. To compare this delicate membrane with the firm perisarcial diaphragm which forms the bottom of the hydrotheca of a Campanularia is likely to cause confusion. The membrane is not at the bottom of the hydrotheca, and it does not, on account of its pliability, in any way limit the contracting back of the hydranth; when the hydranth of a *Lafoëa* is contracted back it does not rest upon the diaphragm like a *Campanularia*, but contracts back below the diaphragm to the bottom of the hydrotheca.

Lictorella halecioides from Torres Straits has a typical Campanularian diaphragm. Its hydrotheca, with a thick basal wall, is upon a short peduncle, and the cavity of the hydrotheca is distinctly differentiated from that of the peduncle.

Description of *Lafoëa pinnata*. This Hydroid has two modes of

growth: (a) A creeping form which occurs on *Eudendrium*. In this form the stolon either gives off stems bearing only hydranths, or stems with lateral branches which carry the hydranths. The stem is either simple, monosiphonic, or fascicled. A fascicular stem has usually only one or two auxiliary tubes. (b) An erect form which is distinguishable from the creeping form by the main stem being thick and composed of many auxiliary tubes, and by the presence of thick fascicular branches which give off branchlets to bear the hydranths.

Sars has described and figured the creeping form on *Eudendrium*. Allman, Bonnevie, and Bedot, figure the erect form, which reaches a height of 70 mm. In this collection both forms occur; the erect form is similar to the figures given by Allman and Bedot.

The peduncle of the hydrotheca has the appearance of being twisted near its base. There is not a distinct joint, but rather a corrugation of the perisarc. Occasionally a peduncle was seen without the slightest trace of even a wrinkle, but peduncles with several transverse corrugations or even with two or three distinct rings were more frequently seen.

The hydrothecæ are alternately situated upon the stem, and all turn towards the same side of the colony. They frequently show several rings of growth near their orifice. A single hydrotheca is also present in the axil of the branches.

In addition to the ordinary hydrothecæ, there are very minute pedunculated cups, resembling somewhat in shape and size the sarcothecæ of *Perisiphonia pectinata* (Pictet and Bedot, 1900, Pl. IV. figs. 2b, 2c). They occur either at the axil of a branch, or at the base of the peduncle of a hydrotheca, or on an auxiliary tube of the stem. They are, however, extremely scarce; one branch may have two or three, and another none at all. Some have, undoubtedly, been broken off, as minute holes were found in the perisarc in the places where they should occur, but even the holes are very scarce. A few of the sarcothecæ contain a little cœnosarc which is usually in a contracted or dilapidated condition.

The existence of nematophores in *Lafoëa pinnata* has not been previously noticed, but before changing the generic name again it would be well to know if similar nematophores occur in specimens from other localities, especially off the Norwegian coast. If so, then I would suggest that the species be transferred to the genus *Zygophylax*, Quelch. There seems to be a close relationship between my specimens of *Lafoëa pinnata* and *Zygophylax biarmata* (Billard, 1907).

All the colonies are without gonosomes. Bonnevie has figured the gonosome, and it belongs to the *Scapus* type.

Distribution. Arctic Ocean, 71° 45' N., 15° 41' E., 620 fathoms

(1134 metres), 0-97° C.; 72° 27' N., 35° 1' E., 136 fathoms (249 metres), 0° C. (Bonnievie). Norway, Hardangerfjord, 90-100 fathoms (Sars). Between Iceland and Greenland, 66° 42' N., 26° 40' W., 320 fathoms, +0-11° C. (Broch, 1903). Faeroe Channel, 61° 10' N., 2° 21' W., 345 fathoms, 30° F.; 61° 21' N., 3° 44' W., 640 fathoms, 30° F. (Allman, 1874). Off north-west of Scotland, 59° 28' N., 8° 1' W., 600-700 fathoms (1100-1300 metres) (Broch, 1903). North-west of Faeroe Islands (Broch, 1903). Bay of Biscay, off north coast of Spain, 43° 4' N., 8° 55' W., 80 fathoms (Pictet and Bedot).

Filellum serpens (Hassall).

Lafoëa serpens, Bonnievie, 1899.

This species was very common on *Sertularella abietina* at Stations II. and IX., 75-240 fathoms.

Both Levisen and Bonnievie state that the gonosome belongs to the *Coppinia* type, and a figure of it is given by Bonnievie.

Filellum serpens has recently been recorded by Jäderholm from the Falkland Islands and Tierra del Fuego. It was found by the Norwegian North Atlantic Expedition at many different stations, 10-328 fathoms (Bonnievie).

Perisiphonia pectinata, Pictet et Bedot.

Perisiphonia pectinata, Pictet et Bedot, 1900, p. 18, Pl. IV. V.

There is only one specimen of this interesting Hydroid, which was taken at Station XIII., 412 fathoms, and found attached to the coral *Lophohelia*. The main stem is about 20 mm. in height, and has twelve alternating branches.

There are some exceedingly beautiful figures of this species drawn by Bedot, who believes that his specimens, taken in the Gulf of Gascogne and at the Azores, are identical with those described by Allman (1888) under the name of *Perisiphonia pectinata*. Allman has described two species of *Perisiphonia*—*P. filicula* from the Azores and Australia, and *P. pectinata* from off the coast of New Zealand. My specimen agrees very well with Bedot's figures, but I am not sure that it is identical with either of Allman's species.

The stem and branches have a principal axial tube from which the hydrothecæ arise, and it is surrounded by a number of auxiliary tubes, which do not bear hydrothecæ, but numerous minute sarcothecæ. The presence of sarcothecæ is the characteristic feature of the genus.

The hydrothecæ are adnate for about half their length to the axial tube. According to Allman, a pedunculated hydrotheca is one of the characters of the genus, but I think that this detail might be omitted from the generic characters and passed down to the species. At the

base of the hydrotheca there is a transverse ring, which indicates the presence of a diaphragm similar to the one mentioned in *Lafoëa pinnata*. The hydrothecæ have not the shape or position of those figured by Allman, but are similar to those figured by Bedot. Many of the hydrothecæ show circular rings of growth near their orifice.

The shapes of the sarcothecæ are similar to those figured by Bedot, but they are not like the long sarcothecæ on the auxiliary tubes of Allman's species. So far as I know, no one has yet examined a living *Perisiphonia*, so that the structure and form of the supposed sarco-styles are unknown.

Bedot fortunately found a specimen bearing a gonosome, which was previously unknown. It belongs to the *Coppinia* type, and a beautiful figure is given of it.

Cryptolaria humilis, Allman.

Cryptolaria humilis, Allman, 1888, p. 39, Pl. XVIII. fig. 1.

The collection contains only a fragment from the upper part of a colony. It was taken at Station XIII., 412 fathoms. The hydrothecæ are similar to those of *Cryptolaria humilis* as figured by Allman, and they are also like the hydrothecæ of *C. conferta*, Allman, and *C. crassicaulis*, Allman. It would be well to have these three species united, and a few more with them.

Distribution. *C. humilis*: off the Azores, 38° 30' N., 31° 14' W., 1000 fathoms (Allman, 1888). *C. conferta*: off Cuba, 450 fathoms (Allman, 1877); off the Azores, 70-250 fathoms (Pictet et Bedot); Gulf of Gascogne, 225 fathoms; off West Coast of Morocco and Soudan, Cape Spartel to Cape Garnet, 225-400 fathoms (Billard). *C. crassicornis*: off Ascension Island, 420 fathoms (Allman, 1888).

Cuspidella grandis, Hincks.

This species occurred at Station I., 75 fathoms, on *Sertularella polyzonias*. At Station IV., 109 fathoms, it was fairly common on *Sertularella* and *Diphasia alata*.

Cuspidella costata, Hincks.

This species was only taken at Station I., 75 fathoms, and was rather scarce.

HALECIDÆ.

Halecium sessile, Norman.

A single specimen was taken at Station XIII., 412 fathoms. It is about 2½ inches in height, and has evidently lost some of its branches. The main stem is thick and fasciated; the principal branches are also fasciated and irregular in position.

The hydrothecæ are sessile, and around their orifice there are a number of fine lines. These lines look like a striated band, but on being subjected to a higher magnification each line is seen to be a projecting rim and to represent a rudimentary hydrotheca.

The gonangia (male) are very long and slightly curved. They are situated on the side of the hydrothecæ, either singly or in pairs. Their distal end is rounded, and the proximal end tapers towards a joint which is closed to the hydrotheca. The male gonangium agrees with Bonnevie's description. The female form is still unknown.

Distribution. Scotland, The Minch, in deep water (Hincks, 1868). Norway, Bodo, Lofoden, 55-100 fathoms (Bonnevie).

SERTULARIDÆ.

Sertularella polyzonias (Linn.).

This species occurred at all the stations, except at the two over 400 fathoms. It was usually attached to worm-tubes, shells, and occasionally to small stones or to another Hydroid. A few of the colonies taken at Station II. bear gonophores.

Jäderholm has recently recorded this species for the Falkland Islands and South Georgia.

According to Nutting, the greatest depth recorded for this species is 353 fathoms in the North Atlantic, off Florida.

Sertularella gayi (Lamouroux).

Large colonies, some of which are loaded with gonophores and carry their ova in acrocysts, were taken at Station VII., over 444 fathoms. The species was also fairly common at Station XIII., 412 fathoms.

Some of the colonies have very thick stems, and are evidently of a great age. Even quite small colonies have thick stems and branches, and have the appearance of old colonies producing a new growth of shoots.

Both *Sertularella polyzonias* and *S. gayi* are common species on the Eddystone Grounds, 30-35 fathoms, yet on this cruise *S. gayi* was only taken at the two stations over 400 fathoms, and there *S. polyzonias* was absent.

Sertularella gayi has been taken in the Faeroe Channel at the depth of 605 fathoms (Allman, 1874).

Diphasia pinaster (Ellis and Solander).

A few colonies, without gonangia, were taken at Stations I., II., IV., and V., 75-109 fathoms. Some were attached to worm-tubes.

Distribution. Hebrides, 40 fathoms; off Mull of Galloway, 110-140 fathoms; Dogger Bank; Jersey; Dublin Bay; and other places

(Hincks, 1868). South of the Eddystone (Bourne). Norway, 200 fathoms (Broch, 1903). Portugal (Nobre). Gulf of Gascogne, 100 fathoms; Azores, 75 fathoms (Pictet and Bedot). Off the Azores, 450 fathoms (Allman, 1888). Morocco, Cape Spartel, 60 fathoms; Cape Verde Islands, 220–320 fathoms (Billard).

***Diphasia tamarisca* (Linn.).**

At Stations I. and II., 75 fathoms, a few small colonies and fragments were taken. Some of the colonies have gonophores.

Bonnevie records this species along the Norwegian coast from Kristiansund to Hammerfest, and off the north-west coast of Norway in lat. 69° 44', long. 16° 15' E., 650 fathoms, 0.66° C.; and 71° 45' N., 15° 41' E., 622 fathoms, 0.97° C.

***Diphasia pinnata* (Pallas).**

A splendid colony was taken at Station III., 75 fathoms. There are over a dozen shoots, the largest about 6 inches in height, and several are loaded with female gonophores.

The colony when alive was of a deep carmine colour, which slowly dissolved out in alcohol, and after its complete removal the colony became a dark brownish colour.

Distribution. South coast of Devon and Cornwall, about 30–40 fathoms (Hincks). As this species was not taken by the *Challenger* Expedition, and is not mentioned in recent foreign records, its occurrence outside the areas mentioned above is very doubtful.

***Diphasia alata* (Hincks).**

At Station IV., 109 fathoms, a large colony, with many shoots and branches, up to 5 inches in height, and a small colony were taken. Both colonies were attached to worm-tubes. At Station V. several large branches were again taken.

The main stem is strengthened by a number of auxiliary tubes, which run along one side of it, and decrease in number towards the distal ends.

Several of the large shoots bear female gonosomes. The gonangia are similar to those of the male.

Distribution. Norway, Stavanger, 50–100 fathoms (Bonnevie). Shetlands, 40 fathoms (Hincks). Cornish coast (Hincks). Ireland, west coast, 43 fathoms (Duerden). Bay of Biscay, Gulf of Gascogne, 75–164 fathoms; Azores, 75–174 fathoms (Pictet and Bedot). Gulf of Gascogne, 225 fathoms (Billard).

***Sertularia abietina* (Linn.).**

Abietinaria abietina, Nutting, 1904.

A fine old colony, closely covered with other small Hydroids,

was taken at Station II., 75 fathoms, and some large branches at Station III. At Station IX., 240 fathoms, a few fragments were secured.

Broch (1903) records this species at 250 fathoms in lat. 62° 59' N., long. 10° 37' W.

Hydrallmania falcata (Linn.).

A few fragments were obtained at Station I., 75 fathoms.

PLUMULARIDÆ.

Plumularia elegantula, G. O. Sars.

Plumularia elegantula, G. O. Sars, 1873, p. 103, Tab. III. figs. 9-14; Bonnevie, 1898, p. 15; Bonnevie, 1899, p. 90.

This species occurred at Station VII., over 444 fathoms, and at Station XIII., 412 fathoms. At the first station only two plumes were taken. The largest measures 35 mm. in length, and has a few empty gonangia on the stem. At the second station several young colonies were found attached to the coral *Lophohelia*.

It is very likely that this species is a deep-water variety of *Plumularia pinnata*. It agrees with the latter species in every detail, except that the internodes of the hydrocladia are nearly twice as long. The hydrothecæ are smaller in size, and are situated at the distal end of the internodes. Their position is probably due to the lengthening of the internode at its proximal end. It is the length of the internodes that gives the hydrocladia a more delicate and more slender appearance than that seen in the littoral *Plumularia pinnata*.

Distribution. Norway, Kristiania to Bodo, 55-200 fathoms (Bonnevie, 1899).

Plumularia setacea (Ellis).

At Station I., 75 fathoms, very small colonies bearing gonangia were found on *Aglaophenia* and *Antennularia*.

At Station XIII., 412 fathoms, several little colonies with gonangia were attached to *Plumularia frutescens*.

Distribution. Some recent foreign records:—Norway, 55-110 fathoms (Bonnevie); Azores, 174 fathoms (Pictet et Bedot); Florida (Nutting); California (Nutting); Puget Sound (Torrey); Chile (Hartlaub); Ceylon (Thornely); New Zealand (Hartlaub, 1901); Japan (Jäderholm, 1896).

Plumularia frutescens (Ellis and Solander).

A few short branches bearing gonophores were taken at Station XIII., 412 fathoms.

Bonnevie records this species for the coast of Norway, 20-160 fathoms.

Antennularia antennina (Linn.).

Small colonies were fairly common at Station I., 75 fathoms, but scarce at Station II.

Distribution. Recent foreign records:—Norway, 100–200 fathoms (Bonnievie); Bay of Biscay, Gulf of Gascogne, 10–35 fathoms (Pictet et Bedot); Portugal (Nobre); North Atlantic, off the American coast, lat. 42° N., long. 65° W., 65 fathoms; lat. 35° N., long. 75° W., 71 fathoms (Nutting).

Antennularia ramosa (Lamarck).

A few fragments were taken at Station II., 75 fathoms.

Distribution. Recent foreign records:—Bay of Biscay, Gulf of Gascogne, 35–75 fathoms (Pictet et Bedot); Portugal (Nobre); Azores, 75 fathoms (Pictet et Bedot).

Antennopsis, Allman, 1877.

Generic character (Nutting, 1900). Trophosome—stem jointed; cœnosarc not canaliculated; hydrocladia scattered irregularly over the stem, sometimes approaching a verticillate arrangement. Gonosome—gonangia borne in the axils of the hydrocladia, without protective appendages.

Antennopsis norvegica (G. O. Sars).

Heteropyxis norvegica, G. O. Sars, 1873, p. 104, Tab. III. figs. 15–22.

Antennularia norvegica, Bonnievie, 1899, p. 97.

Antennularia norvegica, Broch, 1903; Broch, 1905, p. 24; Billard, 1907, p. 217.

At Station XIII., 412 fathoms, a few colonies about 15–35 mm. in height were found upon *Lophohelia*.

In young colonies the arrangement of the hydrocladia on the stem is pinnate, as in the genus *Plumularia*. The same arrangement is found at the bottom of the larger plumes, but as the stem grows in length the hydrocladia no longer remain in the same plane. They project out in pairs, either alternate or opposite, at an angle of about forty-five degrees. At the distal end of the plume the hydrocladia become closer together and more irregular in position, and scattered in all directions round the stem. This irregular arrangement of the hydrocladia led Bonnievie to place the species in the genus *Antennularia*.

Nutting in his revision of the Plumularidæ has restricted the genus *Antennularia* to species with a canaliculated stem, and retains the genus *Antennopsis* for species with a simple or fascicled stem.

The specimens from the Bay of Biscay have a simple, monosiphonic stem. Bonnievie, however, states that the main is compound, which I interpret to mean a fascicled stem.

The internodes of the main stem are very irregular in length; some are quite long, carrying about eight hydrocladia, others are very short, with only two or three hydrocladia.

The nematophores are bithalamic and rather small. On each internode of the hydrocladia there are three, two situated in front of the hydrotheca and one behind it. There are also two in the axil of the hydrocladia, and several scattered over each internode of the main stem.

The gonangia are in the axil of the hydrocladia, usually one or two, but occasionally three are present. They are curved downwards, and contain a single ovum.

Distribution. Norway, Kristianfjord, 50–60 fathoms; Hardangerfjord, 90–100 fathoms (Sars). North Atlantic, off the Norwegian coast, 61° 41' N., 3° 19' E., 219 fathoms, +6° C.; 62° 44' N., 1° 48' E., 411 fathoms, -1.6° C.; 64° 48' N., 6° 36' E., 155 fathoms, +6.9° C. (Bonnievie). North Sea, 57° 11' N., 1° 50' W., 55 fathoms, 58° 0' N., 3° 24' E., 50 fathoms; 57° 9' N., 1° 30' E., 50 fathoms, +6.15° C. (Broch, 1905); 62° 16' N., 6° 6' W., 60 fathoms (Broch, 1903). South-west of Toulon, 245 fathoms (Billard).

Aglaophenia myriophyllum (Linn.).

Lytocarpus myriophyllum, Allman, 1883.

Thecocarpus myriophyllum, Nutting, 1900.

About thirty specimens were taken at Station I, 75 fathoms, and a few at Station II.

Distribution. Recent foreign records:—Off the coast of Norway, 200–400 fathoms (Bonnievie). Bay of Biscay, 50–135 fathoms; Azores, 70 fathoms (Pictet et Bedot). Portugal (Nobre). South of Madeira, 55 fathoms; off the west coast of Morocco, 300 fathoms; Cape Verde Islands, 220–320 fathoms (Billard).

LITERATURE.

- ALLEN, E. J. 1899. On the Fauna and Bottom-Deposits near the Thirty-Fathom Line from the Eddystone Grounds to Start Point. Journ. Marine Biol. Assoc., vol. v. pp. 365–452. 16 charts. Plymouth.
- ALLMAN, G. J. 1871–1872. A Monograph of the Gymnoblasic or Tubularian Hydroids. Ray Soc. London.
- ALLMAN, G. J. 1874. Report on the Hydroida collected during the Expeditions of H.M.S. *Porcupine*. Trans. Zool. Soc. Lond., vol. viii. pp. 469–481. Pls. LXV.–LXVIII.
- ALLMAN, G. J. 1883–1888. Report on the Hydroida dredged by H.M.S. *Challenger*. Part i. Plumularidæ, 1883, vol. vii. 55 pp. 20 pls.
Part ii. Tubularinæ, Campanularinæ, etc., 1888, vol. xxiii. 159 pp. 39 pls.
- BILLARD, A. 1907. Hydroides. Expéditions scientifiques du *Travailleur* et du *Talisman*, tom. viii. pp. 153–243. 21 text figures. Paris.

- BONNEVIE, KRISTINE. 1898. Neue norwegische Hydroiden. Bergens Mus. Aarbog, 1898, No. 5. 16 pp. 2 Tafn.
- BONNEVIE, KRISTINE. 1899. The Norwegian North Atlantic Expedition, 1876-1878. Hydroida, No. 26. 103 pp. 8 pls. Christiania.
- BOURNE, G. C. 1890. Notes on the Hydroids of Plymouth. Jour. Mar. Biol. Assoc. (N.S.), vol. i. pp. 391-398. Pl. XXVI. Plymouth.
- BROCH, H. 1903. Die von dem norwegischen Fischereidampfer *Michael Sars* in den Jahren 1900-1902 in dem Nordmeer gesammelten Hydroiden. Bergens Mus. Aarbog, 1903, No. 9. 14 pp. 4 Tafn.
- BROCH, H. 1905. Nordsee-Hydroiden von dem norwegischen Fischereidampfer *Michael Sars* in den Jahren 1903-1904 gesammelt, nebst Bemerkungen über die Systematik der Tekaphoren Hydroiden. Bergens Mus. Aarbog, 1905, No. 6. 28 pp. 2 Tafn.
- DUERDEN, J. E. 1896. The Hydroids of the Irish Coast. Proc. R. Dublin Soc., vol. viii. pp. 405-420.
- HARTLAUB, C. 1897. Die Hydromedusen Helgolands. Wiss. Meeresunters. deutsch. Meere, Bd. ii. pp. 449-536. 10 Tafn.
- HARTLAUB, C. 1901. Hydroiden aus den Stillen Ocean. Zool. Jahrbüch, Bd. xiv. pp. 349-379. Taf. XXI.-XXII.
- HARTLAUB, C. 1904. Hydroiden. Résultats du Voyage du *Belgica*, 1897-1899 (Expédition antarctique). 19 pp. 4 pls. Antwerp.
- HARTLAUB, C. 1905. Die Hydroiden der magalhaensischen Region und chilenischen Küste. Zool. Jahrbüch, Suppl. VI. Dr. L. Plate, Fauna Chilensis. Bd. iii. pp. 497-714. 142 text figures.
- HINCKS, T. 1868. A History of the British Hydroid Zoophytes. London.
- JÄDERHOLM, E. 1896. Ueber assereuropäische Hydroiden des Zoologischen Museums der Universitäts Upsala. Bihang Svensk. Vet. Akad. Handl. Bd. xxi. Afd. 4, No. 6. Stockholm.
- JÄDERHOLM, E. 1905. Hydroiden aus Antarktischen und Subantarktischen Meeren. Schwedischen Südpolar-Expedition, 1901-1903, Bd. v. Lief. 8. 41 pp. 14 Tafn. Stockholm.
- MARINE BIOLOGICAL ASSOCIATION. 1904. Plymouth Marine Invertebrate Fauna. Being Notes of the Local Distribution of Species occurring in the Neighbourhood. Compiled from the Records of the Laboratory. Journ. Mar. Biol. Assoc., vol. vii. pp. 155-298.
- MOTZ-KOSSOWSKA, S. 1905. Contribution à la Connaissance des Hydraires de la Méditerranée occidentale. I. Hydraires gymnoblastiques. Arch. Zool. expérimentale et générale, ser. 4, tom. iii. pp. 39-98. Pl. III. Paris.
- NOBRE, A. 1903. Subsídios para o estudo da fauna marinha do norte de Portugal. Ann. Sci. nat. Porto., vol. viii. pp. 37-94. 1 pl. and pp. 153-160.
- NUTTING, C. C. 1900. American Hydroids. Pt. i. Plumulariæ. 142 pp. 34 pls. Special Bulletin Smithsonian Instit. Washington.
- NUTTING, C. C. 1904. American Hydroids. Pt. ii. Sertulariæ. Special Bulletin Smithsonian Instit. 151 pp. 41 pls.
- PICTET, C., et BEDOT, M. 1900. Hydraires provenant des campagnes de l'*Hirondelle* (1886-1888). Result. Camp. scient. Albert de Monaco, fasc. xviii. 58 pp. 10 pls. Monaco.
- SARS, G. O. 1873. Bidrag til Kundskaben om Norges Hydroider. Videnskabs-Selskabet. Forhandl., 1873, pp. 91-150. Tab. II.-V. Christiania.

- THORNELY, LAURA R. 1904. Report on the Hydroids. Ceylon Pearl Fisheries, pt. ii. pp. 107-126. 3 pls. Royal Soc., London.
- TORREY, H. B. 1902. The Hydroids of the Pacific Coast of North America. Univ. California Publications. Zool., vol. i. pp. 1-104. 11 pls. Berkeley California.

EXPLANATION OF PLATE I.

Figs. 1-3. *Bimeria arborea*, nova species, p. 20.

Fig. 1. The hydranth. $\times 100$.

Fig. 2. Portion of a branch. $\times 9$. G., Gonophore.

Fig. 3. The male gonophore. Longitudinal section. $\times 150$.

Ec., Ectoderm. En., Endoderm. G., Gonads. R., Rudimentary radial canals. P., Perisarc.

Figs. 4-5. *Bimeria biscayana*, nova species, p. 20.

Fig. 4. Transverse section of the stem of a hydranth. $\times 180$.

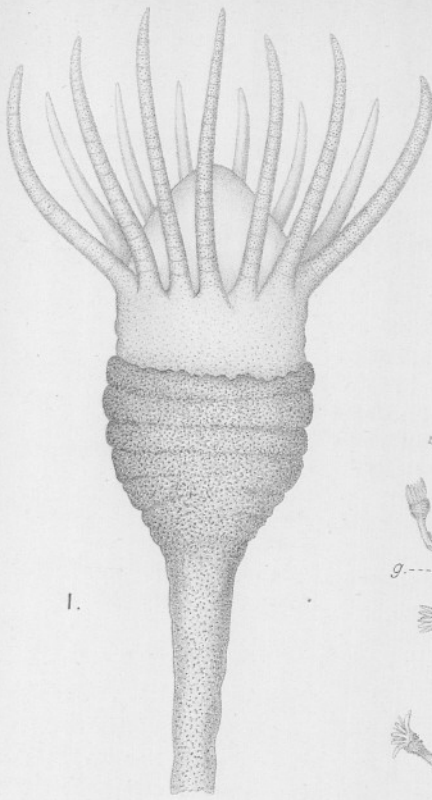
A., Auxiliary tubes. Ec., Ectoderm. En., Endoderm. P., Perisarc. P¹, Inner layer of perisarc. P², Intermediate layers of perisarc forming a coarse mesh-work.

Fig. 5. Portion of a branch drawn to show the arrangement of the hydranths and the auxiliary tubes. $\times 40$.

S., Stem of a hydranth which has grown into a branch. A., Auxiliary tubes growing over the branch and bearing hydranths H¹. A¹, Auxiliary tubes which are probably for the upper parts of the colony. H., Hydranths which give rise to branches and are connected with auxiliary tubes on S. S*, A transverse section of the stem in this position is shown in Fig. 4.

PLATE II.

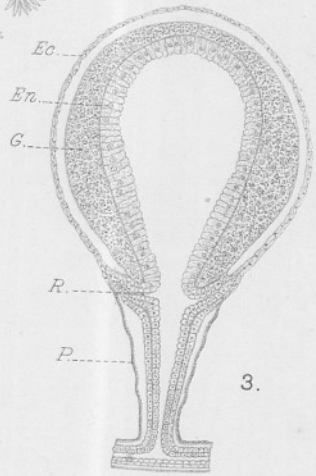
Bimeria arborea. Collotype plate from a photograph by the author. $\times 1.4$.



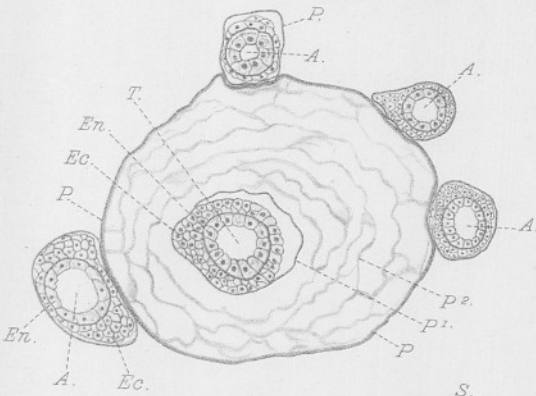
1.



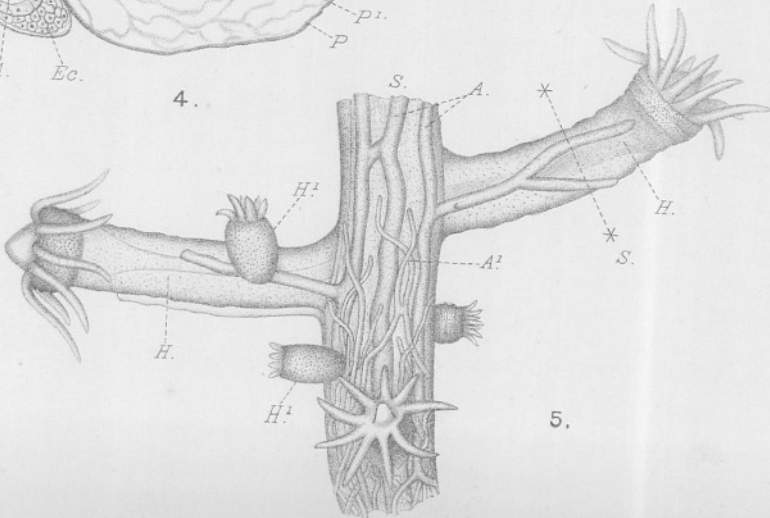
2.



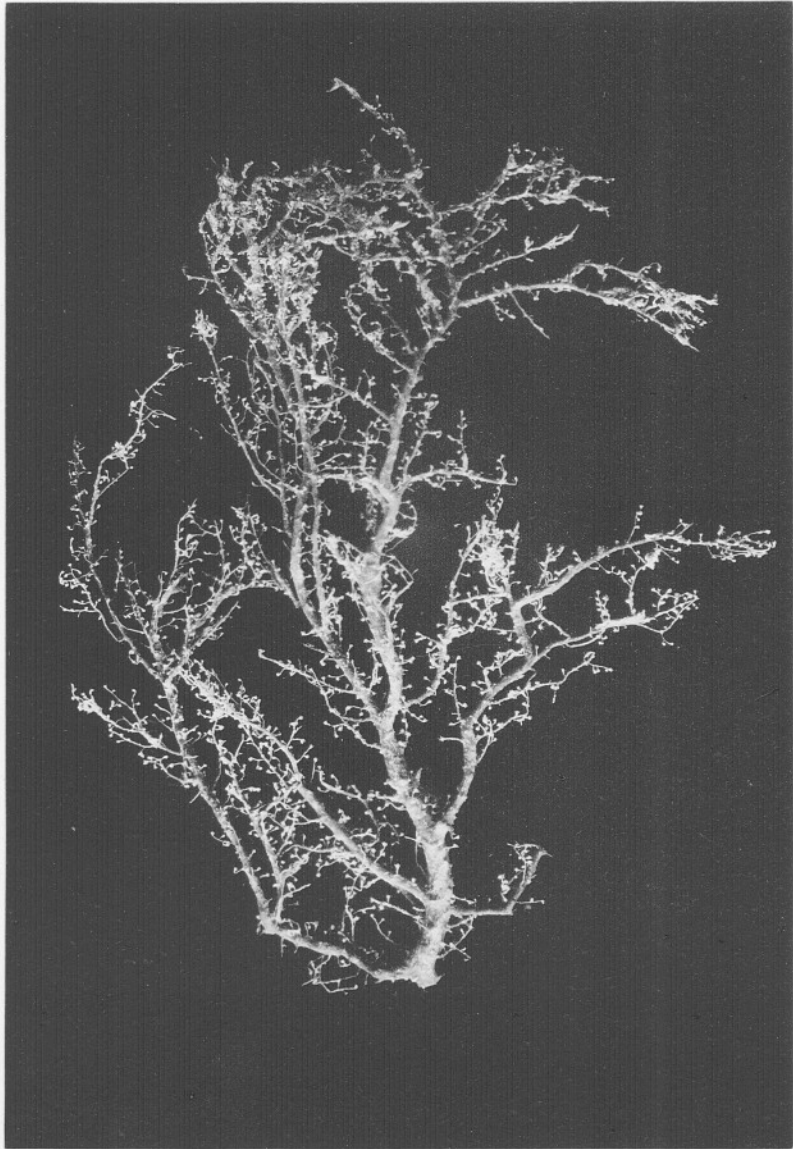
3.



4.



5.



A New Method for Growing Hydroids in Small Aquaria by means of a Continuous Current Tube.

By

Edward T. Browne.

(University College, London.)

With one Figure in the Text.

THE simple piece of apparatus, to which I give the name "Current-tube" was made last year in the Marine Laboratory at Plymouth. I designed it especially for growing Hydroids, and for them it has proved to be a success; but it should also be useful for other fixed organisms, such as sponges, polyzoa, and ascidians.

The previous methods which I had used for growing Hydroids in bell-jars or small aquaria never gave complete satisfaction. Occasionally a success was recorded, but there were too many failures, which frequently involved a great waste of labour.

A Hydroid colony when it has an ample food supply grows at an astonishingly rapid rate. I will give as an example of this the growth of *Syncoryne eximia* in one of my bell-jars at Plymouth in September, 1897.

The colony was taken on September 14th, and suspended in a bell-jar with one of its branches touching the glass. This branch sent out a shoot which attached itself to the glass and became converted into a stolon. The growth of the stolon and its lateral stolons or branches was measured and sketched daily from September 18th to 23rd, and on the 27th.

On September 18th the stolon was 14 mm. in length and had no lateral branches. Nine days later (September 27th) the main stolon measured 77 mm. in length, and its numerous lateral stolons or branches measured altogether 500 mm. These measurements excluded the short stalks of the hydranths, which were then seventy-seven in number. During the same period a second stolon came off from the old colony, and on September 27th it measured 70 mm. in

length and its branches 72 mm. The total amount of new growth in the part of the colony under observation amounted to 773 mm. (34 inches), and ninety-nine hydranths in thirteen days.

The rapid growth of this colony was due to a splendid food supply. The hydranths like large copepods, especially the oily *Calanus*, and there were no difficulties in obtaining a large supply almost every day. To give the hydranths every chance of catching the copepods, the side of the bell-jar to which the colony was fixed was placed facing a south window, but screened from direct sunlight, and only those copepods which are attracted by a strong light were put into the bell-jar. Consequently the copepods spent the day knocking their heads against the glass in the neighbourhood of the hydranths, and many got too close and were captured. During daylight the copepods usually kept near the surface and followed the course of the sun, but at night they could be brought amongst the hydranths by turning a strong beam of gaslight on to the colony.

I have frequently tried to grow *Bougainvillia* and some other Hydroids on the system described for *Syncoryne*, but have never met with a real success. A short stolon would run along the glass and a few hydranths would appear, but they remained in a diminutive condition. The new growth lacked vigour, which was evidently due to the want of food. Although there were plenty of copepods in the bell-jar the hydranths rarely caught them.

The tendency of the copepods to congregate within a small area was not always favourable to the colony, as the zone of the copepods did not always correspond with that of the colony. The introduction of the "plunger" system into bell-jars (described in this journal by the author in 1898) also proved useful for the growing of Hydroids. The currents which the plunger created helped to distribute the copepods more evenly in the water, and other species of copepods which are not attracted by light could be utilized for a food supply. The plunger in its journeys up and down a bell-jar does not set up a current in one direction, but in different directions, so that the copepods are carried hither and thither. It was the quick-changing direction of the current that frequently prevented the hydranths from holding their prey. One current carried a copepod upon the tentacles of a hydranth, and, before the tentacle responded to the touch, another current coming from a different direction would sweep the copepod away.

It must be borne in mind that the number of copepods or the quantity of plankton which can safely be placed into a bell-jar is strictly limited. Overcrowding soon leads to a heavy death rate, and ultimately to the fouling of the water. If copepods are being used

as food supply for Hydroids, then diatoms and other microscopic organisms should be present in the water for the copepods to feed upon. The constituents of the plankton require careful adjustment, and the whole must be kept in a perfectly healthy condition. There should always be a reserve of food in the bell-jar to carry over days of bad weather at sea and other misfortunes.

Hydroids certainly keep in better condition and live longer in a bell-jar with the water in constant motion than in perfectly still water. They are accustomed in the sea to a current running in a definite direction and carrying along plankton, from which they select their food. In the sea the current is ever running, always fresh and aerated, and always carrying new plankton. The successful rearing of Hydroids in a few gallons of water depends greatly upon imitating, as closely as possible, the natural conditions under which they live in the sea. The current-tube imitates fairly closely these conditions. The Hydroid is placed in a glass tube through which flows a constant current of aerated water carrying along with it the plankton in the bell-jar.

Description of the current-tube. The power for producing the current within the tube is compressed air. It does not matter by what method the air is compressed, provided that the pressure is kept fairly constant and the air is clean and pure. The latter condition is important, as a considerable quantity of air passes through the seawater in the course of a day. The supply should be drawn from outside of a building, and then washed or filtered to remove the dust. The air-pump used in the Laboratory at Plymouth is a form of Sprengel's pump, made of metal, and obtainable for about ten shillings.* It is a remarkably cheap, but very efficient piece of apparatus.

I shall describe the current-tube as it was originally made by me. (Fig. 1). Modifications in size and shape will no doubt be introduced later on to meet special requirements.

A is a glass tube, 32 mm. in diameter and about 200 mm. in length. At the lower end a bored cork is inserted, into which is placed the narrow glass tube *B C D*, having an internal diameter of about 4 mm. *B C D* is an ordinary T-tube, with one end (*D*) reduced in length, one end (*B*) made U-shaped as figured, and the third end (*C*) remaining perfectly straight. To *D* is attached by a short piece of rubber-tubing the long glass tube *E*, the length of which depends upon the depth of the bell-jar. The next step is to tie a piece of string round the tube *A* near the top, and lower the current-tube into the bell-jar. The string attached to *A* is made fast to the top of the bell-jar, and adjustments made to hold *A* in an upright position.

* The pump is supplied by Anton Skell, Zinzendorfstrasse 34, Dresden.

A tall bell-jar was used, about 20 inches (50 cm.) in height and 8 inches (20 cm.) in diameter. The top of the tube *A* was about

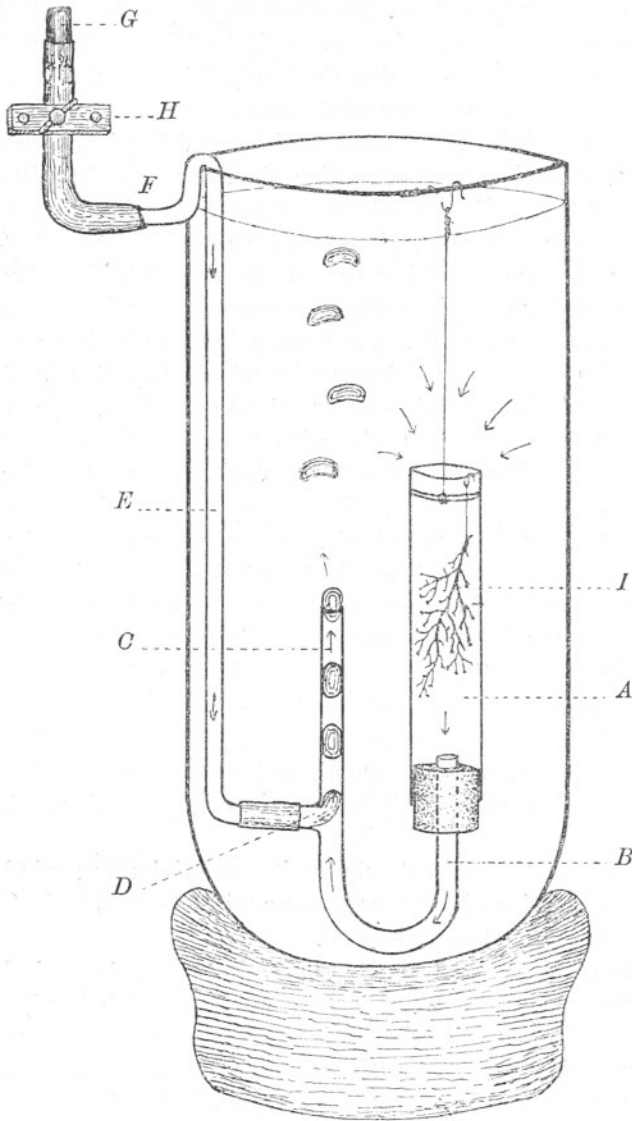


FIG. 1.

Diagram of the current-tube inside a bell-jar.

9 inches (23 cm.) below the surface of the water, which was about an inch below the top of the bell-jar.

After adjusting the current-tube, fill the bell-jar with sea-water, and connect tube *E* at *F*, with rubber-tubing, to the pipe *G*, supplying

the air from the pump. On the rubber-tubing near *F* should be fixed a screw compressor (*H*) to regulate the flow of air. On allowing the air to enter at *F*, it forces the water out of tube *E* down to *D*, and as the air enters tube *C* it breaks into bubbles, which pass up tube *C* and float to the surface. Between every two air-bubbles there is a short column of water. The driving of the water out of tube *C* by the air-bubbles produces an in-draught of water through tube *A*. As the air-bubbles follow one another in rapid succession, there flows down tube *A* a good current of water.

The Hydroid (*I*) is suspended inside tube *A* by a silk thread attached to a small glass hook, which hangs over the top of the tube; and the copepods, diatoms, etc., are put into the bell-jar.

As the current through tube *A* mainly draws from the upper part of the bell-jar, it is best to keep the top of the tube as low down as possible. The continuous stream of air which bubbles out of tube *C* not only aerates the water, but sets up a current inside the bell-jar and produces a good circulation. It is therefore advisable to keep the top of tube *C* low down. This circulation is beneficial to the plankton, and also carries it within the reach of the stream drawing in to tube *A*. The stream of air-bubbles is in another way of great service. Their continual breaking at the surface prevents the formation of the scum, chiefly due to bacteria, which gradually accumulates in small aquaria to form a thick, dirty surface film. This film, when once formed, is difficult to remove, and is often harmful to the inhabitants of an aquarium.

So long as the water in a bell-jar keeps quite clear there is no necessity to completely change it. I usually siphon off about half a gallon twice a week and fill up with very clean water.

The growth of Bougainvillia muscus in a current-tube. On November 6th a small bush-like colony of *Bougainvillia muscus*, about 20 mm. in length, was suspended inside a current-tube with the root of the colony touching the glass. The colony had a few short stolons growing out from near the distal ends of the branches. It was for observations upon the growth and function of these stolons that the *Bougainvillia* was placed in the tube.

Soon it was apparent that *Bougainvillia* liked its new surroundings. The hydranths kept fully extended, and their stomachs were seldom empty. The stolons greatly increased in number and in length, some hanging down 15-20 mm. A few developed, here and there, solitary diminutive hydranths, but there were no signs of active budding of hydranths. The activity of the colony was directed into a stolon which came off from near the root and was able to attach itself to the glass of the tube, along which it grew at a

great rate, sending out lateral stolons and quickly producing large hydranths.

A most fascinating and beautiful sight was to see the colony at night under a low-power lens, illuminated by a strong light against a black background, and to watch the fate of the copepods as they passed down the tube. Usually the copepods on entering the tube either were carried clear of the colony, or going among the hydranths succeeded in escaping into the narrow tube, and then were rapidly ejected along with the air-bubbles. As the current through the tube was fast enough to pass the whole of the water in the bell-jar through several times during the day, the copepods, which escaped on their first round were liable to a few more passages of the tube, until their fate was settled by the hydranths which had recently emptied their stomachs.

On watching the copepods passing through the tube, it was clearly seen how a steady, continuous current in one direction was of advantage to the hydranth in securing a copepod. A copepod would be seen to drift on to the expanded tentacles. If at the moment of touching the copepod gave a jump it usually got away, but occasionally the jump was delayed too long, and pressed by the current against the tentacles, it remained just long enough to be secured.

As my stay at the Laboratory terminated on November 17th, I was only able to watch the growth of the colony for eleven days, and during that period the new growth far surpassed that of any *Bougainvillia* which I had previously tried to grow. Mr. L. R. Crawshay most kindly took charge of the colony, and I am able to give a further account of the growth from his letters to me.

Letter dated November 30th:—"The colony has been kept well fed with copepods every day. The air-pump continues to work successfully, so that the food supply has been continuous. The growth of the colony has consequently been very rapid, more especially, or almost entirely, over the basal stolon, which by yesterday had extended over the whole length of the tube, lining the main expanse of the interior surface. Young polypes have grown out from this surface at every part, and almost without exception at or near the points where branching of the stolon occurs. But so far as I have observed the polypes are simple; there is no tendency to a tree-like expansion anywhere. The parent part of the colony has not developed."

"The colony has developed enemies; from what source I know not, whether from veligers in the tow-nettings or from original infection. Three days ago three minute nudibranchs were first observed browsing on the hydranths, which proved to be *Tergipes despectus*. Yesterday

the number had increased to six, and now the survival of the colony is threatened by about thirty capsules of their spawn deposited all over it."

Letter dated December 18th:—"Shortly after my last letter to you, a day or two only, it was evident to me that the six *Tergipes* were having it all their own way. They had stripped the whole stolon area of almost every visible polype, and had, moreover, simply plastered the same with spawn, containing, I should say, thousands of their embryos. I therefore took out the tube and removed the *Tergipes*, and thoroughly cleaned out the bell-jar before returning the Hydroid colony. The effect was very marked. In about two days the polypes sprung up again in all directions, and the stolon continued to form a closer network inside the tube. But it is even now to all intents and purposes a creeping colony. The first show of arborescent growth occurred inside the tube. This happened after the stolon had reached the summit of the tube and ramified over the edge. A few days ago a similar branching growth appeared outside the tube at one spot. But this is quite insignificant, with only about three polypes, and no more than 10 mm. in height."

"A new source of obstruction has arisen in the form of a brown diatom, which in the past few days has come to infest almost the whole interior of the tube."

Early in February, 1907, I heard that the colony was still alive, but owing to the intermittent failure of the air-pump and the scarcity of copepods the colony had not put forth much new growth.

In March the growth of diatoms and a small alga (*Ectocarpus*) inside the tube was slowly choking the colony. A few vegetarian molluscs were placed on the tube to browse on the algæ. They did more than was expected of them in cleansing the tube. Within a fortnight of their introduction the encrusting mass of diatoms, etc. lining the tube broke away in large flakes, perhaps due to a poison secreted by the molluscs, and carried away at the same time the stolons to such an extent that the whole colony was destroyed.

The successful growing of *Bougainvillia* is not altogether due to the advantages of the current-tube, but greatly also to the personal attention which Mr. Crawshay bestowed upon the colony. I sincerely thank him for the interesting letters from which he has allowed me to quote.

I am also greatly indebted to Dr. Allen. It was during the preliminary testing of his air-pump that the current-tube was designed. He at once most generously gave me the use of the pump, and took a very active interest in the starting of the apparatus and in the welfare of the colony.

A Peculiarly Abnormal Specimen of the Turbot.

By

J. T. Cunningham, M.A., F.Z.S.

With PLATE III.

THE specimen which forms the subject of this note was sent to Dr. Allen by Miss Olivia L. Fox, of Falmouth, at the beginning of December, 1906, preserved in formalin. Dr. Allen sent it to me in London, and requested me to study and describe it. The specimen is 4.4 cm. in length, and presents a condition which has never previously been described in any species of flat-fish. I have examined it with great interest, and would express here my thanks to Dr. Allen for sending it to me.

With respect to the position of the eyes the fish is a reversed specimen, that is to say, both eyes are on the right side, whereas normally in turbot they are on the left. With respect to colour, on the contrary, the specimen partially resembles a normal turbot: the right side is almost entirely unpigmented, the greater part of the left side is coloured as in a normal specimen. The pigmentation does not extend uniformly over the whole of the left side, but is absent from the head, and from the anterior part of the dorsal region above the head. On these areas there are only a few scattered black chromatophores. On the right or uncoloured side there are also scattered black chromatophores, rather more numerous than on the left side of the head. It is important to note that the head and anterior region of the right side, although not fully pigmented, have more pigment than the rest of that side: between the eyes and around the dorsal eye pigmentation is almost complete.

The number of dorsal fin-rays in the specimen is 65, of the ventral 47. The characteristic tubercles of the adult turbot are not yet developed, but there are three little projections at the base of each of the dorsal and ventral fin-rays, and also projections at the bases of the caudal rays: these are probably the beginnings of marginal tubercles.

The anterior end of the dorsal fin, and the basal tissue which carries

it, form a projecting hook-like process over the dorsal eye, that is, the originally left eye which has moved to the right side of the head. This projection, due to the absence of attachment between the base of the fin at the anterior end and the head, occurs commonly in ambicolorate specimens of the turbot, and less frequently in ambicolorate specimens of other species of Pleuronectidae. (See Cunningham & MacMunn, "Coloration of Skins of Fishes," etc., *Phil. Trans.*, 1894.)

The specimen was caught by Miss Fox on September 28th last year, on the sands at Polzeth, near the Doom Bar, Padstow, and was kept alive in captivity till November 28th, when it died. When the fish was alive the right side, on which the eyes are situated, was of course the upper side, while the left was in contact with the ground. It presented, therefore, the extraordinary case of a flat-fish having its upper side white and its lower side coloured. Several normal specimens were seen with the abnormal one, and some were caught; one of these was sent with the abnormal specimen for comparison. The normal specimen was 4.2 cm. long; its metamorphosis was complete, but there were still a few scattered black chromatophores on its right or lower side. Similar chromatophores are present on the right or upper side of the abnormal specimen, and they are a little larger and more numerous. Miss Fox, in a letter, stated that the upper side of this specimen was becoming pigmented during the time she kept it alive, but it is evident that exposure of this side to light had produced very little effect up to the time of death. However, it is not impossible that, had the fish lived to become adult, its upper side would have become completely coloured in consequence of exposure to light, since I have proved by my experiments on flounders that light produces pigment on the lower side of normal flat-fishes. In that case the specimen would have been quite similar to the ambicolorate turbot, or specimens coloured on both sides, which have long been known, except that the present specimen would still be reversed.

The appearance of the two sides of the fish is shown in the two figures here given, which are reproduced from photographs taken by my friend Mr. E. T. Browne, of University College, London. I have discussed the condition of the fish at greater length in a paper in the *Proceedings of the Zoological Society*, 1907, p. 174. I have there pointed out that the condition, which is certainly congenital, is that of a turbot of which the head is reversed while the body remains normal. In other words, the fish consists of a reversed head joined to a normal body. The abnormal position of parts in the fish must be regarded as due to the abnormal position of corresponding parts in the ovum from which it was developed. The determinants of the left side of the head were on the right, and vice versa. I have suggested that

this view may explain the separation of the anterior end of the dorsal fin from the head, which occurs in this specimen and in many ambicolorate specimens. In consequence of the reversion of the head the left side of the body is joined to the right side of the head and vice versa. Thus the dorsal fin, when it grows forwards in the development, finds itself in abnormal relation to the two sides of the head and therefore fails to unite with the head, but grows out as a free process. The pigmentation of the fish is not precisely in agreement with the above hypothesis, since the right side of the head is only incompletely pigmented, and pigment is wanting from the anterior dorsal region of the left side of the body. These deficiencies of pigmentation, whatever their cause, do not appear to me to be sufficient to invalidate my hypothesis, which agrees so well with all the more important peculiarities of the fish.

EXPLANATION OF PLATE III.

- Fig. 1. Right or upper side of abnormal young Turbot, showing both eyes with some pigment on right side of head, absence of pigment from right side of body.
- Fig. 2. Left or lower side of the same specimen, showing absence of eyes and pigment from left side of head, presence of pigment over left side of body.

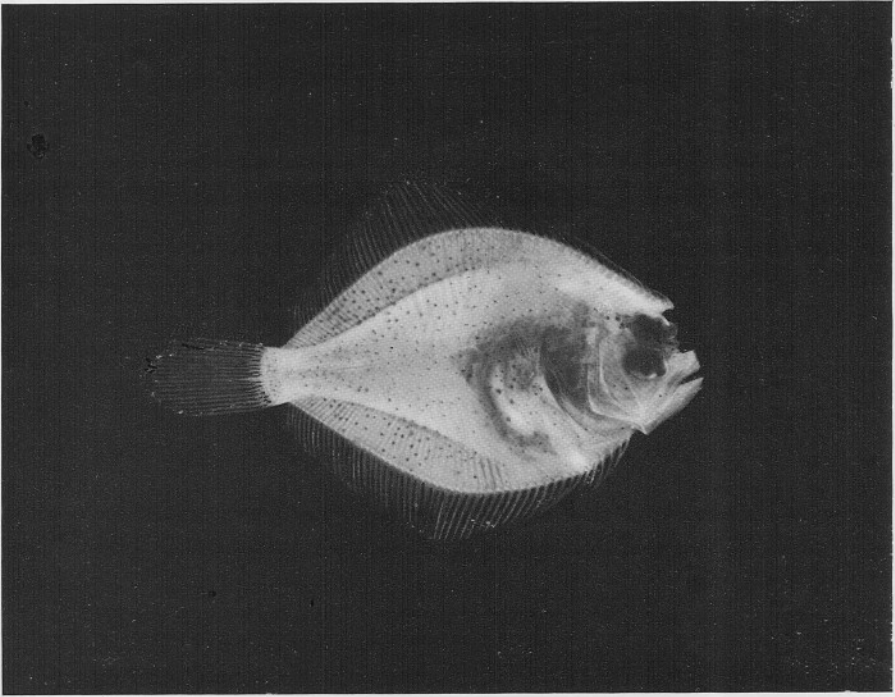


FIG. 1.

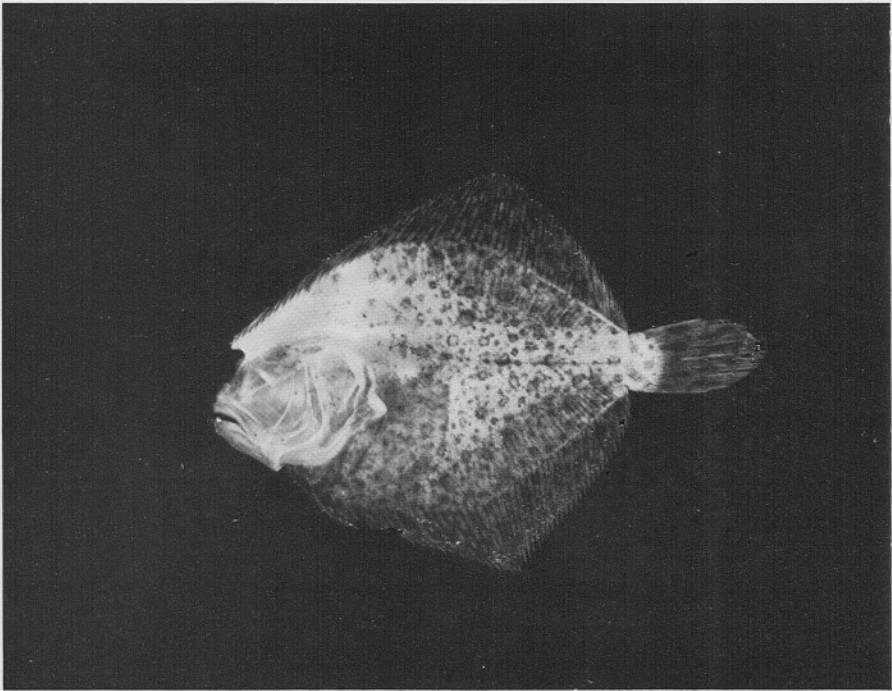


FIG. 2.

On *Phellia murocineta* (Gosse).

By

Chas. L. Walton.

P. H. GOSSE described this beautiful little species in his *British Sea Anemones and Corals*, in 1860, from two specimens obtained from a pool at Petit Tor, near Torquay.

I recently collected two specimens at Zennor, some five miles along the coast south of St. Ives, Cornwall.

An examination of these proved that Gosse's examples were young and immature, as shown by the difference of size and number of tentacles.

Their habitat was very similar to that of the Torquay specimens, namely, attached to the under side of granite stones, at the bottom of a shallow pool in a small dark cave, just at the top of the Laminarian zone. There occurred also on the same stones young specimens of *Actinia equina* (Linn.), *Cereus pedunculatus* (S. Bellis), and a number of *Depastrum cyathiforme*.

Size.—Expanded, half an inch in diameter. The measurements of Gosse's examples were, "Diameter of column $\frac{1}{8}$ of an inch, expanded $\frac{1}{2}$ of an inch."

Outline of base irregular. The "epidermis" not dense (as in Gosse's description), free and easily removed, the animals expanding as freely after the removal as before. The column was usually much flattened during the day, but frequently elongated and pillar-like at night.

No acontia were emitted even after severe irritation.

Tentacles 36 in number. Gosse's specimens had 24. Otherwise the tentacles in my specimens agreed with his account. As he says, "they were generally carried hanging over the margin with a double curve, like the branches of a chandelier, but sometimes the inner row stand erect."

They exhibited much greater activity at night than during the day-time.

Colour.—Although differing slightly from one another, both my specimens agreed with Gosse's, except that the column had no "mealy

appearance and fewer white longitudinal lines," nor were there "broad white gonidial radii" on the disk, though the white patches at the bases of the tentacles were in one specimen much more prominent in the case of the "gonidial tentacles" and those adjacent, than the rest.

The white star-shaped area in the centre of the disk was very well marked in one specimen, less so in the other, and the three white bars on the tentacles varied considerably in intensity.

One of the anemones twice moved from the upper to the under side of the stone to which it was attached, when this had been turned up for inspection.

The colouring of these anemones harmonised so exactly with their surroundings (granite stones covered with live and dead colonies of *Polysoa* and *Serpulæ* brown and white—the rock also being stained dark brown in patches)—as to be very hard to make out even when in the aquarium and close under the eye—especially when fully expanded.

Marine Biological Association of the United Kingdom.

Report of the Council, 1906-7.

The Council and Officers.

Four ordinary and two special meetings of the Council have been held during the year, at which the average attendance has been twelve. The Council desire to express their thanks to the Royal Society, in whose rooms at Burlington House the meetings have been held.

Committees of the Council have visited the Laboratories at Plymouth and Lowestoft and inspected the details of the work which is being carried on.

In November, Lord Carrington, President of the Board of Agriculture and Fisheries, visited the Lowestoft Laboratory, and was entertained by the members of the Council at luncheon.

In December, a deputation to the Chancellor of the Exchequer in support of an application for funds to carry on the work of the Association, was organized by the Council. The deputation was introduced by Mr. Austen Chamberlain, M.P., and was received by Mr. M'Kenna, M.P., Financial Secretary of the Treasury, in the unavoidable absence of Mr. Asquith. As a result of the Council's application the usual grant to the Association for the purposes of the Plymouth Laboratory was renewed, and the Council were asked to continue to carry out the work of the International Investigations until July 1908.

The Council have to record with deep regret the death of Professor Alfred Newton, a Vice-President since the foundation of the Association; and of Sir Michael Foster, K.C.B., also a Vice-President, and for many years the representative of the University of Cambridge on the Council. One of Sir Michael Foster's last public utterances was made at the deputation to the Chancellor of the Exchequer, when he warmly advocated the claims of the work of the Association on the financial support of the Government.

The Laboratories.

The Laboratories at Plymouth and at Lowestoft have been maintained in an efficient state, and both are well equipped for the work which they undertake.

The Boats.

The *Oithona* and *Huxley* have both worked successfully during the year, and have given great satisfaction to those who have conducted the experimental work at sea.

The sailing-boat *Anton Dohrn* was again used during the winter months for collecting work in connection with the Plymouth Laboratory. It would add to the efficiency of the winter work if this boat could be replaced by a small motor fishing-boat, which would be better able to take advantage of fine weather during the winter months.

The Staff.

Mr. W. Bygrave, B.A., of Christ's College, Cambridge, has succeeded Dr. Gough as Assistant Naturalist for Plankton Investigations, on the appointment of the latter to the post of Assistant in the Pretoria Museum.

Mr. C. L. Walton has been appointed a temporary Assistant Naturalist at Lowestoft for work on the steamer *Huxley*.

Occupation of Tables.

The following Naturalists have occupied tables at the Plymouth Laboratory during the year:—

- Miss A. BINDER, Mainz (Hydrozoa).
- E. T. BROWNE, M.A., London (Medusae).
- A. D. COTTON, Kew (Algae).
- A. H. CRAIG, London (General Zoology).
- A. D. DARBISHIRE, M.A., London (Elasmobranchs).
- W. DE MORGAN, London (Crustacea).
- Sir CHARLES ELIOT, K.C.M.G., Sheffield (Nudibranchiata).
- E. S. GOODRICH, M.A., F.R.S., Oxford (Anatomy of Fishes).
- G. H. GROSVENOR, B.A., Oxford (General Zoology).
- T. V. HODGSON, Plymouth (Pycnogonida and Crustacea).
- KEITH LUCAS, M.A., Cambridge (Physiology of Crustacea).
- F. A. POTTS, B.A., Cambridge (Parasitic Crustacea).
- Miss M. ROBINSON, London (Hydrozoa).
- R. W. H. ROW, London (Crustacea).
- C. SHEARER, PH.D., Montreal (Polychaeta).
- E. SPEYER, Eton (Hydrozoa).
- W. M. TATTERSALL, B.SC., Dublin (Plankton).
- A. WILLEY, D.SC., F.R.S. (Polychaeta).

Sixteen students attended a course of study in Marine Biology conducted at the Laboratory during the Easter vacation by Mr. G. H. Grosvenor.

The Library.

The thanks of the Association are due for the following books and current numbers of periodicals presented to the Library during the past year:—

- Académie Imp. des Sciences de St. Pétersbourg. Bulletin.
 — Mémoires.
 American Museum of Natural History. Memoirs.
 — Report.
 American Philosophical Society. Proceedings.
 Australian Museum. Memoirs.
 — Records.
 — Report.
 Bergens Museum. Aarbog.
 — Aarsberetning.
 — An Account of the Crustacea of Norway, etc.; by G. O. Sars.
 — Meeresfauna von Bergen.
 Bernice Pauahi Bishop Museum, Honolulu. Occasional Papers.
 Board of Agriculture and Fisheries. Annual Report of Proceedings under the Salmon and Freshwater Fisheries Acts.
 — Annual Report of Proceedings under Acts relating to Sea Fisheries.
 — Report of Proceedings of 16th Annual Meeting.
 Boston Society of Natural History. Proceedings.
 Bristol Naturalists Society. Proceedings.
 British Association for the Advancement of Science. Report.
 Brooklyn Institute of Arts and Sciences. Cold Spring Harbor Monographs.
 — Science Bulletin.
 Brown University. Contributions from the Anatomical Laboratory.
 Bryn Mawr College. Monographs, Reprint Series.
 Buffalo Society of Natural Sciences. Bulletin.
 Cairo Zoological Gardens. Report on Mission to Europe, 1905.
 Cambridge Natural History. Protozoa, Coelenterates, Echinoderms, etc.
 The Carnegie Institution. Publications.
 — Announcement of Station for Experimental Evolution.
 La Cellule.
 Ceylon Marine Biological Laboratory. Report.
 Ceylon Pearl Oyster Fisheries. Report to Colonial Government.
 College of Science, Tokyo. Journal.
 College voor de Zeevisscherijen. Verslag van den Staat der Nederlandsche Zeevisscherijen.
 Colombo Museum. Spolia Zeylanica.
 The Commissioners of Fisheries, N. S. Wales. Report.
 — The Fishes of Australia. By D. G. Stead.
 Conchological Society of Great Britain and Ireland. Journal of Conchology.
 Conseil perm. internat. pour l'Exploration de la Mer. Bulletin des Résultats acquis pendant les Courses Périodiques.
 — Bulletin Statistique.
 — Publications de Circonstance.
 — Rapports et Procès-Verbaux des Réunions.
 — Rapport Administratif.
 Cuerpo de Ingenieros de Minas del Peru. Boletin.
 — Segunda Memoria.

- Danish Biological Station. Report to the Board of Agriculture.
 Kgl. Danske Videnskabernes Selskab. Oversigt.
 — Skrifter.
- Dept. of Agriculture, Cape of Good Hope. Marine Investigations in
 S. Africa.
- Dept. of Agriculture, etc., Ireland. Reports.
- Dept. of Marine and Fisheries, Canada. Annual Report.
- Deutsche Zoologische Gesellschaft. Verhandlungen.
- Deutscher Fischerei Verein. Zeitschrift für Fischerei.
- Deutscher Seefischerei Verein. Mitteilungen.
- Falmouth Observatory. Meteorological and Magnetic Reports.
- La Feuille des Jeunes Naturalistes.
- Field Columbian Museum. Publications.
- Fisheries Society of Japan. Journal.
- The Fisherman's Nautical Almanack; by O. T. Olsen.
- Fishery Board of Scotland. Annual Report.
- The Fishing Gazette.
- Fiskeri-Beretning, 1905-6.
- The Government Biologist, Cape of Good Hope. Report.
- Government Museum, Madras. Report.
- Harbour of Refuge Enquiry, North Coast of Devon and Cornwall. Report by
 W. Matthews, C.M.G.
- Illinois State Laboratory of Natural History. Bulletin.
- Illustrations of the Zoology of the Royal Indian Marine Survey Ship
Investigator.
- Imperial University of Tokyo. Calendar.
- Internationella Hafsforskningens. Resultaten.
- R. Irish Academy. Proceedings.
 — Transactions.
- Johns Hopkins University Circulars.
- Kansas University. Geological Survey of Kansas.
 — Science Bulletin.
- Kommission zur wissenschaftlichen Untersuchung der Deutschen Meere, etc.
 Wissenschaftliche Meeresuntersuchungen.
- Kommissionen for Havundersøgelser, Copenhagen. Meddelelser, series Fiskeri,
 Hydrografi, Plankton.
- Laboratoire Biologique de St. Pétersbourg. Bulletin.
- Lancashire Sea Fisheries Laboratory. Report.
- Lancashire and Western Sea Fisheries. Superintendent's Report.
 — Quarterly Report on the Scientific Work.
- Liverpool Biological Society. Proceedings and Transactions.
- Manchester Microscopical Society. Annual Report and Transactions.
- Marine Biological Association of the West of Scotland. Fauna and Flora of the
 Clyde Area.
- Marine Biological Laboratory, Woods Holl. Biological Bulletin.
- Mededeelingen over Visscherij.
- Meteorological Office. Monthly Pilot Charts, North Atlantic and Mediterranean.
 — Monthly Pilot Charts, Indian Ocean and Red Sea.
- R. Microscopical Society. Journal.
- Musée du Congo. Annales.
- Musée d'Histoire Naturelle, Paris. Bulletin.
 — Nouvelles Archives.
- Musée Oceanographique de Monaco. Bulletin.

- Museo Nacional, Buenos Aires. Anales.
 Museo Nacional Montevideo. Anales.
 Museo Zoologico della R. Università di Napoli. Annuario.
 Museo de La Plata. Anales.
 — Revista.
 Museum für Meereskunde, Berlin. Führer.
 Museum of Comparative Zoology, Harvard College. Bulletin.
 — Memoirs.
 — Report.
 The Museums Journal.
 Natal Government Museum. First Report.
 National Sea Fisheries Protection Association. Annual Report.
 Naturforschende Gesellschaft in Basel. Verhandlungen.
 Naturhistorischen Museum, Hamburg. Mitteilungen.
 Neapel. Mitteilungen aus der Zoologischen Station.
 New York Academy of Sciences. Annals.
 New York Zoological Society. Bulletin.
 — Report.
 New Zealand Institute. Transactions and Proceedings.
 Norges Fiskeristyreelse. Aarsberetning vedkommende Norges Fiskerier.
 North Sea Fishery Investigations. Report of British Delegates.
 — Northern Area. Second Report.
 Northumberland Sea Fisheries Committee. Report on Scientific Investigations.
 La Nuova Notarisia.
 Oberlin College. The Wilson Bulletin.
 Physiographiske Forening. Christiania. Nyt Magazin for Naturvidenskaberne.
 Plymouth Institution. Annual Report and Transactions.
 Plymouth Museum and Art Gallery. Annual Report.
 Quarterly Journal of Microscopical Science. (Presented by Prof. E. Ray Lankester, F.R.S.)
 Rijksinstituut voor het Onderzoek der Zee. Helder. Jaarboek.
 — Uitkomsten van Meteorologische Waarnemingen op Zee.
 — Vangstatistieken van Hollandsche Stoomtrawlers.
 — Verhandelingen.
 Royal Society of Canada. Transactions.
 Royal Society of Edinburgh. Proceedings.
 — Transactions.
 Royal Society of London. Philosophical Transactions.
 — Proceedings.
 — Reports of Commission for Investigation of Mediterranean Fever. Part V.
 — Reports to the Evolution Committee.
 — Year-Book.
 Royal Society of Victoria. Proceedings.
 Scottish Microscopical Society. Proceedings.
 Selskabet for de Norske Fiskeriers Fremme. Norsk Fiskeritidende.
 Smithsonian Institution. Annual Report.
 Sociedad Geográfica de Lima. Boletín.
 Sociedad Científica de São Paulo. Revista.
 Societas pro Fauna et Flora Fennica. Acta.
 — Meddelanden.
 Société Belge de Géologie, etc. Bulletin.
 Société Centrale d'Aquiculture et de Pêche. Bulletin.
 Société d'Océanographie du Golfe de Gascogne. Rapports.

- Société Suisse de Pêche et Pisciculture. Bulletin.
 Société Imp. Russe de Pisciculture et de Pêche. Vvestnik R'ibopom'shennosti.
 Société Zoologique de France. Bulletin.
 — Mémoires.
 South African Museum. Annals.
 — Report.
 Station Aquicole de Boulogne-sur-Mer. Annales.
 Kgl. Svenska Vetenskaps-Akademien.
 — Arkiv för Botanik.
 — Arkiv för Zoologie.
 — Handlingar.
 Tuft's College. Studies.
 United States Commission of Fish and Fisheries. Bulletin.
 United States National Herbarium. Contributions.
 United States National Museum. Bulletin.
 — Proceedings.
 University of California. Publications. Zoology, Physiology, Botany.
 R. Università di Napoli. Annuario del Museo Zoologico.
 University of Pennsylvania. Contributions from the Zoological Laboratory.
 — University Bulletins.
 Kgl. Vetenskaps Societeten, Upsala. Nova Acta.
 Visscherhavn en Vischhal te Ijmuiden. Jaarverslag.
 Zoological Society of Japan. Annotationes Zoologicae Japonenses.
 Zoological Society of London. List of the Fellows.
 — Proceedings.
 Zoological Record.
 Zoologischen Museum, Berlin. Bericht.
 — Mitteilungen.
-

To the authors of the Memoirs mentioned below the thanks of the Association are due for separate copies of their works presented to the Library:—

- Ashworth, J. H., and Hoyle, W. E. The species of *Ctenopteryx*, a genus of Dibranchiate Cephalopoda.
 Bidder, G. P. Principal Results of the Experiments with Bottom-Trailers.
 Bruce, W. S. The Area of unknown Antarctic Regions compared with Australia; Unknown Arctic Regions, and the British Isles.
 — Report on the Work of the Scottish National Antarctic Expedition.
 Castellani, A., and Willey, A. Observations on Haematozoa in Ceylon.
 Chilton, C. Note on a New Zealand Amphipod belonging to the genus *Seba*.
 Chubb, G. C. The Growth of the Oocyte in *Antedon*. A Morphological Study in the Cell-Metabolism.
 Cotton, A. D. On some Endophytic Algae.
 Darbishire, A. D. On the Difference between Physiological and Statistical Laws of Heredity.
 Davenport, C. B. Inheritance in Poultry.
 — Evolution without Mutation.
 — Animal Morphology in its relation to other Sciences.
 — The Origin of Black Sheep in the Flock.
 — Species and Varieties: Their Origin by Mutation.
 — Report of the Station for Experimental Evolution at Cold Spring Harbor.

- Davenport, C. B., and Hubbard, M. E. Studies in the Evolution of *Pecten*.
IV.—Ray Variability in *Pecten varius*.
- Driesch, H. Analytische und Kritische Ergänzungen zur Lehre von der
Autonomie des Lebens.
— Die Physiologie der Tierischen Form.
— Studien zur Entwicklungsphysiologie der Bilateralität.
— Bemerkungen zu Przibrams Kristall-Analogien.
— Regenerierende Regenerate.
- Eliot, C. The Genus *Doriopsilla*, Bergh.
— Nudibranchiata from the Cape Verde Islands.
— On the Nudibranchs of Southern India and Ceylon, with special Reference
to the Drawings by Kelaart and the Collections belonging to Alder and
Hancock preserved in the Hancock Museum at Newcastle-on-Tyne.
— Mollusca Nudibranchiata. (National Antarctic Expedition.)
- Gurney, Robt. On some Freshwater Entomostraca in the Collection of the
Indian Museum, Calcutta.
- Hadley, P. B. Observations on some Influences of Light upon larval and
early adolescent stages of the American Lobster.
— Preliminary Report regarding the Rate of Growth of the American
Lobster.
- Herdman, W. A. Report to the Government of Ceylon on the Pearl Oyster
Fisheries of the Gulf of Manaar.
- Hickson, S. J. Precious Corals.
- Hodgson, T. V. On Collecting in Antarctic Seas. (National Antarctic Expedition.)
- Holt, E. W. L., and Tattersall, W. M. Preliminary Notice of the Schizopoda
collected by H.M.S. *Discovery* in the Antarctic Region.
- Janet, C. Anatomie de la tête de *Lasius niger*.
— Remplacement des muscles vibrateurs du vol par des colonnes d'adipo-
cytes, chez les Fourmis, après le vol nuptial.
- Kiaer, H. Om dyrelivet i Balsfjorden og denne fjords undløb til havet.
- Laidlaw, F. F. On two new genera of Deep-Sea Nemertines.
- Man, J. G. de. Sur quelques Espèces nouvelles ou peu connues de Nématodes
libres vivant sur les côtes de la Zélande.
— Observations sur quelques Espèces de Nématodes terrestres libres de
l'île de Walcheren.
— Contributions à la connaissance de Nématodes libres de la Seine et des
environs de Paris.
- H.S.H. The Prince of Monaco. Meteorological Researches in the High
Atmosphere.
- Mossman, R. C. Some Meteorological Results of the Scottish National
Antarctic Expedition.
- Nansen, Fridtjof. Northern Waters.
- Nathansohn, A. Ueber die Bedeutung Vertikalen Wasserbewegungen für die
Produktion des Planktons im Meere.
- Pace, R. M. On the Early Stages in the Development of *Flustrella hispida*,
Fab., and on the Existence of a "Yolk Nucleus" in the Egg of this form.
- Pearl, Raymond. Variation and Differentiation in *Ceratophyllum*.
- Philippi, Erich. Ein neuer Deszendenztheoretisch Interessanter Fall von
Viviparität bei einem Teleostier.
— Kurzer Beitrag zur Kenntnis der Teleostiergenera *Glaridichthys*, Garman,
und *Cnesterodon*, Garman (Familie *Cyprinodontidae*, s. *Poeciliidae*).
— Ein neuer Fall von Arrhenoidie.

- Potts, F. A. The Modification of the Sexual Characters of the Hermit Crab caused by the Parasite *Pellogaster* (Castration parasitaire of Giard).
- Punnett, R. C. Sex-determination in *Hydatina*, with some Remarks on Parthenogenesis.
- Rathbun, Mary J. A new Crab from Dominica, West Indies.
 — Description of three new Mangrove Crabs from Costa Rica.
 — A new *Scyllarides* from Brazil.
- Ridewood, W. G. A new species of *Cephalodiscus*.
- Shipley, A. E., and Hornell, J. Report on the Cestode and Nematode Parasites from the Marine Fishes of Ceylon.
- Sinel, J. The Fishes of the Channel Islands.
- Strodtmann, S. Laichen und Wandern der Ostseefische.
- Tattersall, W. M. Report on the Leptostraca, Schizopoda, and Stomatopoda collected by Prof. Herdman.
 — Preliminary Diagnoses of six new Mysidae from the West Coast of Ireland.
- Thomson, G. M. The Portobello Marine Fish Hatchery and Biological Station.
- Tower, W. L. An Investigation of Evolution in Chrysomelid Beetles of the genus *Leptinotarsa*.
- Vernon, H. M. The Conditions of Tissue Respiration.
 — The Rate of Tissue Disintegration and its Relation to the Chemical Constitution of Protoplasm.
- Walker, A. O. Preliminary Descriptions of new species of Amphipoda from the *Discovery* Antarctic Expedition, 1902-4.
- Wiley, A. Report on the Polychaeta collected by Prof. Herdman at Ceylon in 1902.
- Williams, J. Lloyd. Studies in the Dictyotaceae. III.—Periodicity of the Sexual Cells in *Dictyota dichotoma*.
- Woodruff, L. L. An experimental study on the Life History of Hypotrichous Infusoria.

General Work at the Plymouth Laboratory.

Faunistic work during the year has been chiefly directed to extending the observations into the deeper water of the English Channel. A close study has been made of the grounds to the south of the Eddystone as far as the fifty-fathom line. The results of this survey are now being worked up, and it is hoped to publish them in an early number of the Journal.

In August last the *Oithona* was sent to the North Sea in order to carry out fishery investigations in the shallow inshore waters of the East Coast, for which she is specially suited, whilst the *Huxley*, after the completion of the regular August hydrographic cruise, made a short voyage to the deep water on the edge of the Bay of Biscay, south of Parson's Bank. In addition to hydrographic observations, several hauls of the Agassiz trawl were made at depths of from ninety to four hundred fathoms, and some very interesting material was collected. This is now being studied by different specialists, and their reports will add some valuable information to our knowledge of these little-worked grounds.

In connection with the more local faunistic work in the immediate

neighbourhood of Plymouth, the Director has continued to pay special attention to the Polychæta, whilst Mr. Crawshay is commencing a study of the Sponges.

Mr. G. E. Bullen has continued from time to time the observations on the food of the mackerel and other migratory fishes. Since the present spring mackerel season has been characterized by the immense abundance of fish, whilst last year they were very scanty, a comparison of the physical and biological conditions of the two periods is of great interest.

Mr. T. V. Hodgson has occupied a table in the Laboratory during the whole year, and has been engaged in working out the material which he collected in the Antarctic.

The International Fishery Investigations.

The following is a summary of the work done, and of the conclusions arrived at by the scientific staff working under the direction of the Council.

SECTION I.—NORTH SEA WORK.

A. WORK OF THE S.S. "HUXLEY."

TRAWLING INVESTIGATIONS.—From June 1906 to the end of May 1907 the *Huxley* made 15 fishing voyages, during which 198 hauls of the large commercial trawls were made in connection with the scientific survey in progress. The boat was again laid up at Grimsby during December and January.

From the beginning of the investigations 90 voyages have been completed by the *Huxley*, and the result of 1,078 hauls with the large trawls systematically recorded. On many occasions fine-meshed nets have been attached outside the cod-end, and other parts of the commercial trawl, in order to throw light on the proportions of small fish which escape through the meshes.

In August 1906 a temporary exchange of steamers was effected between the Lowestoft and Plymouth Laboratories, in order to facilitate an investigation of the Thames Estuary, which was carried out very satisfactorily by the s.s. *Oithona*. Two members of the Lowestoft staff had charge of the work, and were kindly assisted by Dr. James Murie, of Leigh, Essex, who was present on board the vessel throughout the voyage. The otter trawl was shot on 44 occasions.

FISH MEASURED.—More than 100,000 measurements of fish, representative of the total catch on almost every occasion, were made and recorded at sea during the past year.

Nearly 410,000 fishes have been measured under these conditions since the beginning of the investigations, as shown in detail in the following table:—

		PLAICE.	HADDOCK.	OTHERS.	TOTALS.
1902-6	Voyages I-LXXV	90,463	26,705	181,660 ...	298,828
1906-7	Voyages LXXVI-XC	17,151	20,535	71,633 ...	109,319
	TOTALS	107,614	47,240	253,293 ...	408,147

In order to supplement the *Huxley's* measurements of plaice during the spawning season, and to compare her results with those of commercial trawlers during this season, a voyage on a Lowestoft smack was made by a member of the staff in February last, and the entire catch of plaice (2,631 fish) was measured and examined. During January and February two members of the staff also measured and examined 19 samples of plaice, amounting to 8,208 fish, from smacks in Lowestoft market.

MARKING EXPERIMENTS.—During the past year 2,053 marked plaice have been set free, as compared with 2,041* during the previous twelve months (1905-6). Of the latter fish 522 have been reported as recaptured by May 31st, 1907, i.e. 25·6 per cent of the total liberated, as compared with 23·9 per cent reported last year for the 5,115 marked plaice previously liberated.

The correspondence of these percentages renders it highly probable that under similar experimental conditions the percentage of recaptures of marked plaice affords a reliable factor for estimating the intensity of fishing in a particular area under modern conditions, and for measuring differences in this respect in different regions.

The annual percentage of marked fish returned has been found to vary with the size of the fish, increasing regularly from less than 10 per cent for plaice marked at less than 20 cm. (8 inches) in length to a maximum which lies between 30 per cent and 45 per cent in the case of plaice marked at 30-39 cm. (12-15 inches) in length. Above this size the percentage again decreases, a result which appears from other data to be partly indicative of natural mortality.

In this connection it is not without interest that during the spawning season of the plaice the males have been caught in relatively greater numbers than the females, not only among the marked fish, but also in the ordinary course of the trawling experiments in spawning areas.

The transplantation experiments to the Dogger Bank, which were again carried out in the spring of 1906, have shown nearly the same rapid growth of plaice which was so marked a result of the experiments

* This total was given in last year's report as 2,042, owing to accidental inclusion of a marked dab.

in 1904. On the other hand, experiments on the coastal banks and on the Flamborough Off Grounds have shown that in the western part of the North Sea the area of rapid growth is apparently limited to the Dogger Bank, and does not extend to the grounds south or west of the Dogger Bank.

The following table summarizes the chief results obtained from these experiments as to the average annual increase in length of small plaice, the great majority of which ranged between 19 and 23 cm. in length at the time of liberation.

EXPERIMENT.	ANNUAL INCREMENT.
Dogger Bank, 1904	15 cm.
" " 1905	10 cm.
" " 1906	13 cm.
Leman Banks, 1905	6 cm.
Flamborough Off Ground, 1906	7 cm. (nearly).
Well Bank, 1906	6 cm. (nearly).

Data yielded by the trawling experiments and fishermen's records, as well as by the investigations made concerning the food of fishes, render it highly probable that the above variations in the growth of plaice on the Dogger Bank are mainly due to competition for the same articles of food between this fish and the haddock. Young haddock were much more abundant in 1905, when the growth of plaice was relatively small, than in either of the years before or after.

The transplantation experiments to the Dogger Bank have been again repeated during the spring of the present year, and have been extended to certain grounds on the Great and Little Fisher Banks.

The experiments devised last year to test whether still smaller plaice of a length of 2-4 inches would thrive if transplanted to the Dogger Bank have been unsuccessful.

Experiments with marked fish have also been carried out upon certain other species besides the plaice, as shown in the following table:—

FISH.	NO. MARKED.	NO. RECAUGHT.
Sole	463	23
Brill	33	7
Turbot	11	7
Lemon Sole	15	6
Flounder	17	1
Dab	12	2
Cod	252	40
Haddock	44	1
Whiting	1	—
Pouting	1	—
Latchet	30	2
Red Gurnard	18	—
Thornback Ray	108	26

It will be seen that in spite of many trials, the sole has not proved a very suitable subject for experiments of this kind, as the number of recaptures has been excessively small compared with the labour involved. On the other hand, the experiments with other flat-fish, especially brill, turbot, and lemon sole, have been very satisfactory, and merely require to be carried out on a large scale in order to yield results of interest comparable with those of the plaice.

The experiments with cod and thornback, though not so numerous as is desirable, have yielded results of great value, both as regards the migrations and rate of growth of these fishes; and the two recaptures of marked latchet have also shown features of considerable interest.

MARKED COCONUTS AND DRIFT BOTTLES.—With the object of obtaining additional data on the relative intensity of trawling in different parts of the North Sea, 859 perforated coconuts, to each of which a numbered brass label was attached, were thrown overboard from the *Huxley* in September last. They were put out at equal intervals of one mile along lines which traversed the chief fishing grounds of the Lowestoft smacks as well as the Dogger Bank and the grounds east and west of it. Many of these nuts have been returned to the Lowestoft Laboratory by fishermen and the Association's agents with particulars of capture, but a complete year must elapse before it would be profitable to compare the records.

Of the bottles designed by Mr. Bidder for the study of bottom currents, 170 were put out along three lines in the southern part of the North Sea in November and December. Mr. Bidder has communicated to the International Council an account of some results of former experiments carried out on the *Huxley* with these bottles. In these experiments the bottles were recovered by commercial trawlers over all the area at the rate of 54 per cent per annum, while in particular districts the rate of recovery was even higher.

B. LABORATORY WORK.

AGE OF PLAICE.—A detailed report on the age of plaice based on the examination of nearly 8,000 otoliths collected up to the end of 1905, has been completed and is now in the press.

The report, besides demonstrating the reliability of the methods of age-determination employed, contains definite information in regard to

1. The distribution of the various age-groups in the southern part of the North Sea.
2. The relation of size to age on different fishing grounds.
3. The rate of growth of young plaice on the English inshore grounds.

4. The average rate of growth of plaice in the southern part of the North Sea at different ages, and the difference between the sexes in this respect.
5. The relative numerical proportions of the two sexes at successive ages.
6. The age and size at first maturity.

FOOD OF FISHES. The stomachs of over 10,000 fishes belonging to 34 species have now been examined, and a second detailed report on the food of fishes is in the press.

Among the more important observations it contains may be mentioned those on

1. The predominant extent to which Crustacea serve as food for almost all useful species of fish during their earliest stages, and the degree to which the different species of fish diverge in their selection of food as they grow older.
2. The cessation of feeding by flat-fish, especially plaice, during the winter months, and the relation of this phenomenon to spawning and other conditions.
4. The competition between plaice, haddock, and dabs for molluscan food, especially on the Dogger Bank, and the great destruction of molluscan fry by these species, particularly by the haddock.

BOTTOM FAUNA AND BOTTOM DEPOSITS.—The analysis of this material has made continual progress, and the results are in process of collation.

HERRING INVESTIGATIONS.—Several additional samples, each of 100 fish, including one sample from the Cornish coast, have been examined in conformity with the scheme described last year. All the samples show a high degree of uniformity as regards the number of vertebræ.

C. FISHERMEN'S RECORDS.

This branch of the work has been continued on the same lines and on the same scale as hitherto.

The records of Lowestoft trawling smacks so far as concerns the catch of plaice and soles have been worked up for each of the past four years so as to show the average catch per haul for each month in succession, and for each of nine grounds into which the total area has been subdivided.

The results show clearly the seasonal fluctuations in the catch on different grounds, and harmonize remarkably well with the results of the *Huxley's* marking and other experiments in the same region.

SECTION II.—HYDROGRAPHIC AND PLANKTON WORK
IN THE ENGLISH CHANNEL.

The Hydrographic programme of previous years has been carried out on the quarterly cruises in the English Channel, and the results up to the end of September 1906 have been published in the Bulletin. The work has been rendered unusually difficult by bad weather, and only one set of current measurements has been made. Severe gales made it impossible to complete the November cruise, and the three stations to the east of the Isle of Wight were omitted. The area is to a certain extent covered by the lines of samples taken by steamers sailing from Southampton and Newhaven.

Fortnightly samples and observations of Surface Temperature have been received from the captains of steamers crossing the English Channel, and from five lightships. Outside the English Channel, regular samples have also been received from the captains of liners, covering the North Atlantic south of 56° N. latitude.

The salinity of the English Channel has been slowly decreasing during the past year, the decrease beginning in the western half which is influenced by the southerly flow of fresher water from the Irish Sea. This flow was well marked during February, but no division into layers of different salinity was found at any of the stations. In the eastern half of the Channel the change did not commence till three months later, water of 35.4 ‰ S. being still found on the Newhaven-Caen line during the latter half of April.

The decrease in salinity referred to in a previous report has continued.

In May 1906 there was a very decided fall over the whole of the English Channel. The salinity at Station 3, off Ushant, increased fairly regularly with the depth, being 35.21 ‰ at the surface and 35.34 ‰ at 110 metres. This difference is apparently due to the coastal water of Brittany, and is not connected with the sharp division into layers that is sometimes found on the more westerly stations. At all other stations during May the water was homogeneous from top to bottom.

During the two following months the decrease of salinity still continued, and no value as high as 35 ‰ was found on the Newhaven-Caen line during the latter part of July.

The August cruise showed a strong southerly flow from the Irish Sea across the western entrance to the Channel and a decided division into layers of different salinity on all the western stations except the one off Ushant. The differences between the surface and bottom salinities were greatest on the more northerly positions, especially off

the Bishop and in the Bristol Channel. The Plankton on the western stations was unusually rich in oceanic species, a fact which leads to the conclusion that this southerly current is accompanied by and probably due to a simultaneous movement of water from the Bay of Biscay in a northerly direction.

By November 1906 the surface salinity of the English Channel had risen generally, the 35.4 isohaline in the western area roughly coinciding with the August isohaline of 35.3, while to the east of the Isle of Wight-Cherbourg line the area which during the August cruise had a salinity of 35.0 to 35.1 was filled with water of from 35.1 to 35.2. The southerly flow of low salinity water from the Irish Channel to the west of the Scilly Islands was even more sharply defined on its eastern edge than in August. It extended at least as far south as Parson's Bank, where the surface salinity was 35.33 compared with 35.37 in August. The western edge lies outside the area of the quarterly cruises, and the only observations available are from liners which only cross its northern extremity. Its approximate dimensions on the surface south of the latitude of Land's End may be put at 100 miles in a north and south direction, and 25 to 30 miles across. It reached the bottom at all stations except 4 and 5, where its thickness was about 30 metres, the water below that depth being of higher salinity. In view of the steep salinity gradient to which this current frequently gives rise on the surface, and its possible importance to the Plankton investigations, it would be advisable to devote a special cruise of three or four days to its examination, particularly on its western edge.

The samples from the February cruise have been analysed, but the results have not yet been plotted. The most striking point is the continued fall of the salinity on Station 4 (Parson's Bank), accompanied by a rise at Station 5. The water was of the same composition at all depths.

Two stations were worked south-west of the Start at the end of March, when mackerel were being caught by trawlers on the bottom. The results were much the same as in February, and present no point of interest.

In May five new stations in the Bristol Channel were added to the programme. It had originally been intended to work this area on the same day on which the steamers of the Irish Fishery Department and the Lancashire Sea Fisheries Committee were to carry out similar investigations in the adjacent waters, but this was unfortunately prevented by a gale which interrupted operations for some days.

During the year samples of Plankton were taken as usual on the four quarterly cruises, and also at frequent regular intervals at Plymouth, and at several light-vessels off the English and Irish coasts.

Samples were also taken each week midway between Plymouth and the Channel Islands, from the s.s. *Devonia*.

The records of the species found on each of the quarterly cruises are published in the Bulletin of the International Council.

As in the preceding years, it was found that the percentage of Oceanic species in the Plankton falls regularly as one passes up the Channel from west to east, rising again a little to the east of the Cherbourg-Southampton line.

In August 1906 the Pteropod *Limacina lesueurii* (D'Orbigny) was found in vast numbers at the surface in the north-west portion of the English Channel, and to the north of the Scilly Islands.

This Pteropod, which Professor Paul Pelseneer was good enough to identify, is an inhabitant of tropical waters, and has not previously been recorded north of the Bay of Biscay, so that its appearance in the Plankton would seem to indicate an inflow of water of southerly origin.

It is possible that the shoal entered the Channel from the south-west, following the direction of the strong current which at times flows past Ushant, in a northerly direction.

As no Plankton samples were taken in the south-west portion of the Channel between May (when *Limacina* was entirely absent from the Plankton) and August 1906 it is not possible to obtain any confirmation of this supposition.

At the end of August 1906 an extra set of Plankton samples was taken about 60 miles south-west of Parson's Bank.

These samples contained a number of forms which had not been found on any of the quarterly cruises.

Published Memoirs.

The following papers, either wholly or in part the outcome of work done at the Laboratory, have been published elsewhere than in the Journal of the Association:—

BIDDER, G. P.—*Principal Results of the Experiments with Bottom-Trailers*. Rapp. et Proc. Verb. Cons. Internat. p. l'explor. de la mer, vol. 6., 1906, pp. xxxv.—xlii.

CHUBB, G. C.—*The Growth of the Oocyte in Antedon: A Morphological Study in the Cell-Metabolism*. Phil. Trans. Roy. Soc., Ser. B, vol. 198, 1906, pp. 447-505.

COTTON, A. D.—*On some Endophytic Algae*. Journ. Linn. Soc. Botany, vol. 37, 1906, pp. 288-297.

DAVENPORT, C. B.—*Evolution without Mutation*. Journ. Experim. Zool., vol. 2. 1905, pp. 137-143.

HEWETT, C. G.—*Ligia*. Liverpool Marine Biology Committee. Memoir xiv., London, 1907.

PAGE, R. M.—*On the Early Stages in the Development of FLUSTRELLA HISPIDA (Fabricius), and on the Existence of a "Yolk Nucleus" in the Egg of this Form.* Quart. Journ. Micr. Sci., vol. 50, 1906, pp. 435-478.

ROBINSON, MARGARET.—*On the Development of NEBALIA.* Quart. Journ. Micr. Sci., vol. 50, 1906, pp. 383-433.

SHEARER, CRESSWELL.—*On the Structure of the Nephridia of DINOPHILUS.* Quart. Journ. Micr. Sci., vol. 50, 1906, pp. 517-545.

WOODLAND, W.—*A Preliminary Consideration as to the possible Factors concerned in the Production of the various Forms of Spicules.* Quart. Journ. Micr. Sci., vol. 51, 1907, pp. 55-79.

WOODLAND, W.—*Studies in Spicule Formation. V.—The Scleroblastic Development of the Spicules in Ophiuroidea and Echinoidea, and in the Genera Antedon and Synapta. VI.—The Scleroblastic Development of the Spicules in some Mollusca, and in one Genus of Colonial Ascidians.* Quart. Journ. Micr. Sci., vol. 51, 1907, pp. 31-53.

WOODLAND, W.—*On the Anatomy of CENTROPHORUS CALCEUS (CREPIDALBUS Bocage and Capello) Günther.* Proceed. Zool. Soc., London, 1906, pp. 865-886.

Donations and Receipts.

The receipts for the year for the ordinary work of the Association include the grants from His Majesty's Treasury (£1000) and the Worshipful Company of Fishmongers (£400), Special Donations (£625), Annual Subscriptions (£113), Rent of Tables in the Laboratory (£70), Sale of Specimens (£384), Admission to the Tank Room (£136).

Vice-Presidents, Officers, and Council.

The following is the list of gentlemen proposed by the Council for election for the year 1907-8:—

President.

Prof. E. RAY LANKESTER, LL.D., F.R.S.

Vice-Presidents.

The Duke of ABERCORN, K.G., C.B.
 The Duke of BEDFORD, K.G.
 The Earl of ST. GERMAN'S.
 The Earl of DUCIE, F.R.S.
 Lord AVEBURY, F.R.S.
 Lord TWEEDMOUTH, P.C.
 Lord WALSINGHAM, F.R.S.
 The Right Hon. A. J. BALFOUR, M.P.,
 F.R.S.

The Right Hon. JOSEPH CHAMBERLAIN, M.P.
 The Right Hon. AUSTEN CHAMBERLAIN, M.P.
 Sir EDWARD BIRKBECK, Bart.
 A. C. L. GÜNTHER, Esq., F.R.S.
 Sir JOHN MURRAY, F.R.S.
 Rev. Canon NORMAN, D.C.L., F.R.S.
 EDWIN WATERHOUSE, Esq.

Members of Council.

G. L. ALWARD, Esq.
 Prof. T. W. BRIDGE, Sc.D., F.R.S.
 F. DARWIN, Esq., F.R.S.
 Sir CHARLES ELIOT, K.C.M.G.
 G. HERBERT FOWLER, Esq., Ph.D.
 J. STANLEY GARDINER, Esq., M.A.
 W. GARSTANG, Esq., D.Sc.

S. F. HARMER, Esq., Sc.D., F.R.S.
 E. W. L. HOLT, Esq.
 J. J. LISTER, Esq., F.R.S.
 H. R. MILL, Esq., D.Sc.
 P. CHALMERS MITCHELL, Esq., F.R.S.
 Prof. D'ARCY W. THOMPSON, C.B.
 R. N. WOLFENDEN, Esq., M.D.

Chairman of Council.

A. E. SHIPLEY, Esq., F.R.S.

Hon. Treasurer.

J. A. TRAVERS, Esq.

Hon. Secretary.

E. J. ALLEN, Esq., D.Sc., The Laboratory, Citadel Hill, Plymouth.

The following Governors are also members of the Council :—

G. P. BIDDER, Esq., M.A.
 Sir RICHARD B. MARTIN, Bart. (Prime
 Warden of the Fishmongers'
 Company).
 E. L. BECKWITH, Esq. (Fishmongers'
 Company).

G. C. BOURNE, Esq., D.Sc. (Oxford
 University).
 A. E. SHIPLEY, Esq., F.R.S. (Cambridge
 University).
 Prof. W. A. HERDMAN, D.Sc., F.R.S.
 (British Association).

STATEMENT OF
RECEIPTS AND EXPENDITURE.

Dr. Statement of Receipts and Payments for

	£	s.	d.	£	s.	d.
To Current Income :—						
H. M. Treasury	1,000	0	0			
Fishmongers' Company.....	400	0	0			
Annual Subscriptions.....	113	7	0			
Rent of Tables	70	12	0	1,583	19	0
„ Extraordinary Receipts :—						
G. P. Bidder, Special Donation towards expenses of International Fishery Investigation (see contra).	500	0	0			
Anonymous, Special Donation.....	100	0	0			
J. J. Lister do.	25	0	0	625	0	0
„ Balance :—						
Loan from Bank.....	400	0	0			
Less :—						
Cash at Bank, Current Account.....	69	1	0			
Cash in hand	20	11	4	89	12	4
				310	7	8

NOTE.—This balance is apportioned as follows :—

General Account, overdrawn	468	19	10
Less Repairs and Renewals Account in credit.....	158	12	2
	<u>£310</u>	<u>7</u>	<u>8</u>

This Liability does not include the amount of £100 referred to on the accounts for the year ending 31st May, 1905.

£2,519 6 8

Examined and found correct,

(Signed) N. E. WATERHOUSE, A.C.A.
R. NORRIS WOLFENDEN.

L. W. BYRNE.

26th June, 1907.

the Year ending 31st May, 1907.

Cr.

	£	s.	d.	£	s.	d.
By Balance from last year, being amount due to Bankers ...	171	5	10			
Less Cash in hand	20	4	0	151	1	10
„ Current Expenditure:—						
Salaries and Wages—						
Director	200	0	0			
Naturalist (International Fishery Investigations) ...	250	0	0			
Director's Assistant	150	0	0			
Wages	658	5	3	1,258	5	3
Travelling Expenses				89	17	7
Library				82	4	0
Journal	75	5	9			
Less Sales of Journal	16	10	5	58	15	4
Buildings and Public Tank Room—						
Gas, Water, and Coal	95	10	5			
Stocking Tanks, Feeding, etc.	19	3	5			
Maintenance and Renewals	102	10	4			
Rent of Land, Rates, Taxes, and Insurance	17	5	9			
	234	9	11			
Less Admissions to Tank Room	136	7	11	98	2	0
Laboratory, Boats, and Sundry Expenses—						
Stationery, Office Expenses, Printing, etc.	168	1	5			
Glass, Chemicals, and Apparatus..... £182 16 4						
Less Sales	74	10	9	108	5	7
Purchase of Specimens	51	15	2			
Maintenance and Renewal of Boats, Nets, Gear, etc. £277 6 7						
Less Sales	28	15	6	248	11	1
Coal and Water for Steamer	138	2	5			
	714	15	8			
Less Sales of Specimens, etc. (including £50 from International Investigations Commission for use of s.s. <i>Oithona</i>)	434	12	3	280	3	5
Bank Interest				0	17	3
„ Extraordinary Expenditure:—						
Contribution towards the expenses of the International Fishery Investigations				500	0	0

£2,519 6 8

PUBLICATIONS OF THE ASSOCIATION.

Journal of the Marine Biological Association.

OLD SERIES.

No. 1, AUGUST, 1887 (only a few copies left, reserved for Libraries).

No. 2, AUGUST, 1888. Price 1s.

NEW SERIES (*Royal 8vo*).

Volume I., 1889-90, 472 pp., 28 plates.

Volume II., 1891-2, 410 pp., 14 plates.

Volume III., 1893-4, xxxviii. and 458 pp., 5 plates and 25 woodcuts.

Volume IV., 1895-7, iv. and 425 pp.

Volume V., 1897-9, 550 pp. and 16 plates.

Volume VI., 1899-1903, 676 pp., 3 charts and 7 plates.

Volume VII., 1904-6, 486 pp., 1 chart and 12 plates.

Separate numbers (generally 4 to one volume), in wrappers, 3s. 6d.; to Members, 2s. 8d.

London Agents: Messrs. DULAU & Co., 37 Soho Square, W.

Cloth 4to, 150 pp., 18 plates (12 coloured).

A TREATISE ON THE COMMON SOLE.

BY

J. T. CUNNINGHAM, M.A., F.R.S.E.,

Late Fellow of University College, Oxford; Naturalist to the Association.

Price to Members, 20s.; to Non-Members, 25s.

Medium 8vo, 368 pages. 159 Illustrations and two Maps. Price 7s. 6d. net.
(Macmillan & Co., London.)

THE NATURAL HISTORY OF THE MARKETABLE MARINE FISHES OF THE BRITISH ISLANDS.

Prepared expressly for the use of those interested in the Sea-fishing Industries,

BY

J. T. CUNNINGHAM, M.A.,

FORMERLY FELLOW OF UNIVERSITY COLLEGE, OXFORD;

NATURALIST ON THE STAFF OF THE MARINE BIOLOGICAL ASSOCIATION.

With Preface by

E. RAY LANKESTER, M.A., LL.D., F.R.S.,

PROFESSOR OF COMPARATIVE ANATOMY IN THE UNIVERSITY OF OXFORD.

PUBLICATIONS OF THE INTERNATIONAL COUNCIL FOR THE STUDY OF THE SEA.

BULLETIN

DES RÉSULTATS ACQUIS PENDANT LES COURSES PÉRIODIQUES.

PUBLISHED QUARTERLY. Price per Volume of Four Numbers,
18 Kroner (£1).

RAPPORTS ET PROCÈS-VERBAUX DES RÉUNIONS.

- VOL. I., 1902-3. Kr. 6.
VOL. II., 1903-4. Kr. 4.
VOL. III., 1902-4 (General Report). Kr. 15.
VOL. IV., 1904-5. Kr. 4.
VOL. V., 1906. Kr. 10.
VOL. VI., 1905-6. Kr. 6.

BULLETIN STATISTIQUE. DES PÊCHES MARITIMES.

VOL. I., 1903-4. Kr. 10.

PUBLICATIONS DE CIRCONSTANCE.

- No. 1. **C. G. Joh. Petersen**: How to Distinguish between Mature and Immature Plaice throughout the Year. A Preliminary Communication. 8 pp. 1 pl. July, 1903. Kr. 1.
- No. 2. **Martin Knudsen**: On the Standard-Water used in the Hydrographical Research until July, 1903. 9 pp. July, 1903. Kr. 0.50.
- No. 3. Die Literatur der zehn wichtigsten Nutzfische der Nordsee. In monographischer Darstellung. 112 s., 10 T; August, 1903. Kr. 3.
The Literature of the Ten Principal Food Fishes of the North Sea. In the form of compendious monographs. 108 pp. 10 pl. August, 1903. Kr. 3.
- Nos. 4-5. **Martin Knudsen**: Ueber den Gebrauch von Stickstoffbestimmungen in der Hydrographie.
—— — Gefrierpunkttabelle für Meerwasser.
Zusammen 13 s. September, 1903. Kr. 0.75.

PUBLICATIONS OF THE INTERNATIONAL COUNCIL
FOR THE STUDY OF THE SEA—continued.

- No. 6. **Harry M. Kyle**: On a New Form of Trawl Net, designed to fish in midwater as well as on the ground. Preliminary notice. 8 pp. November, 1903. Kr. 0.50.
- No. 7. **P. J. van Breemen**: Ueber das Vorkommen von *Oithona nana* Giesbr. in der Nordsee. (Aus dem niederlaendischen Institut für Meeresforschung.) 24 s. Mit einer Karte. November, 1903. Kr. 1.
- Nos. 8-9. **T. Wemyss Fulton**: On the Spawning of the Cod (*Gadus morrhua* L.) in Autumn in the North Sea. With a Chart.
— — A New Mark for Fish.
Together, 14 pp. March, 1904. Kr. 1.
- No. 10. **G. O. Sars**: On a New (Planktonic) Species of the Genus *Apherusa*. 4 pp. 1 pl. March, 1904. Kr. 0.50.
- No. 11. **Martin Knudsen**: σ_t Tabelle, Anhang zu den 1901 herausgegebenen hydrographischen Tabellen. 23 pp. May, 1904. Kr. 0.75.
- No. 12. Catalogue des poissons du nord de l'Europe, avec les noms vulgaires dont on se sert dans les langues de cette région. 76 pp. June, 1904. Kr. 1.
- No. 13A. Die Ostsee-Fischerei in ihrer jetzigen Lage. (Erster Teil.)
I. Uebersicht über die Seefischerei in den dänischen Gewässern innerhalb Skagens. Im Auftrag von Dr. **C. G. Joh. Petersen** bearbeitet von **Andreas Otterström**.
II. Uebersicht ueber die Seefischerei Schwedens an den süd—und östlichen Kuesten dieses Landes. Bearbeitet von Dr. **Filip Trybom** und **Alf. Wollebæk**. Together, 59 pp. 6 pl. June, 1904. Kr. 1.50.
- No. 14. **E. van Everdingen** und **C. H. Wind**: Oberflächentemperaturmessungen in der Nordsee. (Vorläufige Mitteilung.) 10 pp. 1 pl. July, 1904. Kr. 1.
- No. 15. **Sigurd Stenius**: Ein Versuch zur Untersuchung der hydrographischen Veränderungen in der nördlichen Ostsee sowie im finnischen und im bottnischen Meerbusen. (Vorläufige Mitteilung.) 7 s. 5 t.
- No. 16. — — Graphische Berechnung von σ_t aus t und σ_s . 1 s.

PUBLICATIONS OF THE INTERNATIONAL COUNCIL
FOR THE STUDY OF THE SEA—continued.

- No. 17. **A. J. Robertson**: Scottish Hydrographic Research during 1903. 6 pp.
- No. 18. **J. W. Sandström**: Einfluss des Windes auf die Dichte und die Bewegung des Meereswassers. 6 s.
- No. 19. **B. Helland-Hansen**: Zur Ozeanographie des Nordmeeres. Résumé eines am 22. Juli gehaltenen Vortrags. Mit 8 s. 3 fig.
- No. 20. **E. Ruppin**: Ueber die Oxydierbarkeit des Meerwassers durch Kaliumpermanganat. 9 s.
(No. 15–20. Ensemble 37 pp. 5 pl. et 3 fig. October, 1904. Kr. 1.50.)
- No. 21. **Charles J. J. Fox**: On the Determination of the Atmospheric Gases Dissolved in Sea-Water. (Communications du Laboratoire central à Christiania No. 1.) 24 pp. 1 pl. 4 fig. March, 1905. Kr. 1.
- No. 22. **D. Damas**: Notes biologiques sur les Copépodes de la mer norvégienne. 24 pp. 1 carte. April, 1905. Kr. 1.
- No. 23. **V. Walfrid Ekman**: On the use of Insulated Water-Bottles and Reversing Thermometers. (Communications du Laboratoire central à Christiania No. 2.) 28 pp. 2 pl. 8 fig. April, 1905. Kr. 1.
- No. 24. **V. Walfrid Ekman**: Kurze Beschreibung eines Propell-Strommessers. (Communications du Laboratoire central à Christiania No. 3.) 4 s. 1 t.
- No. 25. **O. Pettersson**: Beschreibung des Bifilar-Strommessers. 6 s. 1 t.
- No. 26. **A. M. van Rosendaal** und **C. H. Wind**: Prüfung von Strommessern und Strommessungsversuche in der Nordsee. 10 s. 2 t.
(No. 24–26. Zusammen 20 s. 4 t. July, 1905. Kr. 1.50.)
- No. 27. **V. Walfrid Ekman**: An Apparatus for the Collection of Bottom-Samples. (Communications du Laboratoire central à Christiania No. 4.) 6 pp. 5 fig. August, 1905. Kr. 0.50.
- No. 28. Bericht über die Anstalten zur Vermehrung des Lachses und der Meerforellen in den Flüssen der Ostsee. Im Auftrage der Kommission C 1, unter Mitwirkung von Prof. Dr. **O. von Grimm** (Russland), von dem deutschen Seefischerei-Verein (General-Sekretär Prof. Dr. **H. Henking**) (Deutschland) und von Fischereikonsulent **Chr. Levinsen** (Dänemark), bearbeitet von dem Geschäftsführer Dr. **Fil. Trybom**. 34 s. November, 1905. Kr. 0.75.

PUBLICATIONS OF THE INTERNATIONAL COUNCIL
FOR THE STUDY OF THE SEA—continued.

- No. 29. **L. H. Gough**: On the Distribution and the Migrations of *Muggiaea atlantica*, Cunningham, in the English Channel, the Irish Sea, and off the South and West Coasts of Ireland, in 1904. 13 pp. 3 charts. 2 fig. November, 1905. Kr. 1.
- No. 30. **Rolf J. Witting**: Kurze Beschreibung eines elektrisch registrierenden Strommessers. 8 s. Textfig.
- No. 31. ——— Etliches über Strommessung. 11 s.
No. 30–31. Zusammen 19 s. November, 1905. Kr. 0.75.
- No. 32. **Charles Atwood Kofoid**: A Self-closing Water-bucket for Plankton Investigations. 10 pp. 4 fig. December, 1905. Kr. 0.50.
- No. 33. Catalogue des espèces de plantes et d'animaux observées dans le Plankton recueilli pendant les expéditions périodiques depuis le mois d'août 1902 jusqu'au mois de mai 1905. 122 pp. February, 1906. Kr. 2.
- No. 34. **Fridtjof Nansen**: Methods for Measuring Direction and Velocity of Currents in the Sea. With an Appendix by Dr. **V. Walfrid Ekman**. 42 pp. 2 pl and 31 fig. February, 1906.
- No. 35. **Gustave Gilson**: Description d'un Sondeur-collecteur et remarques sur le prélèvement d'échantillons du fond de la mer. 12 pp. 1 pl. December, 1906.
- No. 36. **A. F. H. Dalhuisen und W. E. Ringer**: Fortgesetzte Strommessungsversuche in der Nordsee. 16 pp. 2 taf. January, 1907.
- No. 37. Liste des Stations Explorées pendant les Croisières Hydrographiques Périodiques. 16 pp. April, 1907.
- No. 38. **Martin Knudsen**: Salzgehaltbestimmungen des Oberflaechenwassers als Hilfsmittel bei Positionsbestimmungen au Bord. 9 pp. 1 chart. April, 1907.
- No. 39. **Martin Knudsen**: Some remarks about the Currents in the North Sea and Adjacent Waters. 7 pp. June, 1907.
- No. 40. **Johan Gehrese**: Mean Velocity of the Atlantic Currents running North of Scotland and through the English Channel. 18 pp. 4 fig. June, 1907.

Published on behalf of the International Council

BY

ANDR. FRED. HØST ET FILS,
COPENHAGEN.

OBJECTS
OF THE
Marine Biological Association
OF THE UNITED KINGDOM.

THE ASSOCIATION was founded at a Meeting called for the purpose in March, 1884, and held in the Rooms of the Royal Society of London.

The late Professor HUXLEY, at that time President of the Royal Society, took the chair, and amongst the speakers in support of the project were the late Duke of ARGYLL, the late Sir LYON PLAYFAIR, Lord AVEBURY, Sir JOHN HOOKER, the late Dr. CARPENTER, Dr. GÜNTHER, the late Lord DALHOUSIE, the late Professor MOSELEY, the late Mr. ROMANES, and Professor LANKESTER.

The Association owes its existence and its present satisfactory condition to a combination of scientific naturalists, and of gentlemen who, from philanthropic or practical reasons, are specially interested in the great sea fisheries of the United Kingdom. It is universally admitted that our knowledge of the habits and conditions of life of sea fishes is very small, and insufficient to enable either the practical fisherman or the Legislature to take measures calculated to ensure to the country the greatest return from the "harvest of the sea." Naturalists are, on the other hand, anxious to push further our knowledge of marine life and its conditions. Hence the Association has erected at Plymouth a thoroughly efficient Laboratory, where naturalists may study the history of marine animals and plants in general, and where, in particular, researches on food-fishes and molluscs may be carried out with the best appliances.

The Laboratory and its fittings were completed in June, 1888, at a cost of some £12,000. Since that time investigations, practical and scientific, have been constantly pursued at Plymouth. Practical investigations upon matters connected with sea-fishing are carried on under the direction of the Council; in addition, naturalists from England and from abroad have come to the Laboratory, to carry on their own independent researches, and have made valuable additions to zoological and botanical science, at the expense of a small rent for the use of a working table in the Laboratory and other appliances. The number of naturalists who can be employed by the Association in special investigations on fishery questions, and definitely retained for the purpose of carrying on those researches throughout the year, must depend on the funds subscribed by private individuals and public bodies for the purpose. The first charges on the revenue of the Association are the working of the sea-water circulation in the tanks, stocking the tanks with fish and feeding the latter, the payment of servants and fishermen, the hire and maintenance of fishing-boats, and the salary of the Resident Director and Staff. At the commencement of this number will be found the names of the gentlemen on the staff.

In the summer of 1902 the Association was commissioned by His Majesty's Government to carry out in the southern British area the scheme of International Fishery Investigations adopted by the Conference of European Powers which met at Christiania in 1901. In connection with this work a laboratory has been opened at Lowestoft.

The purpose of the Association is to aid at the same time both science and industry. It is national in character and constitution, and its affairs are conducted by a representative Council, by an Honorary Secretary and an Honorary Treasurer, without any charge upon its funds, so that the whole of the subscriptions and donations received are devoted absolutely to the support of the Laboratory and the prosecution of researches by aid of its appliances. The reader is referred to page 4 of the Cover for information as to membership of the Association.

CONTENTS OF NEW SERIES, Vol. VIII., No. 1.

	PAGE
1. THE FISHES COLLECTED BY THE "HUXLEY" FROM THE NORTH SIDE OF THE BAY OF BISCAY IN AUGUST, 1906. BY L. W. BYRNE. <i>With one Figure in the Text</i>	1
2. THE ALCYONARIA, ANTIPATHARIA, AND MADREPORARIA COLLECTED BY THE "HUXLEY" FROM THE NORTH SIDE OF THE BAY OF BISCAY IN AUGUST, 1906. BY SYDNEY J. HICKSON, M.A., F.R.S.	6
3. THE HYDROIDS COLLECTED BY THE "HUXLEY" FROM THE NORTH SIDE OF THE BAY OF BISCAY IN AUGUST, 1906. BY EDWARD T. BROWNE. <i>With Plates I. and II. and one Figure in the Text</i>	15
4. A NEW METHOD FOR GROWING HYDROIDS IN SMALL AQUARIA BY MEANS OF A CONTINUOUS CURRENT TUBE. BY EDWARD T. BROWNE. <i>With one Figure in the Text</i>	37
5. A PECULIARLY ABNORMAL SPECIMEN OF THE TURBOT. BY J. T. CUNNINGHAM, M.A., F.Z.S. <i>With Plate III.</i>	44
6. ON PHELLIA MUROCINCTA (<i>Gosse</i>). BY CHAS. L. WALTON	47
7. REPORT OF THE COUNCIL, 1906-1907	49
STATEMENT OF RECEIPTS AND EXPENDITURE, 1906-1907	68

NOTICE.

The Council of the Marine Biological Association wish it to be understood that they do not accept responsibility for statements published in this Journal excepting when those statements are contained in an official report of the Council.

TERMS OF MEMBERSHIP.

	£	s.	d.
Annual Members per annum	1	1	0
Life Members Composition Fee	15	15	0
Founders	100	0	0
Governors	500	0	0

Members of the Association have the following rights and privileges: they elect annually the Officers and Council; they receive the Journal of the Association free by post; they are admitted to view the Laboratory at Plymouth, and may introduce friends with them; they have the first claim to rent a place in the Laboratory for research, with use of tanks, boats, &c.; and have access to the books in the Library at Plymouth.

All correspondence should be addressed to the Director, The Laboratory, Plymouth.